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Energy Statement

Berkeley Homes (Southern) Ltd

Southwater Phase 4 S73

Final

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Executive Summary

This Energy Statement has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Berkeley Homes Southern (Ltd) for the development at Southwater Phase 4.

This report is being submitted as part of an S73 application specific to Phase 4 of the development and aims to demonstrate compliance with relevant local planning policy, as well as an improvement beyond the previous Energy Strategy submitted for Phase 3.2 and 4. The provisions outlined within the previous Energy Strategy submitted for Phase 3.2 and 4 still stand for Phase 3.2, which is completed and largely occupied and not covered by this report.

The development may also be subject to the incoming Future Homes Standard (FHS); whilst the requirements of this are not yet confirmed, consideration of this has been taken into account within the strategy, with low carbon heat pump technology ensuring that a significant improvement beyond current Part L 2021 is achieved.

The energy strategy presented prioritises high performance building fabric, incorporating low U-values across building elements, high performance building systems (e.g., mechanical extract ventilation with low SFP, high performance lighting), low air permeability targets and ambitious psi-value targets for thermal bridges.

The strategy additionally incorporates low carbon technologies in the form of high efficiency heat pumps, with air source heat pumps in houses and exhaust air heat pumps in apartments and maisonettes as appropriate. Heat pumps achieve much greater efficiency ratings than a gas boiler alternative, and the use of electricity allows for decarbonisation in line with grid decarbonisation as renewable uptake increases.

Through the measures proposed within this strategy, a significant improvement in carbon reduction is achieved – 57.4% reduction beyond the Part L 2021 baseline.

In the instance where PV is applied to houses, a further improvement in carbon reduction is achieved of 66.0%. The location of PV within the roof slope, where applicable, can be secured by condition.

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1. INTRODUCTION

- 1.1** This Energy Statement has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Berkeley Homes Southern (Ltd) for the development at Southwater Phase 4.
- 1.2** This report is being submitted as part of an S73 application specific to Phase 4 of the development and aims to demonstrate compliance with relevant local planning policy.
- 1.3** The following aims are central to the development of the energy strategy for this site:
- > To address all relevant policy and condition requirements (specific requirements outlined in **Chapter 3**);
 - > To lock in low carbon design principles, including a fabric first approach and the installation of a large capacity of low carbon technologies;
 - > To ensure resident energy bills are reasonable, with the selected energy strategy taking this into consideration.
- 1.4** This report first establishes baseline emissions for the Part L 2021 notional dwelling in **Chapter 4**.
- 1.5** The proposed energy strategy is presented in **Chapter 5**, outlining fabric efficiency measures and low carbon technologies proposed for the site. It is demonstrated that a reduction beyond Part L 2021 is achieved and hence an improvement beyond the previous energy strategy.

2. DEVELOPMENT OVERVIEW

Site Location & Context

- 2.1** The site is located west of Southwater in Broadacres. A location plan is shown in Figure 1 below. Broadacres relates to a high quality residential development built by Berkeley Homes.
- 2.2** Outline planning permission was granted for up to 594 dwellings at Southwater in 2015 under application reference DC/14/0590. The proposals were considered to be EIA development and the application was supported by an Environmental Statement. Reserved matters approval has subsequently been granted for phases 1, 2, 3 and 4, totalling 514 units and community facilities. Phases 1, 2 and 3 have now been completed, with the final Phase 4 and 5 remaining.
- 2.3** In 2018 Berkeley gained reserved matters approval for 213 homes including 61 affordable homes in Phases 3.2 and 4 of the Southwater development (Ref: DC/18/1246).
- 2.4** The Phase 3.2 and Phase 4 reserved matters application has now been implemented in part with Phase 3.2 completed and largely occupied to relate to 56 of the 213 homes (including 6 affordable homes). No work other than an internal access road to base course have been completed within Phase 4.

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Proposed Development

- 2.5** This report has been prepared in support of a Section 73 Minor Material Amendment application to the approved Reserved Matters application associated to Phases 3.2 and 4 of the development known as Broadacres, Southwater.
- 2.6** The proposed changes solely relate to the unbuilt Phase 4 with the aim to deliver an alternative housing mix, amend the number of homes (a reduction of 14 compared to the extant consent) and an improved design. The proposed amendments remain in accordance with the approved outline application parameter plans and no changes are proposed to Phase 3.2 and the other completed elements of the development.
- 2.7** The description of the development is described as a Variation of condition 2 of application reference DC/24/0772 (non material amendment to previously approved application DC/18/1246) to “The development hereby approved comprises 199 no. residential dwellings including 61 affordable dwellings.” Variation of plans approved under condition 1 of application reference DC/18/1246 as detailed in the covering letter.

3. SUMMARY OF REQUIREMENTS

Planning History

- 3.1 Outline Masterplan consent for the development was achieved on 25/06/2015 (DC/14/0590). The masterplan consent does not include conditions relating to energy or carbon emissions targets.
- 3.2 A site-wide Energy Strategy was completed by WSP Environmental Ltd on 17/03/2014. This demonstrated a 10% reduction in carbon emissions against Part L 2013 of the Building Regulations.
- 3.3 The following policy requirements are considered relevant to the proposed development and have informed the strategy outlined within this report:

National Planning Policy Framework: NPPF

- 3.4 The revised National Planning Policy Framework (NPPF) was published on the 20th December 2023 and sets out the Government's planning policies for England.
- 3.5 The NPPF provides a framework for achieving sustainable development, which has been summarised as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*" (Resolution 42/187 of the United Nations General Assembly). These address social progress, economic well-being and environmental protection. At the heart of the framework is a **presumption in favour of sustainable development**.
- 3.6 The document states that the planning system has three overarching objectives which are interdependent and need to be pursued in mutually supportive ways:
 - a) **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;
 - b) **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, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
- 3.7 **An environmental objective** – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Local Policy: Horsham District Council

Horsham District Planning Framework (2015)

3.8 Policy 35 Strategic Policy: Climate Change – development will be supported where... measures include:

- > Improved energy efficiency in new developments, including influencing the behaviour of occupants to reduce energy use;
- > The use of decentralised, renewable and low carbon energy supply systems.

3.9 Policy 36 Strategic Policy: Appropriate Energy Use – development will be required to contribute to clean, efficient energy in Horsham based on the following hierarchy:

- > Lean – use less energy – e.g., through demand reduction;
- > Clean – supply energy efficiently – e.g., through heat networks;
- > Green – use renewable energy sources.

Development should demonstrate that the heating and cooling systems have been selected in accordance with the following heating and cooling hierarchy:

- > Connection to existing (C)CHP distribution networks;
- > Site wide renewable (C)CHP;
- > Site wide gas-fired (C)CHP;
- > Site wide renewable community heating/cooling;
- > Site wide gas-fired community heating/cooling;
- > Individual building renewable heating;
- > Individual building heating, with the exception of electric heating.

Energy Statements

All applications for residential or commercial development must include an Energy Statement demonstrating and quantifying how the development will comply with the Energy Hierarchy.

Developments in Heat Priority Areas and strategic developments should demonstrate and quantify how the development will comply with the heating and cooling hierarchy. Horsham District Council will work proactively with applicants on major developments to ensure these requirements are met.

Horsham District Local Plan 2023 – 2040 (Regulation 19)

- 3.10** The Horsham District Local Plan 2023 – 2040 (Regulation 19) has recently closed after a Period of Representation. Whilst not yet formally adopted, the policy within is considered within this report. The following policies are considered to relate to the contents of this report:
- 3.11** **Strategic Policy 7: Appropriate Energy Use** details the following of an Energy Hierarchy in line with the current Horsham District Planning Framework, with the addition of “*Be Seen – monitor, verify and report on energy performance*”. It additionally acknowledges that where existing heat networks are not currently in place or planned, other methods of heat generation may be more appropriate.
- 3.12** This report takes a stance in line with Strategic Policy 7 of the Horsham District Local Plan 2023 – 2040 (Regulation 19) document, proposing the use of low-carbon heat supply where existing networks are not currently available or planned.

Building Regulations

- 3.13** The development will target compliance with Part L 2021 of the building regulations, which represents an uplift to Part L 2013, equivalent to ~31% reduction in carbon emissions. In achieving compliance with Part L 2021, this strategy demonstrates exceedance of the requirements of the adopted local plan.
- 3.14** The development may additionally be required to comply with incoming Future Homes Standards (FHS) regulations, which are likely to represent an additional uplift – the presented strategy considers this via exceedances far beyond the Part L 2021 baseline.

4. ASSESSMENT METHODOLOGY – BASELINE EMISSIONS

- 4.1 The development is expected to be built under Part L 2021 of the Building Regulations. All calculations have been undertaken using approved Part L 2021 software and associated CO₂ emissions factors.
- 4.2 The development may fall under regulations of the FHS. Whilst the detail of this is not yet known, ongoing consultation suggests that it will likely consist of an uplift to baseline carbon emissions, whilst fabric energy efficiency (FEE) and primary energy rating (PER) will be unchanged. The proposed strategy accounts for this by exceeding the Part L 2021 baseline roughly in line with proposed notional dwelling specifications for the FHS. An allowance for future provision of PV for houses ensures that this strategy is capable of improvements if these are required at a later date.
- 4.3 Baseline emissions have been calculated using the Target Emissions Rate (TER) based upon the final proposed building specification.
- 4.4 The estimated annual energy demand for dwellings has been calculated using the Standard Assessment Procedure (SAP) 10.2 methodology. SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items.
- 4.5 Calculations have been performed on representative dwelling types. These encompass an array of flat and house types which differ in orientation and take account of the impact of mid floors and roofs. The selected dwellings therefore represent a fair aggregation of the proposed unit mix.

Baseline Emissions

- 4.6 A baseline calculation has been carried out to establish the Regulated CO₂ emissions. Table 1 below shows the Part L 2021 Regulated baseline CO₂ emissions rates. TER worksheets supporting these calculations are presented in Appendix A.

Table 1: Carbon Dioxide Emissions Baseline (Part L 2021 Carbon Emission Factors)			
	Regulated Emissions [T CO ₂ /year]	Change [T CO ₂ /year]	% Reduction
Baseline	120.9	0.0	0.0%
Total	120.9	0.0	0.0%

5. ENERGY STRATEGY

- 5.1** This energy strategy follows the Energy Hierarchy as set out in Policy 36 of the Horsham District Planning Framework: Lean, Clean, Green.
- 5.2** The following measures will be implemented to ensure that the development achieves a reduction in regulated emissions from the Part L 2021 baseline.

Lean (Fabric Energy Efficiency)

- 5.3** The development achieves the fabric energy efficiency (FEE) requirements of Part L 2021 via measures set out below:

U-values

- 5.4** The following U-values are proposed):
- > Main external wall U-value of 0.20 W/m².K;
 - > Party walls fully filled and sealed to achieve a U-value of 0.00 W/m².K;
 - > Corridor walls with a U-value of 0.20 W/m².K;
 - > Flat roof U-value of 0.12 W/m².K;
 - > Pitched roof U-value of 0.08 W/m².K;
 - > Ground floor U-value of 0.12 W/m².K;
 - > Double glazing with a U-value of 1.20 W/m².K (and G-value 0.45);
 - > Roof light glazing with a U-value of 1.40 W/m².K (and G-value 0.63);
 - > External door with a U-value of 1.0 W/m².K;

Ventilation, Air Permeability and Lighting

- 5.5** Houses are likely to be provided with mechanical extract ventilation (cMEV) systems. The cMEV system used for the SAP modelling are based on a system with a specific fan power (SFP) of between 0.17 W/l/s (for 1 wet room) and 0.18 W/l/s (for 4 wet rooms).
- 5.6** Apartments and maisonettes will be served by exhaust air heat pumps (EAHP) which are capable of providing ventilation to the dwelling. These have been based on an example EAHP from the SAP database.

5.7 An air permeability target of 4.00 m³/hr.m² is proposed.

5.8 It is assumed that 100% low energy lighting will be used in all dwellings.

Thermal Bridging

5.9 In well insulated buildings, as much as 30% of heat loss can occur through thermal bridges, which occur when highly conductive elements (e.g. metal studs) in the wall construction enable a low resistance escape route for heat. The applicant is committed to developing a building fabric where these are minimised as far as practicable.

5.10 It is acknowledged that under Part L 2021, it is no longer possible to utilise Accredited Construction Details (ACDs). The applicant will carefully assess the design of key junctions and will either use bespoke modelling or industry-approved details to reduce heat loss. Based on other sites the assumptions used within this energy strategy are considered achievable.

5.11 The following key psi values have been used in the SAP modelling for this energy strategy:

- > Lintels (E2) – 0.066;
- > Intermediate floors within/between dwellings (E6/E7) – 0.002 for houses/0.043 for apartments;
- > Eaves (E10) – 0.043;
- > Gables (E12) – 0.032.

5.12 The psi-values suggested within this strategy include allowances for RCD and calculated psi-values.

Clean (Heat Networks)

5.13 It is understood that existing heat networks do not exist or are planned within close proximity to the development site.

5.14 A site-wide solution is not considered appropriate for a development of this size; heat networks are better suited to larger developments and for the proposed scheme at such a small number of connections, heat losses and associated bills are likely to be significant.

5.15 The use of combined heat and power (CHP) engines is not presently considered best practice and carbon emissions associated with this technology are often greater than individual heat pump systems.

5.16 In line with the heating and cooling hierarchy outlined within Policy 36 of the Horsham District Planning Framework, it is proposed that the most appropriate technology for the development site is the use of individual building renewable heating. This is covered within the proceeding section at the 'Green' stage of the Energy Hierarchy

Green (Renewable & Low Carbon Technologies)

Space Heating & Hot Water

- 5.17** The applicant proposes to use highly efficient heat pumps in each dwelling – apartments and maisonettes will utilise exhaust air heat pumps (EAHP) and houses will utilise air source heat pumps (ASHP).
- 5.18** Heat pumps are a low carbon technology that upgrades heat from either external air (in the case of ASHP) or exhaust air from ventilation systems (in the case of EAHP). They do this with a very high efficiency, far exceeding the efficiency capabilities of comparable gas boiler systems. Electricity is used as a fuel source for upgrading this heat, which allows heat pumps to decarbonise over time in line with grid electricity.
- 5.19** The heating systems will be appropriately zoned and provided with dynamic controls to ensure comfortable conditions are maintained throughout the year.
- 5.20** Wastewater Heat Recovery (WWHR) systems are proposed for houses. WWHR systems provide energy savings by utilising otherwise wasted heat for preheating water. Calculations have been completed on the basis of the Recoup Pipe+ HE system for houses and EasyFit+ for apartments and maisonettes.

Photovoltaic (PV Panels)

- 5.21** PV panels have been considered for this scheme, however are not required to achieve the carbon reduction requirements of the development.
- 5.22** **Section 6** of this document details uplifted calculations with inclusion of PV to houses, which may be required should the development be built out to FHS regulations.
- 5.23** The location of PV can be secured by condition where desired by the applicant.

CO₂ Emissions Reduction

- 5.24** With the measures outlined above, the development demonstrates exceedance of the requirements of Part L 2021, including carbon emissions reductions beyond the baseline notional dwelling emissions. Results are shown in Table 2.

Table 2: Carbon Dioxide Emissions Baseline (Part L 2021 Carbon Emission Factors)

	Regulated Emissions [T CO ₂ /year]	Change [T CO ₂ /year]	% Reduction
Baseline	120.9	0.0	0.0%
Proposed Energy Strategy	51.5	69.4	57.4%
Total	51.5	69.4	57.4%

6. PHOTOVOLTAIC (PV) PANELS

- 6.1 PV panels have been considered for this scheme. Due to the significant carbon reductions achieved by installation of heat pump technologies (a 57.4% reduction beyond the Part L 2021 baseline), they are not required to achieve the carbon reduction requirements of the development.
- 6.2 With the FHS being considered in the strategy proposed within this statement, roof space allowance for the future installation of PV has been accounted for, should this be required.
- 6.3 Uplifted energy calculations have been completed factoring in the installation of PV to houses, and the location of such can be secured by Condition if applicable. The assumptions made will be subject to detailed consideration of available roof space, and orientation.
- 6.4 The uplifted emissions reductions are shown in Table 3 below.

Table 3: Carbon Dioxide Emissions Baseline (Part L 2021 Carbon Emission Factors)

	Regulated Emissions [T CO ₂ /year]	Change [T CO ₂ /year]	% Reduction
Baseline	120.9	0.0	0.0%
Proposed Energy Strategy	51.5	69.4	57.4%
Proposed Energy Strategy (inc. PV to Houses)	41.2	79.8	66.0%
Total	41.2	79.8	66.0%

7. CONCLUSION

- 7.1** This Energy Statement has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Berkeley Homes Southern (Ltd) for the development at Southwater Phase 4.
- 7.2** This report is being submitted as part of an S73 application specific to Phase 4 of the development and aims to demonstrate compliance with relevant local planning policy.
- 7.3** The development may also be subject to the incoming Future Homes Standard (FHS); whilst the requirements of this are not yet confirmed, consideration of this has been taken into account within the strategy, with low carbon heat pump technology ensuring that a significant improvement beyond current Part L 2021 is achieved.
- 7.4** The energy strategy presented prioritises high performance building fabric, incorporating low U-values across building elements, high performance building systems (e.g., mechanical extract ventilation with low SFP, high performance lighting), low air permeability targets and ambitious psi-value targets for thermal bridges.
- 7.5** The strategy additionally incorporates low carbon technologies in the form of high efficiency heat pumps, with air source heat pumps in houses and exhaust air heat pumps in apartments and maisonettes as appropriate. Heat pumps achieve much greater efficiency ratings than a gas boiler alternative, and the use of electricity allows for decarbonisation in line with grid decarbonisation as renewable uptake increases.
- 7.6** Through the measures proposed within this strategy, a significant improvement in carbon reduction is achieved – 57.4% reduction beyond the Part L 2021 baseline.
- 7.7** In the instance where PV is applied to houses, a further improvement in carbon reduction is achieved of 66.0%. The location of PV within the roof slope, where applicable, can be secured by condition.

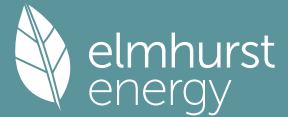
APPENDICES

Appendix A – SAP TER & DER Worksheets (Proposed Strategy)

Appendix B – SAP TER & DER Worksheets (Proposed Strategy inc. PV Uplift)

APPENDIX A – SAP TER & DER WORKSHEETS (PROPOSED STRATEGY)

Full SAP Calculation Printout



Property Reference	Top Floor Flat (2)_Copy				Issued on Date	24/06/2024		
Assessment Reference	00001_Copy_Copy			Prop Type Ref	Mid Floor Flat			
Property	Block C							
SAP Rating	72 C		DER	5.81		TER	13.94	
Environmental	94 A		% DER < TER				58.32	
CO ₂ Emissions (t/year)	0.39		DFEE	31.20		TFEE	32.26	
Compliance Check	See BREL		% DFEE < TFEE				3.28	
% DPER < TPER	17.41		DPER	61.10		TPER	73.98	
Assessor Details	Miss Eleanor Ballinger					Assessor ID	M976-0001	
Client								

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)
Ground floor	51.1200 (1b)	2.5000 (2b)	127.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1200		127.8000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	127.8000 (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	3.5000	(17)
Infiltration rate	0.1750	(18)
Number of sides sheltered	2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1487 (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	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.20)			4.8000	1.1450	5.4962		(27)
Door			2.0300	1.0000	2.0300		(26)
External Wall 1	37.8500	4.8000	33.0500	0.2000	6.6100	60.0000	1983.0000 (29a)
Corridor Wall	4.5800	2.0300	2.5500	0.1800	0.4590	60.0000	153.0000 (29a)
External Roof 1	51.1200		51.1200	0.1200	6.1344	9.0000	460.0800 (30)
Total net area of external elements Aum(A, m ²)			93.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7296		(33)
Party Wall 1			29.0800	0.0000	0.0000	180.0000	5234.4000 (32)
Party Floor 1			51.1200			40.0000	2044.8000 (32d)
Internal Wall 1			70.0000			9.0000	630.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10505.2800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		205.5023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	15.1400	0.0430	0.6510

Full SAP Calculation Printout



E16 Corner (normal)									5.0000	0.0390	0.1950	
E25 Staggered party wall between dwellings									5.0000	0.0350	0.1750	
E7 Party floor between dwellings (in blocks of flats)									1.8300	0.0430	0.0787	
E25 Staggered party wall between dwellings									5.0000	0.0350	0.1750	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									11.6300	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)									15.1400	0.0430	0.6510	
E14 Flat roof									1.8300	0.1600	0.2928	
P4 Party wall - Roof (insulation at ceiling level)									11.6300	0.0330	0.3838	
E2 Other lintels (including other steel lintels)									4.7300	0.0660	0.3122	
E3 Sill									3.7500	0.0210	0.0788	
E4 Jamb									11.8200	0.1000	1.1820	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												4.1753 (36)
Point Thermal bridges												0.0000
Total fabric heat loss										(33) + (36) + (36a) =		24.9048 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870 (38)
Average = Sum(39)m / 12 =	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918 (39)
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												1.7231 (42)
Hot water usage for mixer showers												
Hot water usage for baths	53.1104	52.3122	51.1492	48.9239	47.2817	45.4503	44.4093	45.5636	46.8289	48.7952	51.0683	52.9069 (42a)
Hot water usage for other uses	22.9624	22.6214	22.1412	21.2557	20.5927	19.8575	19.4604	19.9373	20.4565	21.2432	22.1469	22.8848 (42b)
Average daily hot water use (litres/day)	32.2764	31.1027	29.9290	28.7553	27.5816	26.4079	26.4079	27.5816	28.7553	29.9290	31.1027	32.2764 (42c)
Daily hot water use												
Energy conte	108.3492	106.0363	103.2194	98.9349	95.4560	91.7157	90.2777	93.0825	96.0407	99.9674	104.3179	108.0681 (44)
Energy content (annual)	171.5986	150.9943	158.6443	135.4370	128.5021	112.7752	109.1830	115.2555	118.4277	135.6548	148.6199	169.2085 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7398	22.6491	23.7966	20.3155	19.2753	16.9163	16.3775	17.2883	17.7642	20.3482	22.2930	25.3813 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0640 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1146 (55)
Total storage loss	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (56)
If cylinder contains dedicated solar storage	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	206.1500	182.2020	193.1957	168.8738	163.0535	146.2120	143.7344	149.8069	151.8645	170.2061	182.0567	203.7599 (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	206.1500	182.2020	193.1957	168.8738	163.0535	146.2120	143.7344	149.8069	151.8645	170.2061	182.0567	203.7599 (64)
12Total per year (kWh/year)												2061.1154 (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	57.0565	50.2056	52.7492	45.0328	42.7270	37.4978	36.3034	38.3225	39.3772	45.1052	49.4161	56.2618 (65)

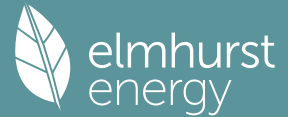
5. Internal gains (see Table 5 and 5a)												

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.1409	95.3703	86.1409	89.0123	86.1409	89.0123	86.1409	86.1409	89.0123	86.1409	89.0123	86.1409 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1423	151.7003	147.7742	139.4159	128.8651	118.9489	112.3242	110.7662	114.6923	123.0506	133.6014	143.5177 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244 (71)
Water heating gains (Table 5)	76.6889	74.7107	70.8995	62.5455	57.4287	52.0802	48.7948	51.5087	54.6906	60.6253	68.6335	75.6207 (72)
Total internal gains	361.8188	370.6280	353.6613	339.8204	321.2814	308.8880	296.1066	297.2625	307.2418	318.6634	340.0938	354.1260 (73)

6. Solar gains												

[Jan]		Area		Solar flux		g		FF		Access		Gains
		m2		Table 6a		Specific data		Specific data		factor		W
				W/m2		or Table 6b		or Table 6c		Table 6d		
North		3.9200		10.6334		0.4500		0.8000		0.7700		10.3990 (74)
West		0.8800		19.6403		0.4500		0.8000		0.7700		4.3119 (80)

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Solar gains	14.7109	28.3080	47.6604	74.5015	97.8977	103.6392	97.2284	78.7260	56.7576	33.6651	18.2050	12.2150 (83)
Total gains	376.5297	398.9361	401.3217	414.3219	419.1792	412.5272	393.3350	375.9885	363.9994	352.3286	358.2988	366.3410 (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	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489
alpha	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299
util living area	0.9876	0.9814	0.9708	0.9351	0.8478	0.6737	0.5066	0.5502	0.7769	0.9374	0.9781	0.9893 (86)
Living	19.9790	20.1008	20.2854	20.5642	20.8136	20.9576	20.9920	20.9879	20.9110	20.6185	20.2557	19.9428
Non living	19.2424	19.3625	19.5439	19.8117	20.0360	20.1460	20.1652	20.1635	20.1161	19.8662	19.5163	19.2067
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.4777	20.1008	20.2854	20.5642	20.8136	20.9576	20.9920	20.9879	20.9110	20.6185	20.2557	20.0906 (87)
Th 2	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678 (88)
util rest of house	0.9846	0.9769	0.9632	0.9173	0.8071	0.6002	0.4146	0.4565	0.7116	0.9169	0.9719	0.9866 (89)
MIT 2	19.6944	19.3625	19.5439	19.8117	20.0360	20.1460	20.1652	20.1635	20.1161	19.8662	19.5163	19.3411 (90)
Living area fraction	20.0882	19.7336	19.9167	20.1900	20.4269	20.5540	20.5809	20.5780	fLA = Living area / (4) =			0.5027 (91)
MIT	20.0882	19.7336	19.9167	20.1900	20.4269	20.5540	20.5809	20.5780	20.5157	20.2444	19.8880	19.7179 (92)
Temperature adjustment												0.0000
adjusted MIT	20.0882	19.7336	19.9167	20.1900	20.4269	20.5540	20.5809	20.5780	20.5157	20.2444	19.8880	19.7179 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9842	0.9740	0.9604	0.9178	0.8207	0.6354	0.4609	0.5035	0.7405	0.9190	0.9693	0.9849 (94)
Useful gains	370.5864	388.5578	385.4434	380.2658	344.0273	262.1266	181.2792	189.3021	269.5255	323.8003	347.3141	360.8040 (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	726.1271	682.2264	617.0593	519.2486	401.3672	273.8369	183.0884	192.1525	295.0696	443.5657	588.1445	713.6979 (97)
Space heating kWh	264.5223	197.3453	172.3222	100.0676	42.6609	0.0000	0.0000	0.0000	0.0000	89.1055	173.3979	262.5531 (98a)
Space heating requirement - total per year (kWh/year)												1301.9747
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	264.5223	197.3453	172.3222	100.0676	42.6609	0.0000	0.0000	0.0000	0.0000	89.1055	173.3979	262.5531 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1301.9747
Space heating per m2										(98c) / (4) =		25.4690 (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 %)												166.2243 (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	264.5223	197.3453	172.3222	100.0676	42.6609	0.0000	0.0000	0.0000	0.0000	89.1055	173.3979	262.5531 (98)
Space heating efficiency (main heating system 1)	166.2243	166.2243	166.2243	166.2243	166.2243	0.0000	0.0000	0.0000	0.0000	166.2243	166.2243	166.2243 (210)
Space heating fuel (main heating system)	159.1357	118.7223	103.6685	60.2003	25.6647	0.0000	0.0000	0.0000	0.0000	53.6056	104.3156	157.9511 (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	206.1500	182.2020	193.1957	168.8738	163.0535	146.2120	143.7344	149.8069	151.8645	170.2061	182.0567	203.7599 (64)
Efficiency of water heater (217)m	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530 (216)
Fuel for water heating, kWh/month	93.9809	83.0634	88.0752	76.9872	74.3338	66.6560	65.5265	68.2949	69.2329	77.5946	82.9971	92.8913 (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	13.1316	11.8608	13.1316	12.7080	13.1316	12.7080	13.1316	13.1316	12.7080	13.1316	12.7080	13.1316 (231)
Lighting	18.3130	14.6914	13.2279	9.6914	7.4859	6.1160	6.8289	8.8764	11.5296	15.1275	17.0864	18.8220 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												783.2637 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.3530
Water heating fuel used												939.6339 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.8450)	
mechanical ventilation fans (SFP = 0.8450)	154.6139 (230a)
Total electricity for the above, kWh/year	154.6139 (231)
Electricity for lighting (calculated in Appendix L)	147.7964 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2025.3078 (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	783.2637	0.1552	121.5804 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	939.6339	0.1410	132.5001 (264)
Space and water heating			254.0805 (265)
Pumps, fans and electric keep-hot	154.6139	0.1387	21.4469 (267)
Energy for lighting	147.7964	0.1443	21.3316 (268)
Total CO2, kg/year			296.8589 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8100 (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	783.2637	1.5747	1233.3820 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	939.6339	1.5214	1429.5765 (278)
Space and water heating			2662.9585 (279)
Pumps, fans and electric keep-hot	154.6139	1.5128	233.8999 (281)
Energy for lighting	147.7964	1.5338	226.6950 (282)
Total Primary energy kWh/year			3123.5533 (286)
Dwelling Primary energy Rate (DPER)			61.1000 (287)

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

1. Overall dwelling characteristics

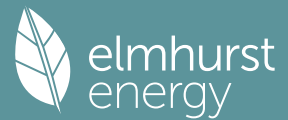
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	51.1200 (1b)	x 2.5000 (2b)	= 127.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 127.8000 (5)

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) = 0.1565 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4065 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3455 (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	0.4405	0.4319	0.4233	0.3801	0.3714	0.3282	0.3282	0.3196	0.3455	0.3714	0.3887	0.4060 (22b)
Effective ac	0.5970	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5755	0.5824 (25)

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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	
TER Opaque door			2.0300	1.0000	2.0300			(26)
TER Opening Type (Uw = 1.20)			4.8000	1.1450	5.4962			(27)
External Wall 1	37.8500	4.8000	33.0500	0.1800	5.9490			(29a)
Corridor Wall	4.5800	2.0300	2.5500	0.1800	0.4590			(29a)
External Roof 1	51.1200		51.1200	0.1100	5.6232			(30)
Total net area of external elements A _{um} (A, m ²)			93.5500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.5574			(33)
Party Wall 1			29.0800	0.0000	0.0000			(32)

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

205.5023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	15.1400	0.0700	1.0598	
E16 Corner (normal)	5.0000	0.0900	0.4500	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
E7 Party floor between dwellings (in blocks of flats)	1.8300	0.0700	0.1281	
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.6300	0.0000	0.0000	
E10 Baves (insulation at ceiling level)	15.1400	0.0600	0.9084	
E14 Flat roof	1.8300	0.0800	0.1464	
P4 Party wall - Roof (insulation at ceiling level)	11.6300	0.1200	1.3956	
E2 Other lintels (including other steel lintels)	4.7300	0.0500	0.2365	
E3 Sill	3.7500	0.0500	0.1875	
E4 Jamb	11.8200	0.0500	0.5910	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				5.7033 (36)
Point Thermal Bridges			(36a) =	0.0000
Total fabric heat loss			(33) + (36) + (36a) =	25.2607 (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	25.1794	25.0205	24.8648	24.1331	23.9962	23.3590	23.3590	23.2410	23.6045	23.9962	24.2732	24.5627	(38)
Heat transfer coeff	50.4401	50.2812	50.1254	49.3938	49.2569	48.6197	48.6197	48.5017	48.8651	49.2569	49.5338	49.8233	(39)
Average = Sum(39)m / 12 =												49.3932	
HLP	0.9867	0.9836	0.9805	0.9662	0.9636	0.9511	0.9511	0.9488	0.9559	0.9636	0.9690	0.9746	(40)
HLP (average)												0.9662	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

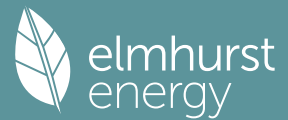
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7231 (42)
Hot water usage for mixer showers	53.1104	52.3122	51.1492	48.9239	47.2817	45.4503	44.4093	45.5636	46.8289	48.7952	51.0683	52.9069	(42a)
Hot water usage for baths	22.9624	22.6214	22.1412	21.2557	20.5927	19.8575	19.4604	19.9373	20.4565	21.2432	22.1469	22.8848	(42b)
Hot water usage for other uses	32.2764	31.1027	29.9290	28.7553	27.5816	26.4079	26.4079	27.5816	28.7553	29.9290	31.1027	32.2764	(42c)
Average daily hot water use (litres/day)												99.5979	(43)
Daily hot water use	108.3492	106.0363	103.2194	98.9349	95.4560	91.7157	90.2777	93.0825	96.0407	99.9674	104.3179	108.0681	(44)
Energy conte	171.5986	150.9943	158.6443	135.4370	128.5021	112.7752	109.1830	115.2555	118.4277	135.6548	148.6199	169.2085	(45)
Energy content (annual)										Total = Sum(45)m =		1654.3010	
Distribution loss (46)m = 0.15 x (45)m	25.7398	22.6491	23.7966	20.3155	19.2753	16.9163	16.3775	17.2883	17.7642	20.3482	22.2930	25.3813	(46)
Water storage 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	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	218.1935	193.0800	205.2392	180.5288	175.0970	157.8670	155.7779	161.8505	163.5196	182.2497	193.7118	215.8034	(62)
WWHRS	-24.2799	-21.4733	-22.4856	-18.6190	-17.3522	-14.8484	-13.9180	-14.8004	-15.3627	-18.1110	-20.5175	-23.8302	(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	193.9137	171.6067	182.7536	161.9098	157.7448	143.0186	141.8599	147.0500	148.1569	164.1387	173.1942	191.9732	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1977.3202	(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	94.3325	83.8742	90.0252	81.1063	80.0029	73.5712	73.5793	75.5984	75.4507	82.3811	85.4896	93.5377	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5960	98.0884	88.5960	91.5492	88.5960	91.5492	88.5960	88.5960	91.5492	88.5960	91.5492	88.5960	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1423	151.7003	147.7742	139.4159	128.8651	118.9489	112.3242	110.7662	114.6923	123.0506	133.6014	143.5177	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	(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)	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	(71)

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Water heating gains (Table 5)	126.7910	124.8128	121.0016	112.6476	107.5307	102.1823	98.8969	101.6107	104.7926	110.7273	118.7355	125.7228 (72)
Total internal gains	417.3759	426.4482	409.2184	395.4594	376.8385	361.5270	348.6637	349.8196	359.8808	374.2206	395.7328	409.6831 (73)

6. Solar gains

[Jan]	Area m ²		Solar flux Table 6a W/m ²		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	3.9200		10.6334		0.6300		0.7000		0.7700		12.7388	(74)
West	0.8800		19.6403		0.6300		0.7000		0.7700		5.2820	(80)
Solar gains	18.0209	34.6774	58.3840	91.2644	119.9247	126.9580	119.1048	96.4394	69.5280	41.2398	22.3011	14.9634 (83)
Total gains	435.3968	461.1256	467.6024	486.7237	496.7633	488.4850	467.7685	446.2589	429.4088	415.4603	418.0339	424.6465 (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	57.8534	58.0363	58.2166	59.0789	59.2431	60.0196	60.0196	60.1656	59.7181	59.2431	58.9119	58.5696
alpha	4.8569	4.8691	4.8811	4.9386	4.9495	5.0013	5.0013	5.0110	4.9812	4.9495	4.9275	4.9046
util living area	0.9800	0.9712	0.9552	0.9044	0.7965	0.6110	0.4523	0.4921	0.7191	0.9059	0.9646	0.9820 (86)
MIT	19.9493	20.0850	20.2909	20.6002	20.8414	20.9677	20.9940	20.9910	20.9277	20.6547	20.2760	19.9354 (87)
Th 2	20.0944	20.0970	20.0996	20.1116	20.1138	20.1243	20.1243	20.1262	20.1203	20.1138	20.1093	20.1045 (88)
util rest of house	0.9752	0.9643	0.9440	0.8804	0.7488	0.5371	0.3648	0.4024	0.6485	0.8778	0.9549	0.9777 (89)
MIT 2	18.8875	19.0600	19.3192	19.7034	19.9754	20.1039	20.1219	20.1224	20.0689	19.7750	19.3107	18.8776 (90)
Living area fraction	19.4213	19.5753	19.8077	20.1543	20.4108	20.5381	20.5604	20.5591	20.5007	20.2173	19.7960	19.4094 (92)
MIT	19.4213	19.5753	19.8077	20.1543	20.4108	20.5381	20.5604	20.5591	20.5007	20.2173	19.7960	19.4094 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4213	19.5753	19.8077	20.1543	20.4108	20.5381	20.5604	20.5591	20.5007	20.2173	19.7960	19.4094 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9707	0.9594	0.9397	0.8817	0.7657	0.5728	0.4088	0.4474	0.6804	0.8815	0.9508	0.9735 (94)
Useful gains	422.6460	442.4094	439.4276	429.1516	380.3905	279.8224	191.2084	199.6383	292.1519	366.2167	397.4699	413.3757 (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	762.7196	737.8937	667.0539	555.8912	429.0658	288.7107	192.5524	201.7240	312.7698	473.7163	628.8814	757.7831 (97)
Space heating kWh	253.0148	198.5654	169.3539	91.2525	36.2144	0.0000	0.0000	0.0000	0.0000	79.9797	166.6162	256.2391 (98a)
Space heating requirement - total per year (kWh/year)												1251.2360
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	253.0148	198.5654	169.3539	91.2525	36.2144	0.0000	0.0000	0.0000	0.0000	79.9797	166.6162	256.2391 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1251.2360
Space heating per m ²										(98c) / (4) =		24.4764 (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	253.0148	198.5654	169.3539	91.2525	36.2144	0.0000	0.0000	0.0000	0.0000	79.9797	166.6162	256.2391 (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)	274.1222	215.1305	183.4821	98.8651	39.2355	0.0000	0.0000	0.0000	0.0000	86.6519	180.5160	277.6155 (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	193.9137	171.6067	182.7536	161.9098	157.7448	143.0186	141.8599	147.0500	148.1569	164.1387	173.1942	191.9732 (64)
Efficiency of water heater	84.6574	84.3879	83.8894	82.8258	81.3392	79.8000	79.8000	79.8000	79.8000	82.5408	83.9730	79.8000 (216)
Fuel for water heating, kWh/month	229.0570	203.3548	217.8507	195.4823	193.9345	179.2213	177.7693	184.2732	185.6602	198.8577	206.2499	84.7081 (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	18.4085	14.7680	13.2969	9.7419	7.5249	6.1479	6.8645	8.9227	11.5897	15.2064	17.1755	18.9201 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.6288	-25.7754	-38.4094	-44.8333	-49.7961	-47.0398	-46.5086	-43.2221	-37.6163	-30.2547	-19.7223	-15.1386 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.3211	-15.6496	-31.5635	-48.0693	-64.1903	-64.6971	-63.8916	-53.7658	-39.0055	-22.5467	-9.8312	-5.7674 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1355.6186 (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												2398.3400 (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)												148.5671 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-842.2447 (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												3146.2811 (238)

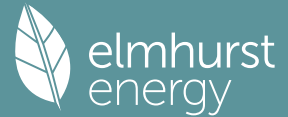
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1355.6186	0.2100	284.6799 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2398.3400	0.2100	503.6514 (264)
Space and water heating			788.3313 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.5671	0.1443	21.4428 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.9456	0.1338	-55.6561
PV Unit electricity exported	-426.2991	0.1255	-53.5030
Total			-109.1590 (269)
Total CO2, kg/year			712.5444 (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	1355.6186	1.1300	1531.8490 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2398.3400	1.1300	2710.1242 (278)
Space and water heating			4241.9733 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.5671	1.5338	227.8772 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.9456	1.4945	-621.6225
PV Unit electricity exported	-426.2991	0.4607	-196.3853
Total			-818.0078 (283)
Total Primary energy kWh/year			3781.9434 (286)
Target Primary Energy Rate (TPER)			73.9800 (287)

Full SAP Calculation Printout



Property Reference	4.14 (2)_Copy			Issued on Date	24/06/2024
Assessment Reference	00001_Copy_Copy	Prop Type Ref	5.11		
Property	143				
SAP Rating	79 C	DER	4.23	TER	9.74
Environmental	96 A	% DER < TER			56.57
CO ₂ Emissions (t/year)	0.62	DFEE	44.28	TFEE	44.88
Compliance Check	See BREL	% DFEE < TFEE			1.34
% DPER < TPER	14.10	DPER	44.14	TPER	51.38
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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)
Ground floor	71.8100 (1b)	x 2.4000 (2b)	= 172.3440 (1b) - (3b)
First floor	89.3300 (1c)	x 2.7000 (2c)	= 241.1910 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 413.5350 (5)

2. Ventilation rate

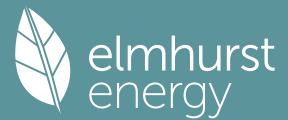
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.20)			27.9200	1.1450	31.8550		(27)
Door			6.1800	1.0000	6.1800		(26)
Ground Floor			71.8100	0.1200	8.6172	110.0000	7899.1000 (28a)
Exposed Floor			19.9400	0.1400	2.7916		(28b)
External Wall 1	183.7300	34.0000	149.7300	0.2000	29.9460	60.0000	8983.8000 (29a)
Garage Wall	20.5700		20.5700	0.1600	3.2912	60.0000	1234.2000 (29a)
Main Roof	89.3300		89.3300	0.1200	10.7196	9.0000	803.9700 (30)
Bay Roof	2.4200		2.4200	0.1200	0.2904	9.0000	21.7800 (30)
Total net area of external elements Aum (A, m ²)			387.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.6910		(33)
Internal Wall 1			270.0000			9.0000	2430.0000 (32c)
Internal Floor 1			69.3900			18.0000	1249.0200 (32d)
Internal Ceiling 1			69.3900			9.0000	624.5100 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	23246.3800 (34)

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

144.2620 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	31.7900	0.0620	1.9710
E5 Ground floor (normal)	8.5700	0.0620	0.5313
E6 Intermediate floor within a dwelling	27.3800	0.0020	0.0548
E10 Eaves (insulation at ceiling level)	12.8600	0.0430	0.5530
E12 Gable (insulation at ceiling level)	26.9400	0.0320	0.8621
E14 Flat roof	4.4100	0.1600	0.7056
E16 Corner (normal)	35.4000	0.0390	1.3806
E17 Corner (inverted - internal area greater than external area)	15.0000	-0.0860	-1.2900
E20 Exposed floor (normal)	10.0700	0.0330	0.3323
E21 Exposed floor (inverted)	8.5700	0.3200	2.7424
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.0430	0.1006
E2 Other lintels (including other steel lintels)	22.5200	0.0660	1.4863
E3 Sill	19.5800	0.0210	0.4112
E4 Jamb	47.6400	0.1000	4.7640

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

14.6052 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 108.2961 (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	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	(38)
Heat transfer coeff	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	(39)
Average = Sum(39)m / 12 =												176.5294	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	(40)
HLP (average)												1.0955	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.9505 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.6900	72.5826	70.9689	67.8813	65.6028	63.0618	61.6174	63.2190	64.9745	67.7028	70.8567	73.4077	(42a)
Hot water usage for baths	31.8124	31.3399	30.6746	29.4478	28.5293	27.5107	26.9606	27.6212	28.3406	29.4305	30.6825	31.7048	(42b)
Hot water usage for other uses	44.8461	43.2153	41.5845	39.9538	38.3230	36.6922	36.6922	38.3230	39.9538	41.5845	43.2153	44.8461	(42c)
Average daily hot water use (litres/day)												138.2040	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.3485	147.1378	143.2280	137.2830	132.4551	127.2648	125.2703	129.1632	133.2689	138.7178	144.7545	149.9586	(44)
Energy conte	238.1152	209.5223	220.1361	187.9335	178.3100	156.4869	151.5035	159.9310	164.3339	188.2388	206.2293	234.7989	(45)
Energy content (annual)										Total = Sum(45)m =		2295.5395	
Distribution loss (46)m = 0.15 x (45)m	35.7173	31.4283	33.0204	28.1900	26.7465	23.4730	22.7255	23.9897	24.6501	28.2358	30.9344	35.2198	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.7800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												0.9612	(55)

Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(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	291.1748	257.4471	273.1957	239.2815	231.3696	207.8349	204.5631	212.9906	215.6819	241.2984	257.5773	287.8585	(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	291.1748	257.4471	273.1957	239.2815	231.3696	207.8349	204.5631	212.9906	215.6819	241.2984	257.5773	287.8585	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2920.2735	(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

	121.6210	108.0060	115.6429	103.5663	101.7358	93.1103	92.8226	95.6248	95.7194	105.0371	109.6496	120.5183	(65)
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5. Internal gains (see Table 5 and 5a)

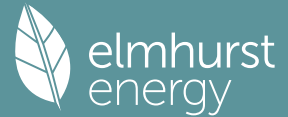
Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.0868	187.2033	169.0868	174.7231	169.0868	174.7231	169.0868	169.0868	174.7231	169.0868	174.7231	169.0868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	332.3992	335.8485	327.1564	308.6521	285.2938	263.3402	248.6739	245.2246	253.9166	272.4209	295.7793	317.7329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	(71)
Water heating gains (Table 5)	163.4691	160.7232	155.4341	143.8421	136.7416	129.3198	124.7616	128.5279	132.9436	141.1789	152.2912	161.9870	(72)
Total internal gains	732.2126	751.0325	718.9349	694.4748	658.3797	634.6406	609.7798	610.0968	628.8408	649.9441	690.0510	716.0642	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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		W/m2	or Table 6b	or Table 6c	Table 6d	
North	14.4600	10.6334	0.4500	0.8000	0.7700	38.3598 (74)
East	1.8300	19.6403	0.4500	0.8000	0.7700	8.9667 (76)
South	9.7500	46.7521	0.4500	0.8000	0.7700	113.7211 (78)
West	1.7800	19.6403	0.4500	0.8000	0.7700	8.7217 (80)

Solar gains	169.7694	294.1558	418.7968	551.3341	650.8052	661.7111	631.3908	554.1459	463.8760	329.2053	204.1755	144.7902	(83)
Total gains	901.9820	1045.1883	1137.7316	1245.8088	1309.1850	1296.3517	1241.1706	1164.2427	1092.7169	979.1494	894.2265	860.8545	(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	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	
alpha	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	
util living area	0.9881	0.9795	0.9649	0.9282	0.8533	0.7188	0.5724	0.6209	0.8148	0.9427	0.9800	0.9899	(86)
Living	18.9133	19.1552	19.5168	20.0061	20.4677	20.7991	20.9328	20.9095	20.6675	20.0739	19.3997	18.8557	
Non living	18.0939	18.3336	18.6909	19.1678	19.6015	19.8847	19.9774	19.9651	19.7852	19.2402	18.5781	18.0367	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9325	19.1552	19.5168	20.0061	20.4677	20.7991	20.9328	20.9095	20.6675	20.0739	19.3997	19.1557	(87)
Th 2	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	(88)
util rest of house	0.9857	0.9753	0.9573	0.9115	0.8164	0.6449	0.4627	0.5132	0.7561	0.9262	0.9752	0.9878	(89)
MIT 2	19.0271	18.3336	18.6909	19.1678	19.6015	19.8847	19.9774	19.9651	19.7852	19.2402	18.5781	18.3120	(90)
Living area fraction									fLA =	Living area /	(4) =	0.2233	(91)
MIT	19.2293	18.5171	18.8754	19.3550	19.7950	20.0890	20.1908	20.1761	19.9823	19.4264	18.7616	18.5004	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2293	18.5171	18.8754	19.3550	19.7950	20.0890	20.1908	20.1761	19.9823	19.4264	18.7616	18.5004	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9669	0.9462	0.8981	0.8073	0.6518	0.4846	0.5333	0.7546	0.9138	0.9670	0.9836	(94)
Useful gains	886.9931	1010.6319	1076.5016	1118.8134	1056.9690	844.9558	601.4737	620.8650	824.5198	894.7694	864.7410	846.7017	(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	2635.4687	2403.8172	2184.6198	1845.6163	1429.0020	968.9626	633.8845	666.5872	1038.3952	1558.1248	2058.6186	2524.4431	(97)
Space heating kWh	1300.8659	936.2206	824.4400	523.2981	276.7925	0.0000	0.0000	0.0000	0.0000	493.5364	859.5919	1248.2396	(98a)
Space heating requirement - total per year (kWh/year)												6462.9850	
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	1300.8659	936.2206	824.4400	523.2981	276.7925	0.0000	0.0000	0.0000	0.0000	493.5364	859.5919	1248.2396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6462.9850	
Space heating per m2										(98c) / (4) =		40.1079	(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 %)												261.7230	(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	1300.8659	936.2206	824.4400	523.2981	276.7925	0.0000	0.0000	0.0000	0.0000	493.5364	859.5919	1248.2396	(98)
Space heating efficiency (main heating system 1)	261.7230	261.7230	261.7230	261.7230	261.7230	0.0000	0.0000	0.0000	0.0000	261.7230	261.7230	261.7230	(210)
Space heating fuel (main heating system)	497.0392	357.7143	315.0048	199.9435	105.7578	0.0000	0.0000	0.0000	0.0000	188.5720	328.4358	476.9316	(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	291.1748	257.4471	273.1957	239.2815	231.3696	207.8349	204.5631	212.9906	215.6819	241.2984	257.5773	287.8585	(64)
Efficiency of water heater	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	(216)
Fuel for water heating, kWh/month	163.5917	144.6423	153.4904	134.4363	129.9911	116.7685	114.9304	119.6652	121.1772	135.5694	144.7155	161.7285	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0267	9.0563	10.0267	9.7032	10.0267	9.7032	10.0267	10.0267	9.7032	10.0267	9.7032	10.0267	(231)
Lighting	44.7635	35.9109	32.3338	23.6891	18.2982	14.9498	16.6922	21.6971	28.1824	36.9769	41.7653	46.0076	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											2469.3990	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											177.9888	
Water heating fuel used											1640.7065	(219)
Space cooling fuel											0.0000	(221)
Electricity for pumps and fans:												
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2340)												
mechanical ventilation fans (SFP = 0.2340)											118.0560	(230a)
Total electricity for the above, kWh/year											118.0560	(231)
Electricity for lighting (calculated in Appendix L)											361.2667	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											0.0000	(233)
Wind generation											0.0000	(234)
Hydro-electric generation (Appendix N)											0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)											0.0000	(235)
Appendix Q - special features												
Energy saved or generated											-0.0000	(236)
Energy used											0.0000	(237)
Total delivered energy for all uses											4589.4283	(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	2469.3990	0.1547	381.9788	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1640.7065	0.1410	231.2823	(264)
Space and water heating			613.2611	(265)
Pumps, fans and electric keep-hot	118.0560	0.1387	16.3758	(267)
Energy for lighting	361.2667	0.1443	52.1420	(268)
Total CO2, kg/year			681.7789	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2300	(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	2469.3990	1.5727	3883.5122	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1640.7065	1.5212	2495.9100	(278)
Space and water heating			6379.4222	(279)
Pumps, fans and electric keep-hot	118.0560	1.5128	178.5951	(281)
Energy for lighting	361.2667	1.5338	554.1230	(282)
Total Primary energy kWh/year			7112.1402	(286)
Dwelling Primary energy Rate (DPER)			44.1400	(287)

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

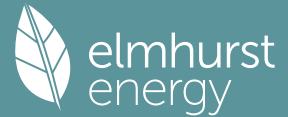
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	71.8100 (1b)	x 2.4000 (2b)	= 172.3440 (1b) - (3b)	
First floor	89.3300 (1c)	x 2.7000 (2c)	= 241.1910 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	161.1400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e) ... (3n) =	413.5350 (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) =	0.0967 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3467 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2947 (21)

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Wind speed	Jan 5.1000	Feb 5.0000	Mar 4.9000	Apr 4.4000	May 4.3000	Jun 3.8000	Jul 3.8000	Aug 3.7000	Sep 4.0000	Oct 4.3000	Nov 4.5000	Dec 4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.3758	0.3684	0.3610	0.3242	0.3168	0.2800	0.2800	0.2726	0.2947	0.3168	0.3316	0.3463	(22b)
	0.5706	0.5679	0.5652	0.5525	0.5502	0.5392	0.5392	0.5372	0.5434	0.5502	0.5550	0.5600	(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	
TER Opaque door			6.1800	1.0000	6.1800			(26)
TER Opening Type (Uw = 1.20)			27.8200	1.1450	31.8550			(27)
Ground Floor			71.8100	0.1300	9.3353			(28a)
Exposed Floor			19.9400	0.1300	2.5922			(28b)
External Wall 1	183.7300	34.0000	149.7300	0.1800	26.9514			(29a)
Garage Wall	20.5700		20.5700	0.1800	3.7026			(29a)
Main Roof	89.3300		89.3300	0.1100	9.8263			(30)
Bay Roof	2.4200		2.4200	0.1100	0.2662			(30)
Total net area of external elements Aum(A, m2)			387.8000					(31)
Fabric heat loss, W/K = Sum (A x U)						90.7090		(33)
								(26)...(30) + (32) =
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							144.2620	(35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	31.7900	0.1600	5.0864	
E5 Ground floor (normal)	8.5700	0.1600	1.3712	
E6 Intermediate floor within a dwelling	27.3800	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	12.8600	0.0600	0.7716	
E12 Gable (insulation at ceiling level)	26.9400	0.0600	1.6164	
E14 Flat roof	4.4100	0.0800	0.3528	
E16 Corner (normal)	35.4000	0.0900	3.1860	
E17 Corner (inverted - internal area greater than external area)	15.0000	-0.0900	-1.3500	
E20 Exposed floor (normal)	10.0700	0.3200	3.2224	
E21 Exposed floor (inverted)	8.5700	0.3200	2.7424	
E24 Eaves (insulation at ceiling level - inverted)	2.3400	0.2400	0.5616	
E2 Other lintels (including other steel lintels)	22.5200	0.0500	1.1260	
E3 Sill	19.5800	0.0500	0.9790	
E4 Jamb	47.6400	0.0500	2.3820	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)				22.0478 (36)
Point Thermal bridges				(36a) = 0.0000
Total fabric heat loss				(33) + (36) + (36a) = 112.7568 (37)

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

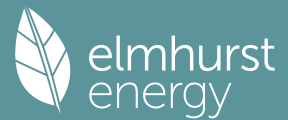
(38)m	Jan 77.8678	Feb 77.4937	Mar 77.1270	Apr 75.4045	May 75.0823	Jun 73.5821	Jul 73.5821	Aug 73.3043	Sep 74.1599	Oct 75.0823	Nov 75.7342	Dec 76.4158	(38)
Heat transfer coeff	190.6245	190.2504	189.8837	188.1613	187.8390	186.3388	186.3388	186.0610	186.9167	187.8390	188.4910	189.1725	(39)
Average = Sum(39)m / 12 =												188.1597	
HLP	Jan 1.1830	Feb 1.1807	Mar 1.1784	Apr 1.1677	May 1.1657	Jun 1.1564	Jul 1.1564	Aug 1.1547	Sep 1.1600	Oct 1.1657	Nov 1.1697	Dec 1.1740	(40)
HLP (average)												1.1677	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9505 (42)
Hot water usage for mixer showers	73.6900	72.5826	70.9689	67.8813	65.6028	63.0618	61.6174	63.2190	64.9745	67.7028	70.8567	73.4077	(42a)
Hot water usage for baths	31.8124	31.3399	30.6746	29.4478	28.5293	27.5107	26.9606	27.6212	28.3406	29.4305	30.6825	31.7048	(42b)
Hot water usage for other uses	44.8461	43.2153	41.5845	39.9538	38.3230	36.6922	36.6922	38.3230	39.9538	41.5845	43.2153	44.8461	(42c)
Average daily hot water use (litres/day)												138.2040	(43)
Daily hot water use	Jan 150.3485	Feb 147.1378	Mar 143.2280	Apr 137.2830	May 132.4551	Jun 127.2648	Jul 125.2703	Aug 129.1632	Sep 133.2689	Oct 138.7178	Nov 144.7545	Dec 149.9586	(44)
Energy conte	238.1152	209.5223	220.1361	187.9335	178.3100	156.4869	151.5035	159.9310	164.3339	188.2388	206.2293	234.7989	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m	35.7173	31.4283	33.0204	28.1900	26.7465	23.4730	22.7255	23.9897	24.6501	28.2358	30.9344	35.2198	(46)
Water storage loss:													
Store volume												250.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.0208	(55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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	293.0220	259.1156	275.0429	241.0691	233.2168	209.6225	206.4103	214.8378	217.4695	243.1455	259.3649	289.7057	(62)
WWHRS	-33.6880	-29.7940	-31.1985	-25.8336	-24.0760	-20.6020	-19.3111	-20.5354	-21.3156	-25.1288	-28.4678	-33.0642	(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	259.3340	229.3216	243.8444	215.2355	209.1408	189.0205	187.0992	194.3024	196.1538	218.0168	230.8970	256.6416	(64)
Total per year (kWh/year)												2629.0077	(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	123.0988	109.3408	117.1207	104.9964	103.2135	94.5404	94.3004	97.1025	97.1495	106.5148	111.0797	121.9961	(65)

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

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	172.4411	190.9169	172.4411	178.1891	172.4411	178.1891	172.4411	172.4411	178.1891	172.4411	178.1891	172.4411 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	332.3992	335.8485	327.1564	308.6521	285.2938	263.3402	248.6739	245.2246	253.9166	272.4209	295.7793	317.7329 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525 (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)												
	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200 (71)
Water heating gains (Table 5)												
	165.4553	162.7095	157.4203	145.8283	138.7278	131.3061	126.7478	130.5141	134.9299	143.1651	154.2774	163.9732 (72)
Total internal gains												
	740.5531	759.7324	727.2754	702.9271	666.7202	640.0929	615.1203	615.4373	634.2931	658.2846	698.5033	724.4047 (73)

6. Solar gains

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

North					14.4600	10.6334	0.6300	0.7000	0.7700	46.9907 (74)		
East					1.8300	19.6403	0.6300	0.7000	0.7700	10.9842 (76)		
South					9.7500	46.7521	0.6300	0.7000	0.7700	139.3084 (78)		
West					1.7800	19.6403	0.6300	0.7000	0.7700	10.6841 (80)		

Solar gains	207.9675	360.3408	513.0260	675.3842	797.2364	810.5961	773.4538	678.8287	568.2481	403.2765	250.1149	177.3680 (83)
Total gains	948.5206	1120.0732	1240.3014	1378.3113	1463.9566	1450.6890	1388.5740	1294.2660	1202.5413	1061.5611	948.6183	901.7728 (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	33.8746	33.9412	34.0067	34.3180	34.3769	34.6537	34.6537	34.7054	34.5466	34.3769	34.2580	34.1346
alpha	3.2583	3.2627	3.2671	3.2879	3.2918	3.3102	3.3102	3.3137	3.3031	3.2918	3.2839	3.2756
util living area	0.9863	0.9759	0.9580	0.9143	0.8297	0.6880	0.5433	0.5929	0.7937	0.9339	0.9770	0.9884 (86)
MIT	18.7736	19.0476	19.4479	19.9889	20.4703	20.8059	20.9347	20.9117	20.6659	20.0425	19.3169	18.7295 (87)
Th 2	19.9336	19.9355	19.9373	19.9459	19.9475	19.9551	19.9551	19.9564	19.9522	19.9475	19.9443	19.9409 (88)
util rest of house	0.9835	0.9709	0.9490	0.8946	0.7882	0.6101	0.4320	0.4826	0.7300	0.9147	0.9714	0.9860 (89)
MIT 2	17.3317	17.6807	18.1882	18.8670	19.4428	19.8107	19.9227	19.9090	19.6759	18.9454	18.0316	17.2799 (90)
Living area fraction	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (92)
MIT	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (93)
Temperature adjustment												0.0000
adjusted MIT	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9745	0.9580	0.9321	0.8753	0.7756	0.6165	0.4539	0.5027	0.7262	0.8967	0.9590	0.9779 (94)
Useful gains	924.3010	1073.0230	1156.0557	1206.4157	1135.4591	894.3663	630.2799	650.6413	873.2278	951.8597	909.7542	881.8765 (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	2545.5453	2489.6094	2272.8223	1922.5570	1497.5042	1012.3807	661.2606	694.5505	1083.5632	1613.6171	2114.6206	2535.5976 (97)
Space heating kWh	1206.2058	951.9460	830.8743	515.6217	269.3615	0.0000	0.0000	0.0000	0.0000	492.3475	867.5038	1230.3685 (98a)
Space heating requirement - total per year (kWh/year)												6364.2293
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	1206.2058	951.9460	830.8743	515.6217	269.3615	0.0000	0.0000	0.0000	0.0000	492.3475	867.5038	1230.3685 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6364.2293
Space heating per m ²										(98c) / (4) =		39.4950 (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	1206.2058	951.9460	830.8743	515.6217	269.3615	0.0000	0.0000	0.0000	0.0000	492.3475	867.5038	1230.3685 (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)	1306.8319	1031.3608	900.1889	558.6368	291.8326	0.0000	0.0000	0.0000	0.0000	533.4209	939.8741	1333.0103 (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	259.3340	229.3216	243.8444	215.2355	209.1408	189.0205	187.0992	194.3024	196.1538	218.0168	230.8970	256.6416 (64)
Efficiency of water heater												79.8000 (216)

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(217)m	87.0625	86.8974	86.5844	85.9454	84.6283	79.8000	79.8000	79.8000	79.8000	85.8291	86.7435	87.1045	(217)
Fuel for water heating, kWh/month	297.8712	263.8992	281.6264	250.4328	247.1286	236.8678	234.4602	243.4868	245.8068	254.0126	266.1837	294.6363	(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	7.0685	(231)
Lighting	35.8299	28.7440	25.8808	18.9614	14.6463	11.9662	13.3609	17.3670	22.5580	29.5973	33.4301	36.8257	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-76.2637	-102.9704	-141.7676	-152.3693	-158.4858	-145.7295	-143.7259	-138.3360	-128.2480	-114.1119	-82.1214	-66.4630	(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	-58.0764	-120.0780	-234.9937	-347.8544	-455.2616	-455.9057	-450.7121	-383.8849	-284.3136	-170.1916	-77.0058	-46.1032	(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												6895.1563	(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												3116.4124	(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)												289.1674	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4534.9736	(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												5851.7625	(238)

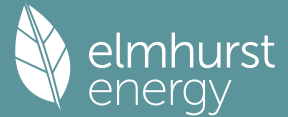
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6895.1563	0.2100	1447.9828 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3116.4124	0.2100	654.4466 (264)
Space and water heating			2102.4294 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	289.1674	0.1443	41.7358 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1450.5926	0.1356	-196.6397
PV Unit electricity exported	-3084.3810	0.1263	-389.6222
Total			-586.2619 (269)
Total CO2, kg/year			1569.8326 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7400 (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	6895.1563	1.1300	7791.5267 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3116.4124	1.1300	3521.5460 (278)
Space and water heating			11313.0726 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	289.1674	1.5338	443.5347 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1450.5926	1.5011	-2177.4174
PV Unit electricity exported	-3084.3810	0.4637	-1430.2381
Total			-3607.6555 (283)
Total Primary energy kWh/year			8279.0526 (286)
Target Primary Energy Rate (TPER)			51.3800 (287)

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Property Reference	5.11 (2)_Copy				Issued on Date	24/06/2024
Assessment Reference	00001_Copy_Copy		Prop Type Ref	5.11		
Property	143					
SAP Rating	78 C	DER	4.07	TER	9.23	
Environmental	95 A	% DER < TER				55.90
CO ₂ Emissions (t/year)	0.91	DFEE	44.32	TFEE	44.54	
Compliance Check	See BREL	% DFEE < TFEE				0.48
% DPER < TPER	12.62	DPER	42.57	TPER	48.72	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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)
Ground floor	106.3800 (1b)	x 2.4000 (2b)	= 255.3120 (1b) - (3b)
First floor	135.4500 (1c)	x 2.6200 (2c)	= 354.8790 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	241.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 610.1910 (5)

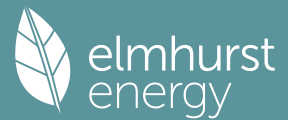
2. Ventilation rate

	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)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.2359 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 - centralised	
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
Window (Uw = 1.20)			38.2500	1.1450	43.7977		(27)
Door			4.1200	1.0000	4.1200		(26)
N W Roof			0.9600	1.3258	1.2727		(27a)
Ground Floor			106.3800	0.1200	12.7656	110.0000	(28a)
Exposed Floor			40.4000	0.1400	5.6560		(28b)
External Wall 1	192.1100	40.0700	152.0400	0.2000	30.4080	60.0000	(29a)
Stud Wall	26.8600		26.8600	0.2100	5.6406	18.0000	(29a)
Gable Wall	17.8000		17.8000	0.2000	3.5600	60.0000	(29a)
Dormer Wall	4.8400	2.3000	2.5400	0.2400	0.6096	18.0000	(29a)
Garage Wall	30.5000		30.5000	0.1800	5.4900	60.0000	(29a)
Main Roof	93.2700		93.2700	0.1500	13.9905	9.0000	(30)
RIR Flat Roof	27.4200		27.4200	0.1500	4.1130	9.0000	(30)
Ground Floor Roof	13.0400		13.0400	0.1500	1.9560	9.0000	(30)
RIR Pitched Roof	26.7100	0.9600	25.7500	0.0800	2.0600	9.0000	(30)
Total net area of external elements Aum(A, m ²)			579.3300				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	135.4397			(33)
Internal Wall 1	300.0000		9.0000	2700.0000	(32c)
Internal Floor 1	93.2700		18.0000	1678.8600	(32d)
Internal Ceiling 1	93.2700		9.0000	839.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	30905.0100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		127.7964	(35)

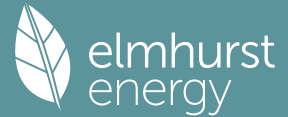
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	29.1100	0.0660	1.9213	
E2 Other lintels (including other steel lintels)	27.1500	0.0210	0.5702	
E3 Sill	65.8000	0.1000	6.5800	
E4 Jamb	1.6000	0.1120	0.1792	
R1 Head of roof window	1.6000	0.1120	0.1792	
R2 Sill of roof window	2.4000	0.0710	0.1704	
R3 Jamb of roof window	41.2100	0.0620	2.5550	
E5 Ground floor (normal)	12.7100	0.0620	0.7880	
E5 Ground floor (normal)	32.7600	0.0020	0.0655	
E6 Intermediate floor within a dwelling	23.6900	0.0430	1.0187	
E10 Eaves (insulation at ceiling level)	23.3200	0.0450	1.0494	
E12 Gable (insulation at ceiling level)	4.8700	0.0230	0.1120	
E13 Gable (insulation at rafter level)	5.2700	0.1600	0.8432	
E14 Flat roof	43.5000	0.0390	1.6965	
E16 Corner (normal)	23.1000	-0.0860	-1.9866	
E17 Corner (inverted - internal area greater than external area)	2.6000	0.0390	0.1014	
E16 Corner (normal)	12.7100	0.0330	0.4194	
E20 Exposed floor (normal)	12.7100	0.0330	0.4194	
E21 Exposed floor (inverted)	11.0500	0.1200	1.3260	
R6 Flat ceiling	11.0500	0.1200	1.3260	
R8 Roof to wall (rafter)	6.2100	0.1200	0.7452	
R8 Roof to wall (rafter)	6.4400	0.0430	0.2769	
E24 Eaves (insulation at ceiling level - inverted)	4.8700	0.0430	0.2094	
E24 Eaves (insulation at ceiling level - inverted)			20.5657	(36)
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			0.0000	(36a)
Point Thermal bridges				
Total fabric heat loss			156.0055	(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	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	(38)
Heat transfer coeff	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	(39)
Average = Sum(39)m / 12 =												256.6870	(39)
HLP	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	(40)
HLP (average)												1.0614	(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													3.0563 (42)
Hot water usage for mixer showers	75.4641	74.3301	72.6775	69.5156	67.1822	64.5800	63.1009	64.7410	66.5388	69.3327	72.5626	75.1750	(42a)
Hot water usage for baths	32.5753	32.0915	31.4102	30.1541	29.2135	28.1705	27.6071	28.2837	29.0202	30.1363	31.4183	32.4651	(42b)
Hot water usage for other uses	45.9297	44.2595	42.5893	40.9192	39.2490	37.5788	37.5788	39.2490	40.9192	42.5893	44.2595	45.9297	(42c)
Average daily hot water use (litres/day)													141.5320 (43)
Daily hot water use	153.9691	150.6810	146.6770	140.5888	135.6446	130.3293	128.2868	132.2736	136.4782	142.0583	148.2403	153.5698	(44)
Energy conte	243.8494	214.5678	225.4371	192.4590	182.6037	160.2551	155.1518	163.7823	168.2912	192.7718	211.1955	240.4532	(45)
Energy content (annual)										Total = Sum(45)m =		2350.8179	
Distribution loss (46)m = 0.15 x (45)m	36.5774	32.1852	33.8156	28.8689	27.3906	24.0383	23.2728	24.5673	25.2437	28.9158	31.6793	36.0680	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7800 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(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	296.9090	262.4926	278.4967	243.8070	235.6633	211.6031	208.2114	216.8419	219.6392	245.8314	262.5435	293.5128	(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	296.9090	262.4926	278.4967	243.8070	235.6633	211.6031	208.2114	216.8419	219.6392	245.8314	262.5435	293.5128	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2975.5519	(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	123.5276	109.6836	117.4055	105.0710	103.1634	94.3632	94.0357	96.9053	97.0352	106.5443	111.3009	122.3984	(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	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	209.7369	232.2087	209.7369	216.7281	209.7369	216.7281	209.7369	209.7369	216.7281	209.7369	216.7281	209.7369	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.2457	413.4924	402.7909	380.0086	351.2501	324.2211	306.1641	301.9174	312.6190	335.4012	364.1598	391.1887	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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Losses e.g. evaporation (negative values) (Table 5)	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524 (71)
Water heating gains (Table 5)	166.0317	163.2197	157.8031	145.9320	138.6605	131.0600	126.3920	130.2491	134.7712	143.2047	154.5846	164.5139 (72)
Total internal gains	853.8590	877.7654	839.1755	811.5133	768.4921	740.8539	711.1377	710.7480	732.9629	757.1875	804.3171	834.2842 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					16.7600	10.6334	0.4500	0.8000			0.7700	44.4612 (74)	
East					1.5700	19.6403	0.4500	0.8000			0.7700	7.6928 (76)	
South					14.8600	46.7521	0.4500	0.8000			0.7700	173.3227 (78)	
West					5.0600	19.6403	0.4500	0.8000			0.7700	24.7933 (80)	
North					0.9600	26.0000	0.5300	0.8000			1.0000	9.5247 (82)	
Solar gains	259.7947	452.1573	645.7908	848.1683	995.6639	1009.0302	964.2180	850.7120	715.1595	506.8954	312.8905	221.2398 (83)	
Total gains	1113.6536	1329.9227	1484.9663	1659.6816	1764.1560	1749.8841	1675.3556	1561.4600	1448.1224	1264.0828	1117.2076	1055.5240 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443
alpha	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296
util living area	0.9904	0.9824	0.9684	0.9338	0.8638	0.7389	0.5984	0.6484	0.8340	0.9508	0.9837	0.9920 (86)
Living	18.6379	18.9032	19.3055	19.8454	20.3595	20.7405	20.9058	20.8751	20.5820	19.9111	19.1682	18.5773
Non living	17.8531	18.1166	18.5153	19.0444	19.5335	19.8689	19.9908	19.9730	19.7433	19.1152	18.3819	17.7928
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325 (88)
util rest of house	0.9887	0.9791	0.9622	0.9194	0.8312	0.6709	0.4924	0.5458	0.7824	0.9374	0.9801	0.9905 (89)
MIT 2	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325 (90)
Living area fraction									fLA = Living area / (4) =			0.1664 (91)
MIT	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9890	0.9797	0.9633	0.9221	0.8372	0.6834	0.5114	0.5645	0.7921	0.9399	0.9808	0.9907 (94)
Useful gains	1101.3792	1302.9782	1430.4823	1530.3122	1476.9783	1195.8013	856.8059	881.4559	1147.0566	1188.1581	1095.7304	1045.7358 (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	4079.6315	3925.6193	3514.9201	2898.8713	2180.1477	1435.7555	922.3815	973.7189	1564.0990	2462.5034	3360.9079	4105.3002 (97)
Space heating kWh	2215.8197	1762.4148	1550.8217	985.3625	523.1581	0.0000	0.0000	0.0000	0.0000	948.1129	1630.9278	2276.3159 (98a)
Space heating requirement - total per year (kWh/year)												11892.9335
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	2215.8197	1762.4148	1550.8217	985.3625	523.1581	0.0000	0.0000	0.0000	0.0000	948.1129	1630.9278	2276.3159 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11892.9335
Space heating per m ²										(98c) / (4) =		49.1789 (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 %)												342.3613 (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	2215.8197	1762.4148	1550.8217	985.3625	523.1581	0.0000	0.0000	0.0000	0.0000	948.1129	1630.9278	2276.3159 (98)
Space heating efficiency (main heating system 1)	342.3613	342.3613	342.3613	342.3613	342.3613	0.0000	0.0000	0.0000	0.0000	342.3613	342.3613	342.3613 (210)
Space heating fuel (main heating system)	647.2167	514.7821	452.9781	287.8136	152.8087	0.0000	0.0000	0.0000	0.0000	276.9334	476.3762	664.8870 (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	296.9090	262.4926	278.4967	243.8070	235.6633	211.6031	208.2114	216.8419	219.6392	245.8314	262.5435	293.5128 (64)
Efficiency of water heater (217)m	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400 (216)
Fuel for water heating, kWh/month	248.7925	219.9535	233.3641	204.2961	197.4722	177.3111	174.4691	181.7010	184.0449	205.9925	219.9962	245.9467 (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)

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Pumps and Fa	18.0826	16.3327	18.0826	17.4993	18.0826	17.4993	18.0826	18.0826	17.4993	18.0826	17.4993	18.0826	(231)
Lighting	58.2015	46.6914	42.0404	30.8006	23.7913	19.4377	21.7032	28.2106	36.6428	48.0774	54.3033	59.8191	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3473.7958	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												119.3400	
Water heating fuel used												2493.3399	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2860)													
mechanical ventilation fans (SFP = 0.2860)												212.9078	(230a)
Total electricity for the above, kWh/year												212.9078	(231)
Electricity for lighting (calculated in Appendix L)												469.7193	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)
Wind generation												0.0000	(234)
Hydro-electric generation (Appendix N)												0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)												0.0000	(235)
Appendix Q - special features													
Energy saved or generated												-0.0000	(236)
Energy used												0.0000	(237)
Total delivered energy for all uses												6649.7628	(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	3473.7958	0.1544	536.4675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2493.3399	0.1410	351.5022	(264)
Space and water heating			887.9698	(265)
Pumps, fans and electric keep-hot	212.9078	0.1387	29.5329	(267)
Energy for lighting	469.7193	0.1443	67.7950	(268)
Total CO2, kg/year			985.2977	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.0700	(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	3473.7958	1.5717	5459.9207	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2493.3399	1.5213	3793.0772	(278)
Space and water heating			9252.9979	(279)
Pumps, fans and electric keep-hot	212.9078	1.5128	322.0870	(281)
Energy for lighting	469.7193	1.5338	720.4711	(282)
Total Primary energy kWh/year			10295.5560	(286)
Dwelling Primary energy Rate (DPER)			42.5700	(287)

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

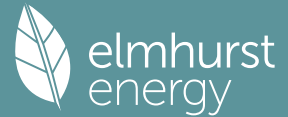
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	106.3800 (1b)	x 2.4000 (2b)	= 255.3120	(1b) - (3b)
First floor	135.4500 (1c)	x 2.6200 (2c)	= 354.8790	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	241.8300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 610.1910	(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)

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Number of intermittent extract fans
Number of passive vents
Number of flueless gas fires

4 * 10 = 40.0000 (7a)
0 * 10 = 0.0000 (7b)
0 * 40 = 0.0000 (7c)

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

Air changes per hour
40.0000 / (5) = 0.0656 (8)
Yes
Blower Door
5.0000 (17)
0.3156 (18)
1 (19)

Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.2919 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Adj infilt rate													
Effective ac	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430	(22b)
	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			4.1200	1.0000	4.1200			(26)
TER Opening Type (Uw = 1.20)			38.2500	1.1450	43.7977			(27)
N W Roof			0.9600	1.5918	1.5281			(27a)
Ground Floor			106.3800	0.1300	13.8294			(28a)
Exposed Floor			40.4000	0.1300	5.2520			(28b)
External Wall 1	192.1100	40.0700	152.0400	0.1800	27.3672			(29a)
Stud Wall	26.8600		26.8600	0.1800	4.8348			(29a)
Gable Wall	17.8000		17.8000	0.1800	3.2040			(29a)
Dormer Wall	4.8400	2.3000	2.5400	0.1800	0.4572			(29a)
Garage Wall	30.5000		30.5000	0.1800	5.4900			(29a)
Main Roof	93.2700		93.2700	0.1100	10.2597			(30)
RIR Flat Roof	27.4200		27.4200	0.1100	3.0162			(30)
Ground Floor Roof	13.0400		13.0400	0.1100	1.4344			(30)
RIR Pitched Roof	26.7100	0.9600	25.7500	0.1100	2.8325			(30)
Total net area of external elements Aum(A, m2)			579.3300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	127.4232		(33)

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

127.7964 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element	29.1100	0.0500	1.4555	
E2 Other lintels (including other steel lintels)	27.1500	0.0500	1.3575	
E3 Sill	65.8000	0.0500	3.2900	
E4 Jamb	1.6000	0.0800	0.1280	
R1 Head of roof window	1.6000	0.0600	0.0960	
R2 Sill of roof window	2.4000	0.0800	0.1920	
R3 Jamb of roof window	41.2100	0.1600	6.5936	
E5 Ground floor (normal)	12.7100	0.1600	2.0336	
E6 Intermediate floor within a dwelling	32.7600	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	23.6900	0.0600	1.4214	
E12 Gable (insulation at ceiling level)	23.3200	0.0600	1.3992	
E13 Gable (insulation at rafter level)	4.8700	0.0800	0.3896	
E14 Flat roof	5.2700	0.0800	0.4216	
E16 Corner (normal)	43.5000	0.0900	3.9150	
E17 Corner (inverted - internal area greater than external area)	23.1000	-0.0900	-2.0790	
E16 Corner (normal)	2.6000	0.0900	0.2340	
E20 Exposed floor (normal)	12.7100	0.3200	4.0672	
E21 Exposed floor (inverted)	12.7100	0.3200	4.0672	
R6 Flat ceiling	11.0500	0.0600	0.6630	
R8 Roof to wall (rafter)	11.0500	0.0600	0.6630	
R8 Roof to wall (rafter)	6.2100	0.0600	0.3726	
E24 Eaves (insulation at ceiling level - inverted)	6.4400	0.2400	1.5456	
E24 Eaves (insulation at ceiling level - inverted)	4.8700	0.2400	1.1688	

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

33.3954 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 160.8186 (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	114.6259	114.0844	113.5537	111.0607	110.5943	108.4230	108.4230	108.0209	109.2594	110.5943	111.5379	112.5243	(38)
Heat transfer coeff	275.4445	274.9030	274.3723	271.8793	271.4129	269.2416	269.2416	268.8395	270.0780	271.4129	272.3565	273.3429	(39)
Average = Sum(39)m / 12 =												271.8771	

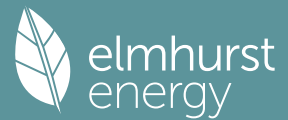
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1390	1.1368	1.1346	1.1243	1.1223	1.1134	1.1134	1.1117	1.1168	1.1223	1.1262	1.1303	(40)
HLP (average)												1.1242	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.0563 (42)	
Hot water usage for mixer showers													
75.4641	74.3301	72.6775	69.5156	67.1822	64.5800	63.1009	64.7410	66.5388	69.3327	72.5626	75.1750	(42a)	
Hot water usage for baths													
32.5753	32.0915	31.4102	30.1541	29.2135	28.1705	27.6071	28.2837	29.0202	30.1363	31.4183	32.4651	(42b)	
Hot water usage for other uses													
45.9297	44.2595	42.5893	40.9192	39.2490	37.5788	37.5788	39.2490	40.9192	42.5893	44.2595	45.9297	(42c)	
Average daily hot water use (litres/day)												141.5320 (43)	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	153.9691	150.6810	146.6770	140.5888	135.6446	130.3293	128.2868	132.2736	136.4782	142.0583	148.2403	153.5698 (44)	
Energy content (annual)	243.8494	214.5678	225.4371	192.4590	182.6037	160.2551	155.1518	163.7823	168.2912	192.7718	211.1955	240.4532 (45)	
										Total = Sum(45)m =			2350.8179
Distribution loss (46)m = 0.15 x (45)m													
36.5774	32.1852	33.8156	28.8689	27.3906	24.0383	23.2728	24.5673	25.2437	28.9158	31.6793	36.0680 (46)		

8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9777	0.9611	0.9347	0.8785	0.7820	0.6298	0.4696	0.5202	0.7399	0.9040	0.9637	0.9810 (94)
Useful gains	1153.8209	1382.4024	1526.9282	1625.5033	1552.3435	1240.9567	885.8954	909.8477	1189.8571	1250.7460	1151.9250	1092.5391 (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												
Space heating	3576.0869	3505.3238	3208.0105	2721.8942	2126.7110	1442.3486	943.2205	989.8419	1537.1696	2274.6878	2971.7060	3561.2363 (97)
Space heating kWh	1802.1659	1426.6032	1250.7252	789.4015	427.3294	0.0000	0.0000	0.0000	0.0000	761.8127	1310.2424	1836.7107 (98a)
Space heating requirement - total per year (kWh/year)												9604.9910
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	1802.1659	1426.6032	1250.7252	789.4015	427.3294	0.0000	0.0000	0.0000	0.0000	761.8127	1310.2424	1836.7107 (98c)

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

9604.9910
(98c) / (4) = 39.7179 (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	1802.1659	1426.6032	1250.7252	789.4015	427.3294	0.0000	0.0000	0.0000	0.0000	761.8127	1310.2424	1836.7107 (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)	1952.5091	1545.6156	1355.0653	855.2562	462.9788	0.0000	0.0000	0.0000	0.0000	825.3659	1419.5475	1989.9358 (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	264.2571	233.6498	248.3943	219.1391	212.8549	192.2927	190.2826	197.6593	199.5980	221.9448	235.1779	261.4998 (64)
Efficiency of water heater	87.5375	87.4126	87.1710	86.6760	85.5905	79.8000	79.8000	79.8000	79.8000	86.5966	87.3017	79.8000 (216)
Fuel for water heating, kWh/month	301.8788	267.2953	284.9505	252.8257	248.6900	240.9683	238.4494	247.6934	250.1229	256.2975	269.3854	298.6210 (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	44.5864	35.7689	32.2059	23.5954	18.2258	14.8906	16.6262	21.6113	28.0710	36.8306	41.6001	45.8256 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-89.6963	-121.7353	-168.4237	-181.8751	-189.7931	-174.6465	-172.1743	-165.3860	-152.8385	-135.2518	-96.7824	-78.0849 (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	-66.0650	-136.8792	-268.4141	-398.1118	-521.8194	-522.9225	-517.0498	-440.1057	-325.5081	-194.3854	-87.7184	-52.4306 (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												10406.2742 (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												3157.1781 (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)												359.8379 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-5258.0980 (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												8751.1921 (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	10406.2742	0.2100	2185.3176 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3157.1781	0.2100	663.0074 (264)
Space and water heating			2848.3250 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	359.8379	0.1443	51.9357 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1726.6878	0.1355	-233.9025
PV Unit electricity exported	-3531.4102	0.1263	-445.8666
Total			-679.7691 (269)
Total CO2, kg/year			2232.4209 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2300 (273)

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

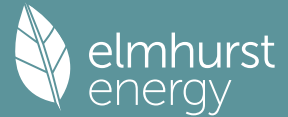
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	10406.2742	1.1300	11759.0898 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3157.1781	1.1300	3567.6113 (278)
Space and water heating			15326.7011 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	359.8379	1.5338	551.9313 (282)

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Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1726.6878	1.5007	-2591.2360
PV Unit electricity exported	-3531.4102	0.4635	-1636.6906
Total			-4227.9265 (283)
Total Primary energy kWh/year			11780.8067 (286)
Target Primary Energy Rate (TPER)			48.7200 (287)

Full SAP Calculation Printout



Property Reference	M2.2 (2)_Copy				Issued on Date	24/06/2024		
Assessment Reference	00001_Copy_Copy			Prop Type Ref	5.11			
Property	143							
SAP Rating	79 C		DER	5.32		TER	12.36	
Environmental	96 A		% DER < TER				56.96	
CO ₂ Emissions (t/year)	0.36		DFEE	38.34		TFEE	38.42	
Compliance Check	See BREL		% DFEE < TFEE				0.20	
% DPER < TPER	13.42		DPER	56.02		TPER	64.71	
Assessor Details	Miss Eleanor Ballinger					Assessor ID	M976-0001	
Client								

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)
Ground floor	36.6800 (1b)	x 2.4000 (2b)	= 88.0320 (1b) - (3b)
First floor	36.6700 (1c)	x 2.7000 (2c)	= 99.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.0410 (5)

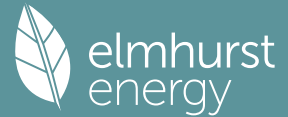
2. Ventilation rate

											m3 per hour		
Number of open chimneys												0 * 80 =	0.0000 (6a)
Number of open flues												0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 =	0.0000 (6d)
Number of flues attached to other heater												0 * 35 =	0.0000 (6e)
Number of blocked chimneys												0 * 20 =	0.0000 (6f)
Number of intermittent extract fans												0 * 10 =	0.0000 (7a)
Number of passive vents												0 * 10 =	0.0000 (7b)
Number of flueless gas fires												0 * 40 =	0.0000 (7c)
											Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =											0.0000 (8)	
Pressure test												Yes	
Pressure Test Method												Blower Door	
Measured/design AP50												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 - centralised													
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
Window (Uw = 1.20)			11.6000	1.1450	13.2824		(27)
Door			2.0600	1.0000	2.0600		(26)
Ground Floor			36.6700	0.1200	4.4004	110.0000	4033.7000 (28a)
External Wall 1	87.3600	13.6600	73.7000	0.2000	14.7400	60.0000	4422.0000 (29a)
Main Roof	36.6700		36.6700	0.1500	5.5005	9.0000	330.0300 (30a)
Total net area of external elements Aum(A, m ²)			160.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9833		(33)
Party Wall 1			43.6600	0.0000	0.0000	180.0000	7858.8000 (32)
Internal Wall 1			115.0000			9.0000	1035.0000 (32c)
Internal Floor 1			36.6700			18.0000	660.0600 (32d)
Internal Ceiling 1			36.6700			9.0000	330.0300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18669.6200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							254.5279 (35)
List of Thermal Bridges							

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K1 Element	Length	Psi-value	Total
E5 Ground floor (normal)	17.1300	0.0620	1.0621
E6 Intermediate floor within a dwelling	17.1300	0.0020	0.0343
E10 Eaves (insulation at ceiling level)	8.5800	0.0430	0.3689
E12 Gable (insulation at ceiling level)	8.5600	0.0320	0.2739
E16 Corner (normal)	10.2000	0.0360	0.3672
E18 Party wall between dwellings	10.2000	0.0360	0.3672
P1 Party wall - Ground floor	8.5600	0.0580	0.4965
P4 Party wall - Roof (insulation at ceiling level)	8.5600	0.0330	0.2825
P2 Party wall - Intermediate floor within a dwelling	0.0000	0.0000	0.0000
E2 Other lintels (including other steel lintels)	8.1900	0.0660	0.5405
E3 Sill	7.2100	0.0210	0.1514
E4 Jamb	15.9000	0.1000	1.5900
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			5.5345 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	45.5178 (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	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	30.8618	(38)
Heat transfer coeff	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	76.3796	(39)
Average = Sum(39)m / 12 =													76.3796
HLP	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	1.0413	(40)
HLP (average)													1.0413
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3246 (42)
Hot water usage for mixer showers	63.1961	62.2464	60.8625	58.2146	56.2605	54.0814	52.8427	54.2162	55.7217	58.0615	60.7662	62.9540	(42a)
Hot water usage for baths	27.2996	26.8942	26.3232	25.2705	24.4823	23.6082	23.1361	23.7030	24.3203	25.2556	26.3300	27.2073	(42b)
Hot water usage for other uses	38.4366	37.0389	35.6412	34.2435	32.8458	31.4481	31.4481	32.8458	34.2435	35.6412	37.0389	38.4366	(42c)
Average daily hot water use (litres/day)													118.5181 (43)
Daily hot water use	128.9323	126.1795	122.8269	117.7286	113.5886	109.1377	107.4269	110.7650	114.2856	118.9583	124.1351	128.5979	(44)
Energy conte	204.1973	179.6779	188.7804	161.1646	152.9121	134.1975	129.9236	137.1502	140.9255	161.4253	176.8532	201.3532	(45)
Energy content (annual)										Total = Sum(45)m =			1968.5608
Distribution loss (46)m = 0.15 x (45)m	30.6296	26.9517	28.3171	24.1747	22.9368	20.1296	19.4885	20.5725	21.1388	24.2138	26.5280	30.2030	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7800 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(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	257.2569	227.6027	241.8400	212.5126	205.9717	185.5455	182.9832	190.2098	192.2735	214.4849	228.2012	254.4128	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	257.2569	227.6027	241.8400	212.5126	205.9717	185.5455	182.9832	190.2098	192.2735	214.4849	228.2012	254.4128	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =			2593.2948 (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	110.3433	98.0827	105.2172	94.6656	93.2909	85.6991	85.6473	88.0501	87.9361	96.1216	99.8821	109.3976	(65)

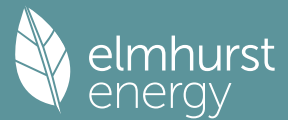
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	105.5314	116.8383	105.5314	109.0491	105.5314	109.0491	105.5314	105.5314	109.0491	105.5314	109.0491	105.5314	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.9862	207.1133	201.7530	190.3417	175.9369	162.3984	153.3539	151.2267	156.5870	167.9984	182.4032	195.9416	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	(71)
Water heating gains (Table 5)	148.3108	145.9564	141.4209	131.4800	125.3911	119.0265	115.1173	118.3469	122.1335	129.1957	138.7251	147.0398	(72)
Total internal gains	516.6979	527.7776	506.5748	488.7403	464.7288	448.3435	431.8720	432.9746	445.6391	460.5949	488.0469	506.3823	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	3.7100	19.6403	0.4500	0.8000	0.7700	18.1785 (76)
West	7.8900	19.6403	0.4500	0.8000	0.7700	38.6598 (80)

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Solar gains	56.8383	111.1878	183.1104	267.0556	327.2867	335.0362	318.9681	273.9889	212.9650	131.9336	70.8707	46.7410 (83)
Total gains	573.5362	638.9653	689.6852	755.7959	792.0155	783.3796	750.8401	706.9635	658.6041	592.5286	558.9176	553.1234 (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	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	
alpha	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	
util living area	0.9933	0.9869	0.9712	0.9180	0.7972	0.6058	0.4447	0.4917	0.7394	0.9410	0.9861	0.9945 (86)	
Living	19.9628	20.1196	20.3568	20.6614	20.8840	20.9791	20.9968	20.9945	20.9411	20.6521	20.2498	19.9227	
Non living	19.1168	19.2716	19.5032	19.7889	19.9762	20.0402	20.0483	20.0476	20.0198	19.7868	19.4014	19.0771	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4694	20.1196	20.3568	20.6614	20.8840	20.9791	20.9968	20.9945	20.9411	20.6521	20.2498	20.0734 (87)	
Th 2	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491 (88)	
util rest of house	0.9912	0.9828	0.9619	0.8925	0.7426	0.5236	0.3502	0.3928	0.6597	0.9169	0.9810	0.9928 (89)	
MIT 2	19.5721	19.2716	19.5032	19.7889	19.9762	20.0402	20.0483	20.0476	20.0198	19.7868	19.4014	19.2131 (90)	
Living area fraction									FLA = Living area / (4) =				0.2442 (91)
MIT	19.7912	19.4786	19.7116	20.0020	20.1979	20.2695	20.2799	20.2788	20.2448	19.9981	19.6085	19.4232 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7912	19.4786	19.7116	20.0020	20.1979	20.2695	20.2799	20.2788	20.2448	19.9981	19.6085	19.4232 (93)	

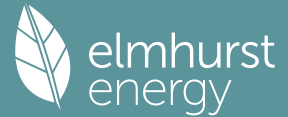
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9797	0.9578	0.8910	0.7518	0.5432	0.3733	0.4171	0.6773	0.9153	0.9779	0.9913 (94)
Useful gains	568.0867	625.9726	660.6138	673.4357	595.4445	425.5603	280.2959	294.8499	446.0469	542.3532	546.5598	548.3081 (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	1183.2135	1113.5101	1009.0970	847.9633	649.0651	433.0315	281.0677	296.2619	469.3366	717.8230	955.3966	1162.7381 (97)
Space heating kWh	457.6544	327.6253	259.2715	125.6599	39.8937	0.0000	0.0000	0.0000	0.0000	130.5495	294.3625	457.1360 (98a)
Space heating requirement - total per year (kWh/year)												2092.1528
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	457.6544	327.6253	259.2715	125.6599	39.8937	0.0000	0.0000	0.0000	0.0000	130.5495	294.3625	457.1360 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2092.1528
Space heating per m2										(98c) / (4) =		28.5229 (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 %)												218.2352 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	457.6544	327.6253	259.2715	125.6599	39.8937	0.0000	0.0000	0.0000	0.0000	130.5495	294.3625	457.1360 (98)
Space heating efficiency (main heating system 1)	218.2352	218.2352	218.2352	218.2352	218.2352	0.0000	0.0000	0.0000	0.0000	218.2352	218.2352	218.2352 (210)
Space heating fuel (main heating system)	209.7070	150.1249	118.8037	57.5800	18.2802	0.0000	0.0000	0.0000	0.0000	59.8206	134.8832	209.4694 (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	257.2569	227.6027	241.8400	212.5126	205.9717	185.5455	182.9832	190.2098	192.2735	214.4849	228.2012	254.4128 (64)
Efficiency of water heater (217)m	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346 (216)
Fuel for water heating, kWh/month	145.7260	128.9281	136.9930	120.3801	116.6750	105.1043	103.6529	107.7465	108.9155	121.4974	129.2672	144.1150 (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	4.2831	3.8686	4.2831	4.1449	4.2831	4.1449	4.2831	4.2831	4.1449	4.2831	4.1449	4.2831 (231)
Lighting	23.1074	18.5376	16.6911	12.2286	9.4457	7.7172	8.6167	11.2003	14.5481	19.0879	21.5597	23.7496 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												958.6690 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	176.5346	
Water heating fuel used	1469.0009	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2210)		
mechanical ventilation fans (SFP = 0.2210)	50.4300	(230a)
Total electricity for the above, kWh/year	50.4300	(231)
Electricity for lighting (calculated in Appendix L)	186.4898	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2664.5896	(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	958.6690	0.1561	149.6726	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1469.0009	0.1409	206.9642	(264)
Space and water heating			356.6368	(265)
Pumps, fans and electric keep-hot	50.4300	0.1387	6.9953	(267)
Energy for lighting	186.4898	0.1443	26.9162	(268)
Total CO2, kg/year			390.5483	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.3200	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	958.6690	1.5780	1512.7709	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1469.0009	1.5210	2234.2787	(278)
Space and water heating			3747.0496	(279)
Pumps, fans and electric keep-hot	50.4300	1.5128	76.2905	(281)
Energy for lighting	186.4898	1.5338	286.0443	(282)
Total Primary energy kWh/year			4109.3844	(286)
Dwelling Primary energy Rate (DPER)			56.0200	(287)

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

1. Overall dwelling characteristics

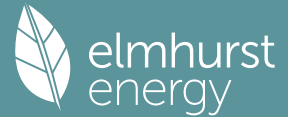
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	36.6800 (1b)	x 2.4000 (2b)	= 88.0320	(1b) - (3b)
First floor	36.6700 (1c)	x 2.7000 (2c)	= 99.0090	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3500			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.0410	(5)

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) =	0.1604 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4104	(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) =	0.3796 (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	0.4840	0.4745	0.4650	0.4176	0.4081	0.3606	0.3606	0.3511	0.3796	0.4081	0.4271	0.4460	(22b)
Effective ac	0.6171	0.6126	0.6081	0.5872	0.5833	0.5650	0.5650	0.5617	0.5721	0.5833	0.5912	0.5995	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type (Uw = 1.20)			11.6000	1.1450	13.2824			(27)
Ground Floor			36.6700	0.1300	4.7671			(28a)
External Wall 1	87.3600	13.6600	73.7000	0.1800	13.2660			(29a)
Main Roof	36.6700		36.6700	0.1100	4.0337			(30)
Total net area of external elements Aum(A, m2)			160.7000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.4092		(33)
Party Wall 1			43.6600	0.0000	0.0000			(32)

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

254.5279 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	17.1300	0.1600	2.7408	
E6 Intermediate floor within a dwelling	17.1300	0.0000	0.0000	
E10 Baves (insulation at ceiling level)	8.5800	0.0600	0.5148	
E12 Gable (insulation at ceiling level)	8.5600	0.0600	0.5136	
E16 Corner (normal)	10.2000	0.0900	0.9180	
E18 Party wall between dwellings	10.2000	0.0600	0.6120	
P1 Party wall - Ground floor	8.5600	0.0800	0.6848	
P4 Party wall - Roof (insulation at ceiling level)	8.5600	0.1200	1.0272	
P2 Party wall - Intermediate floor within a dwelling	0.0000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.1900	0.0500	0.4095	
E3 Sill	7.2100	0.0500	0.3605	
E4 Jamb	15.9000	0.0500	0.7950	

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

8.5762 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.9854 (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	38.0915	37.8108	37.5356	36.2431	36.0013	34.8755	34.8755	34.6670	35.3091	36.0013	36.4905	37.0019	(38)
Average = Sum(39)m / 12 =	84.0770	83.7962	83.5210	82.2285	81.9867	80.8610	80.8610	80.6525	81.2946	81.9867	82.4759	82.2274	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1462	1.1424	1.1387	1.1210	1.1177	1.1024	1.1024	1.0996	1.1083	1.1177	1.1244	1.1314	(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													2.3246 (42)
Hot water usage for mixer showers	63.1961	62.2464	60.8625	58.2146	56.2605	54.0814	52.8427	54.2162	55.7217	58.0615	60.7662	62.9540	(42a)
Hot water usage for baths	27.2996	26.8942	26.3232	25.2705	24.4823	23.6082	23.1361	23.7030	24.3203	25.2556	26.3300	27.2073	(42b)
Hot water usage for other uses	38.4366	37.0389	35.6412	34.2435	32.8458	31.4481	31.4481	32.8458	34.2435	35.6412	37.0389	38.4366	(42c)
Average daily hot water use (litres/day)													118.5181 (43)

Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	128.9323	126.1795	122.8269	117.7286	113.5886	109.1377	107.4269	110.7650	114.2856	118.9583	124.1351	128.5979	(44)
Energy content (annual)	204.1973	179.6779	188.7804	161.1646	152.9121	134.1975	129.9236	137.1502	140.9255	161.4253	176.8532	201.3532	(45)
Distribution loss (46)m = 0.15 x (45)m	30.6296	26.9517	28.3171	24.1747	22.9368	20.1296	19.4885	20.5725	21.1388	24.2138	26.5280	30.2030	(46)

Water storage loss:

Store volume

250.0000 (47)

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

1.8903 (48)

Temperature factor from Table 2b

0.5400 (49)

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

1.0208 (55)

Total storage loss

31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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

	259.1041	229.2711	243.6872	214.3002	207.8189	187.3331	184.8304	192.0570	194.0611	216.3321	229.9889	256.2600	(62)
WWHRS	-28.8906	-25.5511	-26.7556	-22.1547	-20.6474	-17.6681	-16.5611	-17.6110	-18.2801	-21.5503	-24.4138	-28.3556	(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

230.2134	203.7200	216.9315	192.1455	187.1715	169.6650	168.2693	174.4460	175.7810	194.7818	205.5750	227.9044	(64)
Total per year (kWh/year) = Sum(64)m =											2346.6043	(64)
											2347	(64)

12Total per year (kWh/year)

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

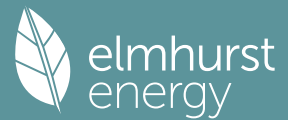
Heat gains from water heating, kWh/month

111.8210	99.4175	106.6949	96.0957	94.7687	87.1292	87.1250	89.5279	89.3662	97.5993	101.3122	110.8754	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	108.1168	119.7007	108.1168	111.7207	108.1168	111.7207	108.1168	108.1168	111.7207	108.1168	111.7207	108.1168	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	204.9862	207.1133	201.7530	190.3417	175.9369	162.3984	153.3539	151.2267	156.5870	167.9984	182.4032	195.9416	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	(69)

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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)	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853 (71)
Water heating gains (Table 5)	150.2971	147.9427	143.4071	133.4663	127.3773	121.0127	117.1035	120.3332	124.1198	131.1819	140.7114	149.0260 (72)
Total internal gains	524.2695	535.6262	514.1464	496.3981	472.3004	453.0013	436.4436	437.5462	450.2969	468.1665	495.7047	513.9539 (73)

6. Solar gains

[Jan]	Area m2		Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
East	3.7100		19.6403		0.6300		0.7000		0.7700		22.2686 (76)	
West	7.8900		19.6403		0.6300		0.7000		0.7700		47.3583 (80)	
Solar gains	69.6269	136.2050	224.3103	327.1431	400.9262	410.4193	390.7359	335.6364	260.8821	161.6187	86.8166	57.2578 (83)
Total gains	593.8964	671.8312	738.4567	823.5412	873.2266	863.4206	827.1795	773.1825	711.1790	629.7852	582.5213	571.2117 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6816	61.8883	62.0922	63.0682	63.2542	64.1349	64.1349	64.3006	63.7928	63.2542	62.8790	62.4915
alpha	5.1121	5.1259	5.1395	5.2045	5.2169	5.2757	5.2757	5.2867	5.2529	5.2169	5.1919	5.1661
util living area	0.9929	0.9857	0.9678	0.9068	0.7774	0.5826	0.4272	0.4746	0.7268	0.9365	0.9851	0.9941 (86)
MIT	19.8258	20.0090	20.2833	20.6405	20.8787	20.9789	20.9965	20.9942	20.9360	20.6191	20.1713	19.8054 (87)
Th 2	19.9632	19.9663	19.9694	19.9837	19.9864	19.9989	19.9989	20.0012	19.9941	19.9864	19.9809	19.9753 (88)
util rest of house	0.9906	0.9812	0.9573	0.8782	0.7190	0.4987	0.3316	0.3743	0.6436	0.9104	0.9796	0.9922 (89)
MIT 2	18.6152	18.8494	19.1949	19.6339	19.8905	19.9877	19.9979	19.9993	19.9541	19.6215	19.0676	18.5981 (90)
Living area fraction	18.9108	19.1325	19.4606	19.8797	20.1318	20.2297	20.2417	20.2422	20.1939	19.8651	19.3371	18.8929 (92)
MIT	18.9108	19.1325	19.4606	19.8797	20.1318	20.2297	20.2417	20.2422	20.1939	19.8651	19.3371	18.8929 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9108	19.1325	19.4606	19.8797	20.1318	20.2297	20.2417	20.2422	20.1939	19.8651	19.3371	18.8929 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9873	0.9762	0.9508	0.8748	0.7280	0.5186	0.3550	0.3989	0.6613	0.9066	0.9748	0.9893 (94)
Useful gains	586.3391	655.8752	702.1103	720.4189	635.7215	447.7407	293.6548	308.4010	470.2794	570.9521	567.8357	565.1152 (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	1228.4322	1192.6311	1082.4867	902.8450	691.2979	455.2250	294.4717	309.8831	495.3970	759.6138	1009.2627	1219.3241 (97)
Space heating kWh	477.7173	360.7000	283.0000	131.3468	41.3489	0.0000	0.0000	0.0000	0.0000	140.3643	317.8275	486.7314 (98a)
Space heating requirement - total per year (kWh/year)												2239.0362
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	477.7173	360.7000	283.0000	131.3468	41.3489	0.0000	0.0000	0.0000	0.0000	140.3643	317.8275	486.7314 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2239.0362
Space heating per m2										(98c) / (4) =		30.5254 (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	477.7173	360.7000	283.0000	131.3468	41.3489	0.0000	0.0000	0.0000	0.0000	140.3643	317.8275	486.7314 (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)	517.5702	390.7909	306.6089	142.3042	44.7983	0.0000	0.0000	0.0000	0.0000	152.0740	344.3418	527.3363 (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	230.2134	203.7200	216.9315	192.1455	187.1715	169.6650	168.2693	174.4460	175.7810	194.7818	205.5750	227.9044 (64)	
Efficiency of water heater (217)m	85.6584	85.3266	84.6570	83.2248	81.2908	79.8000	79.8000	79.8000	79.8000	83.3375	85.0333	79.8000 (216)	
Fuel for water heating, kWh/month	268.7575	238.7532	256.2476	230.8752	230.2493	212.6128	210.8638	218.6040	220.2769	233.7266	241.7583	265.8801 (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	22.4645	18.0219	16.2267	11.8884	9.1829	7.5025	8.3770	10.8887	14.1434	18.5568	20.9599	23.0889 (232)	
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-34.3770	-48.4932	-69.7482	-78.4803	-84.6846	-79.0748	-78.1074	-73.7155	-65.9620	-55.4878	-37.8075	-29.7185 (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)													

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(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	-19.3297	-40.6776	-80.8742	-121.5002	-160.6806	-161.4482	-159.5382	-135.0590	-98.9727	-58.1716	-25.8087	-15.2835	(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												2425.8247	(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												2828.6052	(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)												181.3016	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1813.0009	(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												3708.7306	(238)

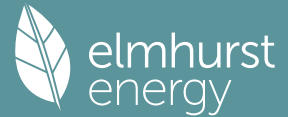
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2425.8247	0.2100	509.4232 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2828.6052	0.2100	594.0071 (264)
Space and water heating			1103.4303 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	181.3016	0.1443	26.1674 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-735.6567	0.1346	-98.9967
PV Unit electricity exported	-1077.3442	0.1259	-135.6264
Total			-234.6230 (269)
Total CO2, kg/year			906.9039 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2425.8247	1.1300	2741.1819 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2828.6052	1.1300	3196.3239 (278)
Space and water heating			5937.5058 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	181.3016	1.5338	278.0865 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-735.6567	1.4973	-1101.5309
PV Unit electricity exported	-1077.3442	0.4621	-497.8419
Total			-1599.3729 (283)
Total Primary energy kWh/year			4746.3202 (286)
Target Primary Energy Rate (TPER)			64.7100 (287)

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Property Reference	Mid Floor Flat (2)_Copy				Issued on Date	24/06/2024	
Assessment Reference	00001_Copy_Copy			Prop Type Ref	Mid Floor Flat		
Property	Block C						
SAP Rating	84 B		DER	4.23		TER	10.90
Environmental	97 A		% DER < TER				61.19
CO ₂ Emissions (t/year)	0.27		DFEE	25.17		TFEE	25.72
Compliance Check	See BREL		% DFEE < TFEE				2.15
% DPER < TPER	22.45		DPER	44.51		TPER	57.39
Assessor Details	Miss Eleanor Ballinger					Assessor ID	M976-0001
Client							

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)
Ground floor	70.9700 (1b)	x 2.6500 (2b)	= 188.0705 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 188.0705 (5)

2. Ventilation rate

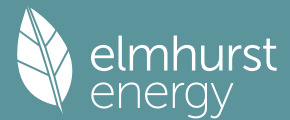
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.1750 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1487 (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	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.20)			6.3400	1.1450	7.2595		(27)
Door			2.0300	1.0000	2.0300		(26)
External Wall 1	46.2200	6.3400	39.8800	0.2000	7.9760	60.0000	2392.8000 (29a)
Stair Wall	17.3300		17.3300	0.2200	3.8126	60.0000	1039.8000 (29a)
Corridor Wall	11.4200	2.0300	9.3900	0.1800	1.6902	60.0000	563.4000 (29a)
Total net area of external elements Aum(A, m ²)			74.9700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7683		(33)
Party Wall 1			17.4600	0.0000	0.0000	180.0000	3142.8000 (32)
Party Floor 1			70.9700			40.0000	2838.8000 (32d)
Party Ceiling 1			70.9700			30.0000	2129.1000 (32b)
Internal Wall 1			105.0000			9.0000	945.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13051.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							183.9045 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E7 Party floor between dwellings (in blocks of flats)	8.6200	0.0430	0.3707
E16 Corner (normal)	5.3000	0.0390	0.2067
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0860	-0.2279
E16 Corner (normal)	7.9500	0.0390	0.3100
E7 Party floor between dwellings (in blocks of flats)	31.6100	0.0430	1.3592
E7 Party floor between dwellings (in blocks of flats)	13.0800	0.0430	0.5624
E17 Corner (inverted - internal area greater than external area)	2.6500	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9700	0.0660	0.3940
E3 Sill	4.9900	0.0210	0.1048
E4 Jamb	14.3200	0.1000	1.4320
E25 Staggered party wall between dwellings	2.6500	0.0180	0.0477
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.0430	0.1406
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.7003 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	27.4686 (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	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316 (38)
Average = Sum(39)m / 12 =	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003 (39)
HLP	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243 (40)
HLP (average)												0.8243
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2694 (42)
Hot water usage for mixer showers	62.2707	61.3349	59.9713	57.3622	55.4367	53.2895	52.0690	53.4223	54.9058	57.2113	59.8764	62.0321 (42a)
Hot water usage for baths	26.9017	26.5022	25.9395	24.9022	24.1254	23.2641	22.7988	23.3575	23.9658	24.8875	25.9462	26.8107 (42b)
Hot water usage for other uses	37.8714	36.4942	35.1171	33.7399	32.3628	30.9857	30.9857	32.3628	33.7399	35.1171	36.4942	37.8714 (42c)
Average daily hot water use (litres/day)												116.7821 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	127.0438	124.3313	121.0279	116.0043	111.9249	107.5392	105.8535	109.1426	112.6116	117.2158	122.3169	126.7142 (44)
Energy content (annual)	201.2063	177.0461	186.0153	158.8040	150.6724	132.2320	128.0206	135.1413	138.8613	159.0608	174.2628	198.4039 (45)
Distribution loss (46)m = 0.15 x (45)m	30.1809	26.5569	27.9023	23.8206	22.6009	19.8348	19.2031	20.2712	20.8292	23.8591	26.1394	29.7606 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0640 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1146 (55)
Total storage loss	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (56)
If cylinder contains dedicated solar storage	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	235.7576	208.2538	220.5667	192.2408	185.2238	165.6688	162.5719	169.6927	172.2981	193.6121	207.6996	232.9552 (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	235.7576	208.2538	220.5667	192.2408	185.2238	165.6688	162.5719	169.6927	172.2981	193.6121	207.6996	232.9552 (64)
12Total per year (kWh/year)												2346.5412 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	66.9011	58.8678	61.8501	52.8023	50.0986	43.9671	42.5668	44.9345	46.1714	52.8877	57.9424	65.9693 (65)

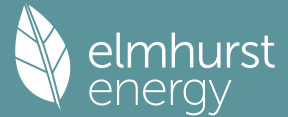
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.7153	128.1134	115.7153	119.5725	115.7153	119.5725	115.7153	115.7153	119.5725	115.7153	119.5725	115.7153 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5503	201.6210	196.4029	185.2941	171.2713	158.0919	149.2872	147.2165	152.4346	163.5434	177.5662	190.7456 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777 (71)
Water heating gains (Table 5)	89.9208	87.6009	83.1319	73.3366	67.3368	61.0655	57.2135	60.3958	64.1269	71.0856	80.4755	88.6684 (72)
Total internal gains	462.2281	474.3770	452.2917	435.2449	411.3651	395.7715	379.2576	380.3693	393.1757	407.3859	434.6558	452.1710 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	0.8700	19.6403	0.4500	0.8000	0.7700	4.2629 (76)
South	5.4700	46.7521	0.4500	0.8000	0.7700	63.8005 (78)

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Solar gains	68.0633	112.8278	146.8334	170.4612	181.3060	175.9874	171.3217	163.6941	155.0111	122.5959	80.9406	58.6351 (83)
Total gains	530.2914	587.2048	599.1251	605.7060	592.6711	571.7588	550.5793	544.0633	548.1868	529.9819	515.5964	510.8060 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	
alpha	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	
util living area	0.9796	0.9647	0.9440	0.8946	0.7991	0.6270	0.4624	0.4878	0.6887	0.8888	0.9624	0.9830 (86)	
Living	20.0556	20.2251	20.4165	20.6573	20.8546	20.9672	20.9942	20.9923	20.9461	20.7164	20.3457	20.0077	
Non living	19.3760	19.5415	19.7271	19.9544	20.1289	20.2147	20.2303	20.2294	20.2009	20.0116	19.6612	19.3289	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5169	20.2251	20.4165	20.6573	20.8546	20.9672	20.9942	20.9923	20.9461	20.7164	20.3457	20.1465 (87)	
Th 2	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323 (88)	
util rest of house	0.9754	0.9576	0.9324	0.8722	0.7576	0.5613	0.3841	0.4095	0.6267	0.8614	0.9535	0.9794 (89)	
MIT 2	19.7943	19.5415	19.7271	19.9544	20.1289	20.2147	20.2303	20.2294	20.2009	20.0116	19.6612	19.4553 (90)	
Living area fraction									FLA = Living area / (4) =				0.4037 (91)
MIT	20.0860	19.8174	20.0054	20.2382	20.4218	20.5185	20.5387	20.5374	20.5017	20.2961	19.9375	19.7343 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0860	19.8174	20.0054	20.2382	20.4218	20.5185	20.5387	20.5374	20.5017	20.2961	19.9375	19.7343 (93)	

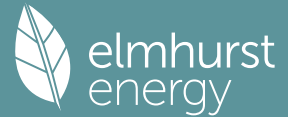
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9744	0.9530	0.9284	0.8724	0.7685	0.5865	0.4157	0.4410	0.6493	0.8639	0.9495	0.9765 (94)
Useful gains	516.7352	559.6245	556.2524	528.4289	455.4596	335.3175	228.8730	239.9200	355.9121	457.8773	489.5386	498.8209 (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	923.4840	872.6742	790.0697	663.2862	510.2298	346.2315	230.4140	242.0394	374.5036	567.2251	750.9998	908.7604 (97)
Space heating kWh	302.6211	210.3694	173.9601	97.0972	40.7491	0.0000	0.0000	0.0000	0.0000	81.3548	188.2520	304.9950 (98a)
Space heating requirement - total per year (kWh/year)												1399.3988
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	302.6211	210.3694	173.9601	97.0972	40.7491	0.0000	0.0000	0.0000	0.0000	81.3548	188.2520	304.9950 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1399.3988
Space heating per m2										(98c) / (4) =		19.7182 (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 %)												191.5487 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	302.6211	210.3694	173.9601	97.0972	40.7491	0.0000	0.0000	0.0000	0.0000	81.3548	188.2520	304.9950 (98)
Space heating efficiency (main heating system 1)	191.5487	191.5487	191.5487	191.5487	191.5487	0.0000	0.0000	0.0000	0.0000	191.5487	191.5487	191.5487 (210)
Space heating fuel (main heating system)	157.9865	109.8256	90.8177	50.6906	21.2735	0.0000	0.0000	0.0000	0.0000	42.4721	98.2790	159.2258 (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	235.7576	208.2538	220.5667	192.2408	185.2238	165.6688	162.5719	169.6927	172.2981	193.6121	207.6996	232.9552 (64)
Efficiency of water heater												244.3139 (216)
(217)m	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139 (217)
Fuel for water heating, kWh/month	96.4978	85.2402	90.2800	78.6860	75.8138	67.8098	66.5422	69.4568	70.5232	79.2473	85.0134	95.3508 (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	13.2273	11.9473	13.2273	12.8006	13.2273	12.8006	13.2273	13.2273	12.8006	13.2273	12.8006	13.2273 (231)
Lighting	25.0112	20.0649	18.0663	13.2361	10.2240	8.3531	9.3266	12.1231	15.7467	20.6605	23.3360	25.7064 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												730.5708 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	244.3139	
Water heating fuel used	960.4615 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.8450)		
mechanical ventilation fans (SFP = 0.8450)	155.7412 (230a)	
Total electricity for the above, kWh/year	155.7412 (231)	
Electricity for lighting (calculated in Appendix L)	201.8550 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	2048.6284 (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	730.5708	0.1558	113.8460 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	960.4615	0.1411	135.5031 (264)	
Space and water heating			249.3491 (265)	
Pumps, fans and electric keep-hot	155.7412	0.1387	21.6032 (267)	
Energy for lighting	201.8550	0.1443	29.1339 (268)	
Total CO2, kg/year			300.0863 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2300 (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	730.5708	1.5769	1152.0338 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	960.4615	1.5217	1461.5116 (278)	
Space and water heating			2613.5455 (279)	
Pumps, fans and electric keep-hot	155.7412	1.5128	235.6053 (281)	
Energy for lighting	201.8550	1.5338	309.6119 (282)	
Total Primary energy kWh/year			3158.7626 (286)	
Dwelling Primary energy Rate (DPER)			44.5100 (287)	

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

1. Overall dwelling characteristics

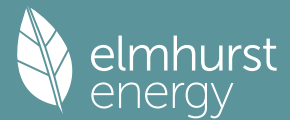
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	70.9700 (1b)	x 2.6500 (2b)	= 188.0705 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 188.0705 (5)	

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) = 0.1595 (8)	
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.4095 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)	
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3481 (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	0.4438	0.4351	0.4264	0.3829	0.3742	0.3307	0.3307	0.3220	0.3481	0.3742	0.3916	0.4090 (22b)
Effective ac	0.5985	0.5947	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0300	1.0000	2.0300			(26)
TER Opening Type (Uw = 1.20)			6.3400	1.1450	7.2595			(27)
External Wall 1	46.2200	6.3400	39.8800	0.1800	7.1784			(29a)
Stair Wall	17.3300		17.3300	0.1800	3.1194			(29a)
Corridor Wall	11.4200	2.0300	9.3900	0.1800	1.6902			(29a)
Total net area of external elements Aum(A, m2)			74.9700					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	21.2775			(33)
Party Wall 1			17.4600	0.0000	0.0000			(32)

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

193.9045 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	8.6200	0.0700	0.6034	
E16 Corner (normal)	5.3000	0.0900	0.4770	
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385	
E16 Corner (normal)	7.9500	0.0900	0.7155	
E7 Party floor between dwellings (in blocks of flats)	31.6100	0.0700	2.2127	
E7 Party floor between dwellings (in blocks of flats)	13.0800	0.0700	0.9156	
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385	
E2 Other lintels (including other steel lintels)	5.9700	0.0500	0.2985	
E3 Sill	4.9900	0.0500	0.2495	
E4 Jamb	14.3200	0.0500	0.7160	
E25 Staggered party wall between dwellings	2.6500	0.0600	0.1590	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1800	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.2400	0.7848	

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

6.6550 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 27.9325 (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	37.1439	36.9065	36.6739	35.5812	35.3767	34.4250	34.4250	34.2487	34.7916	35.3767	35.7903	36.2227	(38)
Heat transfer coeff	65.0764	64.8391	64.6064	63.5137	63.3093	62.3575	62.3575	62.1813	62.7241	63.3093	63.7229	64.1552	(39)
Average = Sum(39)m / 12 =												63.5127	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9170	0.9136	0.9103	0.8949	0.8921	0.8786	0.8786	0.8762	0.8838	0.8921	0.8979	0.9040	(40)
HLP (average)												0.8949	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2694 (42)
Hot water usage for mixer showers	62.2707	61.3349	59.9713	57.3622	55.4367	53.2895	52.0690	53.4223	54.9058	57.2113	59.8764	62.0321	(42a)
Hot water usage for baths	26.9017	26.5022	25.9395	24.9022	24.1254	23.2641	22.7988	23.3575	23.9658	24.8875	25.9462	26.8107	(42b)
Hot water usage for other uses	37.8714	36.4942	35.1171	33.7399	32.3628	30.9857	30.9857	32.3628	33.7399	35.1171	36.4942	37.8714	(42c)
Average daily hot water use (litres/day)												116.7821	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.0438	124.3313	121.0279	116.0043	111.9249	107.5392	105.8535	109.1426	112.6116	117.2158	122.3169	126.7142	(44)
Energy conte	201.2063	177.0461	186.0153	158.8040	150.6724	132.2320	128.0206	135.1413	138.8613	159.0608	174.2628	198.4039	(45)
Energy content (annual)										Total = Sum(45)m =		1939.7268	
Distribution loss (46)m = 0.15 x (45)m	30.1809	26.5569	27.9023	23.8206	22.6009	19.8348	19.2031	20.2712	20.8292	23.8591	26.1394	29.7606	(46)

Water storage 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	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	247.8012	219.1318	232.6102	203.8959	197.2673	177.3238	174.6155	181.7363	183.9532	205.6557	219.3546	244.9988	(62)
WWHRS	-28.4676	-25.1770	-26.3639	-21.8303	-20.3451	-17.4094	-16.3186	-17.3532	-18.0125	-21.2347	-24.0563	-27.9404	(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	219.3336	193.9549	206.2464	182.0656	176.9222	159.9144	158.2969	164.3831	165.9407	184.4210	195.2983	217.0584	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2223.8354	(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)

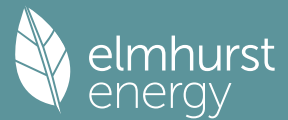
Heat gains from water heating, kWh/month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	104.1770	92.5364	99.1260	88.8758	87.3745	80.0406	79.8428	82.2104	82.2449	90.1636	94.0158	103.2452	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.9392	131.6827	118.9392	122.9039	118.9392	122.9039	118.9392	118.9392	122.9039	118.9392	122.9039	118.9392	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5503	201.6210	196.4029	185.2941	171.2713	158.0919	149.2872	147.2165	152.4346	163.5434	177.5662	190.7456	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	(69)

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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)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values)	(negative values) (71)
Water heating gains	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5)	(Table 5) (72)
Total internal gains	518.5540	531.0483	508.6177	491.6783	467.6911	449.2049	432.5836	433.6952	446.6091	463.7119	491.0892	508.4969 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				0.8700	19.6403	0.6300	0.7000	0.7700	5.2220 (76)			
South				5.4700	46.7521	0.6300	0.7000	0.7700	78.1556 (78)			
Solar gains	83.3776	138.2141	179.8709	208.8149	222.0998	215.5845	209.8690	200.5252	189.8887	150.1800	99.1522	71.8279 (83)
Total gains	601.9316	669.2624	688.4886	700.4932	689.7909	664.7894	642.4526	634.2205	636.4977	613.8919	590.2415	580.3249 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	58.7403	58.9554	59.1676	60.1856	60.3800	61.3015	61.3015	61.4753	60.9432	60.3800	59.9881	59.5838
alpha	4.9160	4.9304	4.9445	5.0124	5.0253	5.0868	5.0868	5.0984	5.0629	5.0253	4.9992	4.9723
util living area	0.9748	0.9568	0.9311	0.8698	0.7618	0.5816	0.4238	0.4467	0.6458	0.8618	0.9519	0.9782 (86)
MIT	20.0319	20.2181	20.4266	20.6901	20.8768	20.9757	20.9959	20.9947	20.9576	20.7481	20.3702	20.0094 (87)
Th 2	20.1531	20.1559	20.1587	20.1718	20.1743	20.1857	20.1857	20.1878	20.1813	20.1743	20.1693	20.1641 (88)
util rest of house	0.9693	0.9477	0.9165	0.8426	0.7151	0.5144	0.3470	0.3699	0.5805	0.8287	0.9403	0.9734 (89)
MIT 2	19.0396	19.2736	19.5331	19.8580	20.0662	20.1699	20.1840	20.1854	20.1513	19.9308	19.4761	19.0196 (90)
Living area fraction	19.4402	19.6549	19.8938	20.1939	20.3934	20.4952	20.5118	20.5121	20.4768	20.2608	19.8370	19.4192 (92)
MIT	19.4402	19.6549	19.8938	20.1939	20.3934	20.4952	20.5118	20.5121	20.4768	20.2608	19.8370	19.4192 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4402	19.6549	19.8938	20.1939	20.3934	20.4952	20.5118	20.5121	20.4768	20.2608	19.8370	19.4192 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	579.9680	630.0088	627.3441	590.8037	502.2668	359.3118	242.8268	254.2036	384.9326	511.0531	551.7985	561.7811 (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	985.2684	956.6919	865.3240	717.3188	550.3754	367.6075	243.9275	255.6960	399.9778	611.6151	811.6395	976.3890 (97)
Space heating kWh	301.5435	219.5310	177.0571	91.0909	35.7928	0.0000	0.0000	0.0000	0.0000	74.8181	187.0855	308.4683 (98a)
Space heating requirement - total per year (kWh/year)												1395.3872
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	301.5435	219.5310	177.0571	91.0909	35.7928	0.0000	0.0000	0.0000	0.0000	74.8181	187.0855	308.4683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1395.3872
Space heating per m2										(98c) / (4) =		19.6616 (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	301.5435	219.5310	177.0571	91.0909	35.7928	0.0000	0.0000	0.0000	0.0000	74.8181	187.0855	308.4683 (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)	326.6994	237.8451	191.8278	98.6900	38.7788	0.0000	0.0000	0.0000	0.0000	81.0597	202.6929	334.2018 (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	219.3336	193.9549	206.2464	182.0656	176.9222	159.9144	158.2969	164.3831	165.9407	184.4210	195.2983	217.0584 (64)
Efficiency of water heater (217)m	84.7740	84.3383	83.7195	82.5914	81.1845	79.8000	79.8000	79.8000	79.8000	82.2045	83.9635	79.8000 (216)
Fuel for water heating, kWh/month	258.7274	229.9726	246.3542	220.4412	217.9261	200.3940	198.3671	205.9939	207.9457	224.3440	232.5990	255.8215 (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	24.7132	19.8259	17.8510	13.0784	10.1021	8.2535	9.2155	11.9787	15.5591	20.4144	23.0580	25.4001 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.1854	-35.2074	-52.2235	-60.6446	-67.0531	-63.1926	-62.4437	-58.1627	-50.8394	-41.1570	-26.9915	-20.7838 (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)												

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(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	-10.4526	-22.3030	-44.9200	-68.3322	-91.1945	-91.9321	-90.8252	-76.4859	-55.5348	-32.1474	-14.0376	-8.2401	(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												1511.7955	(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												2698.8865	(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)												199.4499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1169.2900	(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												3326.8419	(238)

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

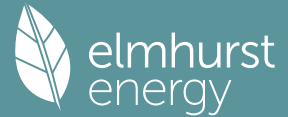
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1511.7955	0.2100	317.4771	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2698.8865	0.2100	566.7662	(264)
Space and water heating			884.2432	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.4499	0.1443	28.7868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-562.8847	0.1339	-75.3806	
PV Unit electricity exported	-606.4054	0.1255	-76.1209	
Total			-151.5015	(269)
Total CO2, kg/year			773.4577	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9000	(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	1511.7955	1.1300	1708.3289	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2698.8865	1.1300	3049.7418	(278)
Space and water heating			4758.0707	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.4499	1.5338	305.9229	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-562.8847	1.4949	-841.4574	
PV Unit electricity exported	-606.4054	0.4608	-279.4057	
Total			-1120.8631	(283)
Total Primary energy kWh/year			4073.2312	(286)
Target Primary Energy Rate (TPER)			57.3900	(287)

APPENDIX B – SAP TER & DER WORKSHEETS (PROPSOED STRATEGY INC. PV UPLIFT)

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Property Reference	5.11 (2)_Copy_Copy				Issued on Date	28/06/2024
Assessment Reference	00001_Copy_Copy_Copy		Prop Type Ref	5.11		
Property	143					
SAP Rating	84 B	DER	3.01	TER	9.23	
Environmental	97 A	% DER < TER				67.39
CO ₂ Emissions (t/year)	0.64	DFEE	44.32	TFEE	44.54	
Compliance Check	See BREL	% DFEE < TFEE				0.48
% DPER < TPER	35.94	DPER	31.21	TPER	48.72	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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)
Ground floor	106.3800 (1b)	x 2.4000 (2b)	= 255.3120 (1b) - (3b)
First floor	135.4500 (1c)	x 2.6200 (2c)	= 354.8790 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	241.8300		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 610.1910 (5)

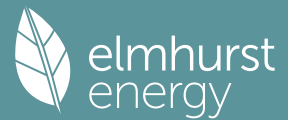
2. Ventilation rate

	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)
Wind speed	Jan 5.1000 Feb 5.0000 Mar 4.9000 Apr 4.4000 May 4.3000 Jun 3.8000 Jul 3.8000 Aug 3.7000 Sep 4.0000 Oct 4.3000 Nov 4.5000 Dec 4.7000 (22)
Wind factor	1.2750 1.2500 1.2250 1.1000 1.0750 0.9500 0.9500 0.9250 1.0000 1.0750 1.1250 1.1750 (22a)
Adj infilt rate	0.2359 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 - centralised	
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
Window (Uw = 1.20)			38.2500	1.1450	43.7977		(27)
Door			4.1200	1.0000	4.1200		(26)
N W Roof			0.9600	1.3258	1.2727		(27a)
Ground Floor			106.3800	0.1200	12.7656	110.0000	(28a)
Exposed Floor			40.4000	0.1400	5.6560		(28b)
External Wall 1	192.1100	40.0700	152.0400	0.2000	30.4080	60.0000	(29a)
Stud Wall	26.8600		26.8600	0.2100	5.6406	18.0000	(29a)
Gable Wall	17.8000		17.8000	0.2000	3.5600	60.0000	(29a)
Dormer Wall	4.8400	2.3000	2.5400	0.2400	0.6096	18.0000	(29a)
Garage Wall	30.5000		30.5000	0.1800	5.4900	60.0000	(29a)
Main Roof	93.2700		93.2700	0.1500	13.9905	9.0000	(30)
RIR Flat Roof	27.4200		27.4200	0.1500	4.1130	9.0000	(30)
Ground Floor Roof	13.0400		13.0400	0.1500	1.9560	9.0000	(30)
RIR Pitched Roof	26.7100	0.9600	25.7500	0.0800	2.0600	9.0000	(30)
Total net area of external elements Aum(A, m ²)			579.3300				(31)

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Fabric heat loss, W/K = Sum (A x U)	(26)...(30) + (32) =	135.4397			(33)
Internal Wall 1	300.0000		9.0000	2700.0000	(32c)
Internal Floor 1	93.2700		18.0000	1678.8600	(32d)
Internal Ceiling 1	93.2700		9.0000	839.4300	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	30905.0100	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		127.7964	(35)

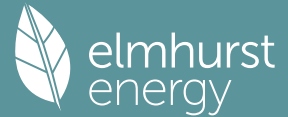
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	29.1100	0.0660	1.9213	
E2 Other lintels (including other steel lintels)	27.1500	0.0210	0.5702	
E3 Sill	65.8000	0.1000	6.5800	
E4 Jamb	1.6000	0.1120	0.1792	
R1 Head of roof window	1.6000	0.1120	0.1792	
R2 Sill of roof window	2.4000	0.0710	0.1704	
R3 Jamb of roof window	41.2100	0.0620	2.5550	
E5 Ground floor (normal)	12.7100	0.0620	0.7880	
E5 Ground floor (normal)	32.7600	0.0020	0.0655	
E6 Intermediate floor within a dwelling	23.6900	0.0430	1.0187	
E10 Eaves (insulation at ceiling level)	23.3200	0.0450	1.0494	
E12 Gable (insulation at ceiling level)	4.8700	0.0230	0.1120	
E13 Gable (insulation at rafter level)	5.2700	0.1600	0.8432	
E14 Flat roof	43.5000	0.0390	1.6965	
E16 Corner (normal)	23.1000	-0.0860	-1.9866	
E17 Corner (inverted - internal area greater than external area)	2.6000	0.0390	0.1014	
E16 Corner (normal)	12.7100	0.0330	0.4194	
E20 Exposed floor (normal)	12.7100	0.0330	0.4194	
E21 Exposed floor (inverted)	11.0500	0.1200	1.3260	
R6 Flat ceiling	11.0500	0.1200	1.3260	
R8 Roof to wall (rafter)	6.2100	0.1200	0.7452	
R8 Roof to wall (rafter)	6.4400	0.0430	0.2769	
E24 Eaves (insulation at ceiling level - inverted)	4.8700	0.0430	0.2094	
E24 Eaves (insulation at ceiling level - inverted)				
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			20.5657	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss			156.0055	(33) + (36) + (36a) = (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	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	100.6815	(38)
Heat transfer coeff	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	256.6870	(39)
Average = Sum(39)m / 12 =												256.6870	(39)
HLP	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	1.0614	(40)
HLP (average)												1.0614	(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													3.0563 (42)
Hot water usage for mixer showers	75.4641	74.3301	72.6775	69.5156	67.1822	64.5800	63.1009	64.7410	66.5388	69.3327	72.5626	75.1750	(42a)
Hot water usage for baths	32.5753	32.0915	31.4102	30.1541	29.2135	28.1705	27.6071	28.2837	29.0202	30.1363	31.4183	32.4651	(42b)
Hot water usage for other uses	45.9297	44.2595	42.5893	40.9192	39.2490	37.5788	37.5788	39.2490	40.9192	42.5893	44.2595	45.9297	(42c)
Average daily hot water use (litres/day)													141.5320 (43)
Daily hot water use	153.9691	150.6810	146.6770	140.5888	135.6446	130.3293	128.2868	132.2736	136.4782	142.0583	148.2403	153.5698	(44)
Energy conte	243.8494	214.5678	225.4371	192.4590	182.6037	160.2551	155.1518	163.7823	168.2912	192.7718	211.1955	240.4532	(45)
Energy content (annual)										Total = Sum(45)m =		2350.8179	
Distribution loss (46)m = 0.15 x (45)m	36.5774	32.1852	33.8156	28.8689	27.3906	24.0383	23.2728	24.5673	25.2437	28.9158	31.6793	36.0680	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.7800 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													0.9612 (55)
Total storage loss	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(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	296.9090	262.4926	278.4967	243.8070	235.6633	211.6031	208.2114	216.8419	219.6392	245.8314	262.5435	293.5128	(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	-7.8028	-19.1888	-45.8698	-81.1583	-117.8897	-122.7300	-119.8493	-94.4309	-60.7758	-29.6636	-10.9440	-5.8924	(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	289.1062	243.3038	232.6269	162.6487	117.7737	88.8731	88.3621	122.4110	158.8635	216.1678	251.5995	287.6204	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2259.3566	(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	123.5276	109.6836	117.4055	105.0710	103.1634	94.3632	94.0357	96.9053	97.0352	106.5443	111.3009	122.3984	(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	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	209.7369	232.2087	209.7369	216.7281	209.7369	216.7281	209.7369	209.7369	216.7281	209.7369	216.7281	209.7369	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.2457	413.4924	402.7909	380.0086	351.2501	324.2211	306.1641	301.9174	312.6190	335.4012	364.1598	391.1887	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)

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Losses e.g. evaporation (negative values) (Table 5)	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524 (71)
Water heating gains (Table 5)	166.0317	163.2197	157.8031	145.9320	138.6605	131.0600	126.3920	130.2491	134.7712	143.2047	154.5846	164.5139 (72)
Total internal gains	853.8590	877.7654	839.1755	811.5133	768.4921	740.8539	711.1377	710.7480	732.9629	757.1875	804.3171	834.2842 (73)

6. Solar gains

[Jan]					Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c			Access factor Table 6d	Gains W	
North					16.7600	10.6334	0.4500	0.8000			0.7700	44.4612 (74)	
East					1.5700	19.6403	0.4500	0.8000			0.7700	7.6928 (76)	
South					14.8600	46.7521	0.4500	0.8000			0.7700	173.3227 (78)	
West					5.0600	19.6403	0.4500	0.8000			0.7700	24.7933 (80)	
North					0.9600	26.0000	0.5300	0.8000			1.0000	9.5247 (82)	
Solar gains	259.7947	452.1573	645.7908	848.1683	995.6639	1009.0302	964.2180	850.7120	715.1595	506.8954	312.8905	221.2398 (83)	
Total gains	1113.6536	1329.9227	1484.9663	1659.6816	1764.1560	1749.8841	1675.3556	1561.4600	1448.1224	1264.0828	1117.2076	1055.5240 (84)	

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
tau	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443	33.4443
alpha	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296	3.2296
util living area	0.9904	0.9824	0.9684	0.9338	0.8638	0.7389	0.5984	0.6484	0.8340	0.9508	0.9837	0.9920 (86)
Living	18.6379	18.9032	19.3055	19.8454	20.3595	20.7405	20.9058	20.8751	20.5820	19.9111	19.1682	18.5773
Non living	17.8531	18.1166	18.5153	19.0444	19.5335	19.8689	19.9908	19.9730	19.7433	19.1152	18.3819	17.7928
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0
24 / 9	31	28	31	30	31	30	31	31	30	31	30	31
16 / 9	0	0	0	0	0	0	0	0	0	0	0	0
MIT	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000	21.0000 (87)
Th 2	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325 (88)
util rest of house	0.9887	0.9791	0.9622	0.9194	0.8312	0.6709	0.4924	0.5458	0.7824	0.9374	0.9801	0.9905 (89)
MIT 2	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325	20.0325 (90)
Living area fraction									fLA = Living area / (4) =			0.1664 (91)
MIT	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934 (92)
Temperature adjustment												0.0000
adjusted MIT	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934	20.1934 (93)

8. Space heating requirement

Utilisation	0.9890	0.9797	0.9633	0.9221	0.8372	0.6834	0.5114	0.5645	0.7921	0.9399	0.9808	0.9907 (94)
Useful gains	1101.3792	1302.9782	1430.4823	1530.3122	1476.9783	1195.8013	856.8059	881.4559	1147.0566	1188.1581	1095.7304	1045.7358 (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	4079.6315	3925.6193	3514.9201	2898.8713	2180.1477	1435.7555	922.3815	973.7189	1564.0990	2462.5034	3360.9079	4105.3002 (97)
Space heating kWh	2215.8197	1762.4148	1550.8217	985.3625	523.1581	0.0000	0.0000	0.0000	0.0000	948.1129	1630.9278	2276.3159 (98a)
Space heating requirement - total per year (kWh/year)												11892.9335
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	2215.8197	1762.4148	1550.8217	985.3625	523.1581	0.0000	0.0000	0.0000	0.0000	948.1129	1630.9278	2276.3159 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												11892.9335
Space heating per m ²										(98c) / (4) =		49.1789 (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 %)												342.3613 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	2215.8197	1762.4148	1550.8217	985.3625	523.1581	0.0000	0.0000	0.0000	0.0000	948.1129	1630.9278	2276.3159 (98)
Space heating efficiency (main heating system 1)	342.3613	342.3613	342.3613	342.3613	342.3613	0.0000	0.0000	0.0000	0.0000	342.3613	342.3613	342.3613 (210)
Space heating fuel (main heating system)	647.2167	514.7821	452.9781	287.8136	152.8087	0.0000	0.0000	0.0000	0.0000	276.9334	476.3762	664.8870 (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	289.1062	243.3038	232.6269	162.6487	117.7737	88.8731	88.3621	122.4110	158.8635	216.1678	251.5995	287.6204 (64)
Efficiency of water heater (217)m	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400	119.3400 (216)
Fuel for water heating, kWh/month	242.2542	203.8745	194.9278	136.2902	98.6875	74.4705	74.0423	102.5733	133.1184	181.1361	210.8258	241.0092 (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)

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Pumps and Fa	18.0826	16.3327	18.0826	17.4993	18.0826	17.4993	18.0826	18.0826	17.4993	18.0826	17.4993	18.0826	(231)
Lighting	58.2015	46.6914	42.0404	30.8006	23.7913	19.4377	21.7032	36.6428	28.2106	36.6428	48.0774	54.3033	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-41.1119	-68.0813	-115.0390	-144.9926	-160.9855	-138.8020	-136.4659	-126.1713	-104.9931	-82.6830	-47.8767	-34.2069	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.3967	0.1583	-2.3298	-11.1776	-28.1925	-45.5546	-44.3789	-33.1195	-19.7730	-3.0616	0.0676	0.3901	(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													3473.7958 (211)
Space heating fuel - main system 2													0.0000 (213)
Space heating fuel - secondary													0.0000 (215)
Efficiency of water heater													119.3400
Water heating fuel used													1893.2098 (219)
Space cooling fuel													0.0000 (221)
Electricity for pumps and fans:													
(MEV)Centralised, Database: in-use factor = 1.3000, SFP = 0.2860)													
mechanical ventilation fans (SFP = 0.2860)													212.9078 (230a)
Total electricity for the above, kWh/year													212.9078 (231)
Electricity for lighting (calculated in Appendix L)													469.7193 (232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation													-1387.9841 (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													4661.6486 (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	3473.7958	0.1544	536.4675	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1893.2098	0.1453	275.0851	(264)
Space and water heating			811.5526	(265)
Pumps, fans and electric keep-hot	212.9078	0.1387	29.5329	(267)
Energy for lighting	469.7193	0.1443	67.7950	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.4092	0.1332	-159.9735	
PV Unit electricity exported	-186.5749	0.1080	-20.1479	
Total			-180.1215	(269)
Total CO2, kg/year			728.7591	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.0100	(273)

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

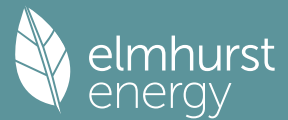
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	3473.7958	1.5717	5459.9207	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1893.2098	1.5375	2910.7927	(278)
Space and water heating			8370.7134	(279)
Pumps, fans and electric keep-hot	212.9078	1.5128	322.0870	(281)
Energy for lighting	469.7193	1.5338	720.4711	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1201.4092	1.4921	-1792.5806	
PV Unit electricity exported	-186.5749	0.3949	-73.6729	
Total			-1866.2535	(283)
Total Primary energy kWh/year			7547.0180	(286)
Dwelling Primary energy Rate (DPER)			31.2100	(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)	
Ground floor	106.3800 (1b)	x	2.4000 (2b)	= 255.3120 (1b) - (3b)
First floor	135.4500 (1c)	x	2.6200 (2c)	= 354.8790 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	241.8300			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	610.1910 (5)

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2. Ventilation rate

												m3 per hour
Number of open chimneys												0 * 80 = 0.0000 (6a)
Number of open flues												0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire												0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler												0 * 20 = 0.0000 (6d)
Number of flues attached to other heater												0 * 35 = 0.0000 (6e)
Number of blocked chimneys												0 * 20 = 0.0000 (6f)
Number of intermittent extract fans												4 * 10 = 40.0000 (7a)
Number of passive vents												0 * 10 = 0.0000 (7b)
Number of flueless gas fires												0 * 40 = 0.0000 (7c)
												Air changes per hour
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =										40.0000 / (5) =	0.0656 (8)
Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.3156 (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) = 0.2919 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
Effective ac	0.3722	0.3649	0.3576	0.3211	0.3138	0.2773	0.2773	0.2700	0.2919	0.3138	0.3284	0.3430	(22b)
	0.5692	0.5666	0.5639	0.5515	0.5492	0.5384	0.5384	0.5364	0.5426	0.5492	0.5539	0.5588	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			4.1200	1.0000	4.1200			(26)
TER Opening Type (Uw = 1.20)			38.2500	1.1450	43.7977			(27)
N W Roof			0.9600	1.5918	1.5281			(27a)
Ground Floor			106.3800	0.1300	13.8294			(28a)
Exposed Floor			40.4000	0.1300	5.2520			(28b)
External Wall 1	192.1100	40.0700	152.0400	0.1800	27.3672			(29a)
Stud Wall	26.8600		26.8600	0.1800	4.8348			(29a)
Gable Wall	17.8000		17.8000	0.1800	3.2040			(29a)
Dormer Wall	4.8400	2.3000	2.5400	0.1800	0.4572			(29a)
Garage Wall	30.5000		30.5000	0.1800	5.4900			(29a)
Main Roof	93.2700		93.2700	0.1100	10.2597			(30)
RIR Flat Roof	27.4200		27.4200	0.1100	3.0162			(30)
Ground Floor Roof	13.0400		13.0400	0.1100	1.4344			(30)
RIR Pitched Roof	26.7100	0.9600	25.7500	0.1100	2.8325			(30)
Total net area of external elements Aum(A, m2)			579.3300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26) ... (30) + (32) =	127.4232		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								
127.7964 (35)								

4. Water heating energy requirements (kWh/year)

Assumed occupancy													3.0563 (42)
Hot water usage for mixer showers													
	75.4641	74.3301	72.6775	69.5156	67.1822	64.5800	63.1009	64.7410	66.5388	69.3327	72.5626	75.1750	(42a)
Hot water usage for baths													
	32.5753	32.0915	31.4102	30.1541	29.2135	28.1705	27.6071	28.2837	29.0202	30.1363	31.4183	32.4651	(42b)
Hot water usage for other uses													

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Average daily hot water use (litres/day)	45.9297	44.2595	42.5893	40.9192	39.2490	37.5788	37.5788	39.2490	40.9192	42.5893	44.2595	45.9297 (42c) 141.5320 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy content (annual)	153.9691	150.6810	146.6770	140.5888	135.6446	130.3293	128.2868	132.2736	136.4782	142.0583	148.2403	153.5698 (44)
Distribution loss (46)m = 0.15 x (45)m	243.8494	214.5678	225.4371	192.4590	182.6037	160.2551	155.1518	163.7823	168.2912	192.7718	211.1955	240.4532 (45)
Water storage loss:	36.5774	32.1852	33.8156	28.8689	27.3906	24.0383	23.2728	24.5673	25.2437	28.9158	31.6793	36.0680 (46)
Store volume												250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8903 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.0208 (55)
Total storage loss	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (56)
If cylinder contains dedicated solar storage	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444 (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	298.7561	264.1610	280.3439	245.5946	237.5105	213.3907	210.0586	218.6891	221.4268	247.6786	264.3311	295.3600 (62)
WWHRS	-34.4991	-30.5112	-31.9496	-26.4555	-24.6556	-21.0980	-19.7760	-21.0298	-21.8288	-25.7337	-29.1532	-33.8602 (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	264.2571	233.6498	248.3943	219.1391	212.8549	192.2927	190.2826	197.6593	199.5980	221.9448	235.1779	261.4998 (64)
12Total per year (kWh/year)												2676.7503 (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	2677 (64)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	125.0053	111.0184	118.8833	106.5011	104.6412	95.7933	95.5134	98.3831	98.4653	108.0221	112.7310	123.8761 (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	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154	152.8154 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	214.5844	237.5756	214.5844	221.7373	214.5844	221.7373	214.5844	214.5844	221.7373	214.5844	221.7373	214.5844 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	409.2457	413.4924	402.7909	380.0086	351.2501	324.2211	306.1641	301.9174	312.6190	335.4012	364.1598	391.1887 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815	38.2815 (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)	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524	-122.2524 (71)
Water heating gains (Table 5)	168.0179	165.2059	159.7893	147.9182	140.6467	133.0462	128.3782	132.2353	136.7574	145.1909	156.5708	166.5002 (72)
Total internal gains	863.6927	888.1186	849.0093	821.5087	778.3259	747.8493	717.9714	717.5818	739.9582	767.0212	814.3125	844.1180 (73)

6. Solar gains

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

North						16.7600	10.6334	0.6300	0.7000			0.7700	54.4650 (74)	
East						1.5700	19.6403	0.6300	0.7000			0.7700	9.4236 (76)	
South						14.8600	46.7521	0.6300	0.7000			0.7700	212.3203 (78)	
West						5.0600	19.6403	0.6300	0.7000			0.7700	30.3717 (80)	
North						0.9600	26.0000	0.6300	0.7000			1.0000	9.9066 (82)	

Solar gains	316.4873	550.2348	784.5909	1028.8455	1206.6827	1222.5145	1168.3646	1031.4874	868.2806	616.4761	381.0555	269.5963 (83)		
Total gains	1180.1800	1438.3534	1633.6002	1850.3542	1985.0086	1970.3637	1886.3360	1749.0692	1608.2388	1383.4974	1195.3680	1113.7142 (84)		

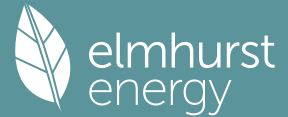
7. Mean internal temperature (heating season)

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	31.1668	31.2282	31.2886	31.5755	31.6298	31.8848	31.8848	31.9325	31.7861	31.6298	31.5202	31.4064
alpha	3.0778	3.0819	3.0859	3.1050	3.1087	3.1257	3.1257	3.1288	3.1191	3.1087	3.1013	3.0938
util living area	0.9887	0.9787	0.9612	0.9191	0.8387	0.7047	0.5641	0.6150	0.8098	0.9413	0.9807	0.9905 (86)
MIT	18.5116	18.8108	19.2522	19.8431	20.3740	20.7555	20.9119	20.8824	20.5906	19.8925	19.0985	18.4645 (87)
Th 2	19.9691	19.9709	19.9727	19.9811	19.9826	19.9899	19.9899	19.9913	19.9871	19.9826	19.9795	19.9762 (88)
util rest of house	0.9865	0.9746	0.9534	0.9018	0.8014	0.6324	0.4567	0.5098	0.7529	0.9254	0.9763	0.9887 (89)
MIT 2	17.0378	17.4197	17.9807	18.7255	19.3684	19.7977	19.9419	19.9222	19.6321	18.7990	17.7941	16.9818 (90)
Living area fraction	0.9865	0.9746	0.9534	0.9018	0.8014	0.6324	0.4567	0.5098	0.7529	0.9254	0.9763	0.9887 (89)
MIT	17.2830	17.6511	18.1922	18.9114	19.5357	19.9571	20.1032	20.0819	19.7916	18.9809	18.0111	17.2285 (92)
Temperature adjustment	17.2830	17.6511	18.1922	18.9114	19.5357	19.9571	20.1032	20.0819	19.7916	18.9809	18.0111	17.2285 (93)
adjusted MIT	17.2830	17.6511	18.1922	18.9114	19.5357	19.9571	20.1032	20.0819	19.7916	18.9809	18.0111	17.2285 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9777	0.9611	0.9347	0.8785	0.7820	0.6298	0.4696	0.5202	0.7399	0.9040	0.9637	0.9810 (94)
Ext temp.	1153.8209	1382.4024	1526.9282	1625.5033	1552.3435	1240.9567	885.8954	909.8477	1189.8571	1250.7460	1151.9250	1092.5391 (95)
	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)

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Heat loss rate W	3576.0869	3505.3238	3208.0105	2721.8942	2126.7110	1442.3486	943.2205	989.8419	1537.1696	2274.6878	2971.7060	3561.2363	(97)
Space heating kWh	1802.1659	1426.6032	1250.7252	789.4015	427.3294	0.0000	0.0000	0.0000	0.0000	761.8127	1310.2424	1836.7107	(98a)
Space heating requirement - total per year (kWh/year)												9604.9910	
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	1802.1659	1426.6032	1250.7252	789.4015	427.3294	0.0000	0.0000	0.0000	0.0000	761.8127	1310.2424	1836.7107	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												9604.9910	
Space heating per m2											(98c) / (4) =	39.7179	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)													0.0000	(201)
Fraction of space heat from main system(s)													1.0000	(202)
Efficiency of main space heating system 1 (in %)													92.3000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
1802.1659	1426.6032	1250.7252	789.4015	427.3294	0.0000	0.0000	0.0000	0.0000	0.0000	761.8127	1310.2424	1836.7107	(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)	1952.5091	1545.6156	1355.0653	855.2562	462.9788	0.0000	0.0000	0.0000	0.0000	825.3659	1419.5475	1989.9358	(211)	
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)	
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)	
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)	
Water heating requirement	264.2571	233.6498	248.3943	219.1391	212.8549	192.2927	190.2826	197.6593	199.5980	221.9448	235.1779	261.4998	(64)	
Efficiency of water heater	87.5375	87.4126	87.1710	86.6760	85.5905	79.8000	79.8000	79.8000	79.8000	86.5966	87.3017	87.5691	(216)	
Fuel for water heating, kWh/month	301.8788	267.2953	284.9505	252.8257	248.6900	240.9683	238.4494	247.6934	250.1229	256.2975	269.3854	298.6210	(217)	
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(219)	
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(222)	
Lighting	44.5864	35.7689	32.2059	23.5954	18.2258	14.8906	16.6262	21.6113	28.0710	36.8306	41.6001	45.8256	(223)	
Electricity generated by PVs (Appendix M) (negative quantity)	-89.6963	-121.7353	-168.4237	-181.8751	-189.7931	-174.6465	-172.1743	-165.3860	-152.8385	-135.2518	-96.7824	-78.0849	(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)	-66.0650	-136.8792	-268.4141	-398.1118	-521.8194	-522.9225	-517.0498	-440.1057	-325.5081	-194.3854	-87.7184	-52.4306	(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												10406.2742	(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												3157.1781	(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)												359.8379	(232)	

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

PV generation													-5258.0980	(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													8751.1921	(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	10406.2742	0.2100	2185.3176	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	3157.1781	0.2100	663.0074	(264)
Space and water heating			2848.3250	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	359.8379	0.1443	51.9357	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1726.6878	0.1355	-233.9025	
PV Unit electricity exported	-3531.4102	0.1263	-445.8666	
Total			-679.7691	(269)
Total CO2, kg/year			2232.4209	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.2300	(273)

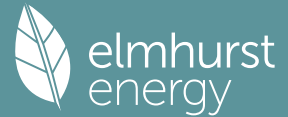
13a. Primary energy - Individual heating systems including micro-CHP

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	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	10406.2742	1.1300	11759.0898 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3157.1781	1.1300	3567.6113 (278)
Space and water heating			15326.7011 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	359.8379	1.5338	551.9313 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1726.6878	1.5007	-2591.2360
PV Unit electricity exported	-3531.4102	0.4635	-1636.6906
Total			-4227.9265 (283)
Total Primary energy kWh/year			11780.8067 (286)
Target Primary Energy Rate (TPER)			48.7200 (287)

Full SAP Calculation Printout



Property Reference	4.14 (2)_Copy_Copy				Issued on Date	28/06/2024
Assessment Reference	00001_Copy_Copy_Copy		Prop Type Ref	5.11		
Property	143					
SAP Rating	87 B	DER	2.83	TER	9.74	
Environmental	97 A	% DER < TER				70.94
CO ₂ Emissions (t/year)	0.38	DFEE	44.28	TFEE	44.88	
Compliance Check	See BREL	% DFEE < TFEE				1.34
% DPER < TPER	42.82	DPER	29.38	TPER	51.38	
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001
Client						

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)
Ground floor	71.8100 (1b)	x 2.4000 (2b)	= 172.3440 (1b) - (3b)
First floor	89.3300 (1c)	x 2.7000 (2c)	= 241.1910 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 413.5350 (5)

2. Ventilation rate

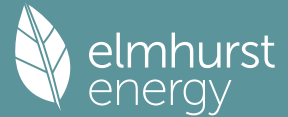
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2000 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1700 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2167	0.2125	0.2083	0.1870	0.1827	0.1615	0.1615	0.1573	0.1700	0.1827	0.1913	0.1998 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.20)			27.8200	1.1450	31.8550		(27)
Door			6.1800	1.0000	6.1800		(26)
Ground Floor			71.8100	0.1200	8.6172	110.0000	7899.1000 (28a)
Exposed Floor			19.9400	0.1400	2.7916		(28b)
External Wall 1	183.7300	34.0000	149.7300	0.2000	29.9460	60.0000	8983.8000 (29a)
Garage Wall	20.5700		20.5700	0.1600	3.2912	60.0000	1234.2000 (29a)
Main Roof	89.3300		89.3300	0.1200	10.7196	9.0000	803.9700 (30)
Bay Roof	2.4200		2.4200	0.1200	0.2904	9.0000	21.7800 (30)
Total net area of external elements Aum (A, m ²)			387.8000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	93.6910		(33)
Internal Wall 1			270.0000			9.0000	2430.0000 (32c)
Internal Floor 1			69.3900			18.0000	1249.0200 (32d)
Internal Ceiling 1			69.3900			9.0000	624.5100 (32e)
Heat capacity Cm = Sum (A x k)						(28)...(30) + (32) + (32a)...(32e) =	23246.3800 (34)

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

144.2620 (35)

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element	31.7900	0.0620	1.9710
E5 Ground floor (normal)	8.5700	0.0620	0.5313
E5 Ground floor (normal)	27.3800	0.0020	0.0548
E6 Intermediate floor within a dwelling	12.8600	0.0430	0.5530
E10 Eaves (insulation at ceiling level)	26.9400	0.0320	0.8621
E12 Gable (insulation at ceiling level)	4.4100	0.1600	0.7056
E14 Flat roof	35.4000	0.0390	1.3806
E16 Corner (normal)	15.0000	-0.0860	-1.2900
E17 Corner (inverted - internal area greater than external area)	10.0700	0.0330	0.3323
E20 Exposed floor (normal)	8.5700	0.3200	2.7424
E21 Exposed floor (inverted)	2.3400	0.0430	0.1006
E24 Eaves (insulation at ceiling level - inverted)	22.5200	0.0660	1.4863
E2 Other lintels (including other steel lintels)	19.5800	0.0210	0.4112
E3 Sill	47.6400	0.1000	4.7640
E4 Jamb			

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

Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	108.2961 (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	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	68.2333	(38)
Heat transfer coeff	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	176.5294	(39)
Average = Sum(39)m / 12 =												176.5294	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	1.0955	(40)
HLP (average)												1.0955	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy

2.9505 (42)

Hot water usage for mixer showers

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Hot water usage for mixer showers	73.6900	72.5826	70.9689	67.8813	65.6028	63.0618	61.6174	63.2190	64.9745	67.7028	70.8567	73.4077	(42a)
Hot water usage for baths	31.8124	31.3399	30.6746	29.4478	28.5293	27.5107	26.9606	27.6212	28.3406	29.4305	30.6825	31.7048	(42b)
Hot water usage for other uses	44.8461	43.2153	41.5845	39.9538	38.3230	36.6922	36.6922	38.3230	39.9538	41.5845	43.2153	44.8461	(42c)
Average daily hot water use (litres/day)												138.2040	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	150.3485	147.1378	143.2280	137.2830	132.4551	127.2648	125.2703	129.1632	133.2689	138.7178	144.7545	149.9586	(44)
Energy conte	238.1152	209.5223	220.1361	187.9335	178.3100	156.4869	151.5035	159.9310	164.3339	188.2388	206.2293	234.7989	(45)
Energy content (annual)										Total = Sum(45)m =		2295.5395	
Distribution loss (46)m = 0.15 x (45)m	35.7173	31.4283	33.0204	28.1900	26.7465	23.4730	22.7255	23.9897	24.6501	28.2358	30.9344	35.2198	(46)

Water storage loss:

Store volume

250.0000 (47)

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

1.7800 (48)

Temperature factor from Table 2b

0.5400 (49)

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

0.9612 (55)

Total storage loss

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	28.8360	(56)
If cylinder contains dedicated solar storage	29.7972	26.9136	29.7972	28.8360	29.7972	28.8360	29.7972	29.7972	28.8360	29.7972	28.8360	29.7972	(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	291.1748	257.4471	273.1957	239.2815	231.3696	207.8349	204.5631	212.9906	215.6819	241.2984	257.5773	287.8585	(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	-8.8230	-21.5307	-51.0587	-89.5402	-129.3083	-134.3073	-131.1825	-103.8364	-67.2622	-33.1456	-12.3415	-6.6764	(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	282.3519	235.9164	222.1370	149.7413	102.0613	73.5276	73.3807	109.1543	148.4197	208.1527	245.2358	281.1822	(64)
Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2131.2607	(64)
Electric shower(s)												2131	(64)

12Total per year (kWh/year)

0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	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

121.6210	108.0060	115.6429	103.5663	101.7358	93.1103	92.8226	95.6248	95.7194	105.0371	109.6496	120.5183	(65)
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5. Internal gains (see Table 5 and 5a)

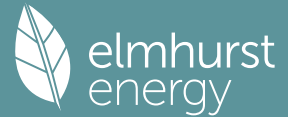
Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	169.0868	187.2033	169.0868	174.7231	169.0868	174.7231	169.0868	169.0868	174.7231	169.0868	174.7231	169.0868	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	332.3992	335.8485	327.1564	308.6521	285.2938	263.3402	248.6739	245.2246	253.9166	272.4209	295.7793	317.7329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	(71)
Water heating gains (Table 5)	163.4691	160.7232	155.4341	143.8421	136.7416	129.3198	124.7616	128.5279	132.9436	141.1789	152.2912	161.9870	(72)
Total internal gains	732.2126	751.0325	718.9349	694.4748	658.3797	634.6406	609.7798	610.0968	628.8408	649.9441	690.0510	716.0642	(73)

6. Solar gains

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

North	14.4600	10.6334	0.4500	0.8000	0.7700	38.3598 (74)
East	1.8300	19.6403	0.4500	0.8000	0.7700	8.9667 (76)
South	9.7500	46.7521	0.4500	0.8000	0.7700	113.7211 (78)
West	1.7800	19.6403	0.4500	0.8000	0.7700	8.7217 (80)

Solar gains	169.7694	294.1558	418.7968	551.3341	650.8052	661.7111	631.3908	554.1459	463.8760	329.2053	204.1755	144.7902	(83)
Total gains	901.9820	1045.1883	1137.7316	1245.8088	1309.1850	1296.3517	1241.1706	1164.2427	1092.7169	979.1494	894.2265	860.8545	(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	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	36.5793	
alpha	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	3.4386	
util living area	0.9881	0.9795	0.9649	0.9282	0.8533	0.7188	0.5724	0.6209	0.8148	0.9427	0.9800	0.9899	(86)
Living	18.9133	19.1552	19.5168	20.0061	20.4677	20.7991	20.9328	20.9095	20.6675	20.0739	19.3997	18.8557	
Non living	18.0939	18.3336	18.6909	19.1678	19.6015	19.8847	19.9774	19.9651	19.7852	19.2402	18.5781	18.0367	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	19.9325	19.1552	19.5168	20.0061	20.4677	20.7991	20.9328	20.9095	20.6675	20.0739	19.3997	19.1557	(87)
Th 2	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	20.0045	(88)
util rest of house	0.9857	0.9753	0.9573	0.9115	0.8164	0.6449	0.4627	0.5132	0.7561	0.9262	0.9752	0.9878	(89)
MIT 2	19.0271	18.3336	18.6909	19.1678	19.6015	19.8847	19.9774	19.9651	19.7852	19.2402	18.5781	18.3120	(90)
Living area fraction									fLA =	Living area /	(4) =	0.2233	(91)
MIT	19.2293	18.5171	18.8754	19.3550	19.7950	20.0890	20.1908	20.1761	19.9823	19.4264	18.7616	18.5004	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.2293	18.5171	18.8754	19.3550	19.7950	20.0890	20.1908	20.1761	19.9823	19.4264	18.7616	18.5004	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9834	0.9669	0.9462	0.8981	0.8073	0.6518	0.4846	0.5333	0.7546	0.9138	0.9670	0.9836	(94)
Useful gains	886.9931	1010.6319	1076.5016	1118.8134	1056.9690	844.9558	601.4737	620.8650	824.5198	894.7694	864.7410	846.7017	(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	2635.4687	2403.8172	2184.6198	1845.6163	1429.0020	968.9626	633.8845	666.5872	1038.3952	1558.1248	2058.6186	2524.4431	(97)
Space heating kWh	1300.8659	936.2206	824.4400	523.2981	276.7925	0.0000	0.0000	0.0000	0.0000	493.5364	859.5919	1248.2396	(98a)
Space heating requirement - total per year (kWh/year)												6462.9850	
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	1300.8659	936.2206	824.4400	523.2981	276.7925	0.0000	0.0000	0.0000	0.0000	493.5364	859.5919	1248.2396	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6462.9850	
Space heating per m2										(98c) / (4) =		40.1079	(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 %)													261.7230 (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	1300.8659	936.2206	824.4400	523.2981	276.7925	0.0000	0.0000	0.0000	0.0000	493.5364	859.5919	1248.2396	(98)
Space heating efficiency (main heating system 1)	261.7230	261.7230	261.7230	261.7230	261.7230	0.0000	0.0000	0.0000	0.0000	261.7230	261.7230	261.7230	(210)
Space heating fuel (main heating system)	497.0392	357.7143	315.0048	199.9435	105.7578	0.0000	0.0000	0.0000	0.0000	188.5720	328.4358	476.9316	(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	282.3519	235.9164	222.1370	149.7413	102.0613	73.5276	73.3807	109.1543	148.4197	208.1527	245.2358	281.1822	(64)
Efficiency of water heater	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	177.9888	(216)
Fuel for water heating, kWh/month	158.6347	132.5456	124.8039	84.1297	57.3414	41.3102	41.2277	61.3265	83.3871	116.9471	137.7816	157.9775	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	10.0267	9.0563	10.0267	9.7032	10.0267	9.7032	10.0267	10.0267	9.7032	10.0267	9.7032	10.0267	(231)
Lighting	44.7635	35.9109	32.3338	23.6891	18.2982	14.9498	16.6922	21.6971	28.1824	36.9769	41.7653	46.0076	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-40.0104	-64.9779	-107.8452	-132.8771	-144.3964	-122.9622	-120.9468	-113.1058	-95.9060	-77.7613	-46.0357	-33.2749	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.4288	-0.3429	-3.7582	-13.9800	-32.0941	-48.5307	-47.3055	-35.7345	-21.6530	-4.1145	-0.2206	0.3292	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)

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Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1											2469.3990	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											177.9888	
Water heating fuel used											1197.4130	(219)
Space cooling fuel											0.0000	(221)

Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2340) mechanical ventilation fans (SFP = 0.2340)											118.0560	(230a)
Total electricity for the above, kWh/year											118.0560	(231)
Electricity for lighting (calculated in Appendix L)											361.2667	(232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-1307.0758	(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											2839.0589	(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	2469.3990	0.1547	381.9788 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1197.4130	0.1460	174.7948 (264)
Space and water heating			556.7736 (265)
Pumps, fans and electric keep-hot	118.0560	0.1387	16.3758 (267)
Energy for lighting	361.2667	0.1443	52.1420 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1100.0998	0.1336	-146.9799
PV Unit electricity exported	-206.9760	0.1095	-22.6596
Total			-169.6395 (269)
Total CO2, kg/year			455.6519 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.8300 (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	2469.3990	1.5727	3883.5122 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1197.4130	1.5400	1844.0449 (278)
Space and water heating			5727.5571 (279)
Pumps, fans and electric keep-hot	118.0560	1.5128	178.5951 (281)
Energy for lighting	361.2667	1.5338	554.1230 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1100.0998	1.4938	-1643.2866
PV Unit electricity exported	-206.9760	0.4005	-82.9015
Total			-1726.1880 (283)
Total Primary energy kWh/year			4734.0872 (286)
Dwelling Primary energy Rate (DPER)			29.3800 (287)

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

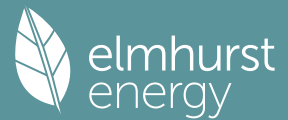
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	71.8100 (1b)	x 2.4000 (2b)	= 172.3440 (1b) - (3b)
First floor	89.3300 (1c)	x 2.7000 (2c)	= 241.1910 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	161.1400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	413.5350 (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) = 0.0967 (8)

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Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3467 (18)
Number of sides sheltered		2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.2947 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Effective ac	0.3758	0.3684	0.3610	0.3242	0.3168	0.2800	0.2800	0.2726	0.2947	0.3168	0.3316	0.3463 (22b)
	0.5706	0.5679	0.5652	0.5525	0.5502	0.5392	0.5392	0.5372	0.5434	0.5502	0.5550	0.5600 (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
TER Opaque door			6.1800	1.0000	6.1800		(26)
TER Opening Type (Uw = 1.20)			27.8200	1.1450	31.8550		(27)
Ground Floor			71.8100	0.1300	9.3353		(28a)
Exposed Floor			19.9400	0.1300	2.5922		(28b)
External Wall 1	183.7300	34.0000	149.7300	0.1800	26.9514		(29a)
Garage Wall	20.5700		20.5700	0.1800	3.7026		(29a)
Main Roof	89.3300		89.3300	0.1100	9.8263		(30)
Bay Roof	2.4200		2.4200	0.1100	0.2662		(30)
Total net area of external elements Aum (A, m2)			387.8000				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	90.7090	(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 144.2620 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	31.7900	0.1600	5.0864
E5 Ground floor (normal)	8.5700	0.1600	1.3712
E5 Ground floor (normal)	27.3800	0.0000	0.0000
E6 Intermediate floor within a dwelling	12.8600	0.0600	0.7716
E10 Eaves (insulation at ceiling level)	26.9400	0.0600	1.6164
E12 Gable (insulation at ceiling level)	4.4100	0.0800	0.3528
E14 Flat roof	35.4000	0.0900	3.1860
E16 Corner (normal)	15.0000	-0.0900	-1.3500
E17 Corner (inverted - internal area greater than external area)	10.0700	0.3200	3.2224
E20 Exposed floor (normal)	8.5700	0.3200	2.7424
E21 Exposed floor (inverted)	2.3400	0.2400	0.5616
E24 Eaves (insulation at ceiling level - inverted)	22.5200	0.0500	1.1260
E2 Other lintels (including other steel lintels)	19.5800	0.0500	0.9790
E3 Sill	47.6400	0.0500	2.3820
E4 Jamb			

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.0478 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 112.7568 (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	77.8678	77.4937	77.1270	75.4045	75.0823	73.5821	73.5821	73.3043	74.1599	75.0823	75.7342	76.4158 (38)
Average = Sum(39)m / 12 =	190.6245	190.2504	189.8837	188.1613	187.8390	186.3388	186.3388	186.0610	186.9167	187.8390	188.4910	189.1725 (39)
												188.1597

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1830	1.1807	1.1784	1.1677	1.1657	1.1564	1.1564	1.1547	1.1600	1.1657	1.1697	1.1740 (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													2.9505 (42)
Hot water usage for mixer showers													
	73.6900	72.5826	70.9689	67.8813	65.6028	63.0618	61.6174	63.2190	64.9745	67.7028	70.8567	73.4077	(42a)
Hot water usage for baths													
	31.8124	31.3399	30.6746	29.4478	28.5293	27.5107	26.9606	27.6212	28.3406	29.4305	30.6825	31.7048	(42b)
Hot water usage for other uses													
	44.8461	43.2153	41.5845	39.9538	38.3230	36.6922	36.6922	38.3230	39.9538	41.5845	43.2153	44.8461	(42c)
Average daily hot water use (litres/day)													138.2040 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	150.3485	147.1378	143.2280	137.2830	132.4551	127.2648	125.2703	129.1632	133.2689	138.7178	144.7545	149.9586	(44)
Energy conte	238.1152	209.5223	220.1361	187.9335	178.3100	156.4869	151.5035	159.9310	164.3339	188.2388	206.2293	234.7989	(45)
Energy content (annual)										Total = Sum(45)m =		2295.5395	
Distribution loss (46)m = 0.15 x (45)m													
	35.7173	31.4283	33.0204	28.1900	26.7465	23.4730	22.7255	23.9897	24.6501	28.2358	30.9344	35.2198	(46)
Water storage loss:													
Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(56)
If cylinder contains dedicated solar storage													
	31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	(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													
	293.0220	259.1156	275.0429	241.0691	233.2168	209.6225	206.4103	214.8378	217.4695	243.1455	259.3649	289.7057	(62)
WWHRS	-33.6880	-29.7940	-31.1985	-25.8336	-24.0760	-20.6020	-19.3111	-20.5354	-21.3156	-25.1288	-28.4678	-33.0642	(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													
	259.3340	229.3216	243.8444	215.2355	209.1408	189.0205	187.0992	194.3024	196.1538	218.0168	230.8970	256.6416	(64)
12Total per year (kWh/year)													
										Total per year (kWh/year) = Sum(64)m =		2629.0077	(64)
												2629	(64)

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Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	123.0988	109.3408	117.1207	104.9964	103.2135	94.5404	94.3004	97.1025	97.1495	106.5148	111.0797	121.9961 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	147.5250	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	172.4411	190.9169	172.4411	178.1891	172.4411	178.1891	172.4411	172.4411	178.1891	172.4411	178.1891	172.4411	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	332.3992	335.8485	327.1564	308.6521	285.2938	263.3402	248.6739	245.2246	253.9166	272.4209	295.7793	317.7329	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	37.7525	(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)	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	-118.0200	(71)
Water heating gains (Table 5)	165.4553	162.7095	157.4203	145.8283	138.7278	131.3061	126.7478	130.5141	134.9299	143.1651	154.2774	163.9732	(72)
Total internal gains	740.5531	759.7324	727.2754	702.9271	666.7202	640.0929	615.1203	615.4373	634.2931	658.2846	698.5033	724.4047	(73)

6. Solar gains

[Jan]														
	Area m2				Solar flux Table 6a		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North	14.4600				10.6334		0.6300		0.7000		0.7700		46.9907 (74)	
East	1.8300				19.6403		0.6300		0.7000		0.7700		10.9842 (76)	
South	9.7500				46.7521		0.6300		0.7000		0.7700		139.3084 (78)	
West	1.7800				19.6403		0.6300		0.7000		0.7700		10.6841 (80)	
Solar gains	207.9675	360.3408	513.0260	675.3842	797.2364	810.5961	773.4538	678.8287	568.2481	403.2765	250.1149	177.3680	(83)	
Total gains	948.5206	1120.0732	1240.3014	1378.3113	1463.9566	1450.6890	1388.5740	1294.2660	1202.5413	1061.5611	948.6183	901.7728	(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	33.8746	33.9412	34.0067	34.3180	34.3769	34.6537	34.6537	34.7054	34.5466	34.3769	34.2580	34.1346
alpha	3.2583	3.2627	3.2671	3.2879	3.2918	3.3102	3.3102	3.3137	3.3031	3.2918	3.2839	3.2756
util living area	0.9863	0.9759	0.9580	0.9143	0.8297	0.6880	0.5433	0.5929	0.7937	0.9339	0.9770	0.9884 (86)
MIT	18.7736	19.0476	19.4479	19.9889	20.4703	20.8059	20.9347	20.9117	20.6659	20.0425	19.3169	18.7295 (87)
Th 2	19.9336	19.9355	19.9373	19.9459	19.9475	19.9551	19.9551	19.9564	19.9522	19.9475	19.9443	19.9409 (88)
util rest of house	0.9835	0.9709	0.9490	0.8946	0.7882	0.6101	0.4320	0.4826	0.7300	0.9147	0.9714	0.9860 (89)
MIT 2	17.3317	17.6807	18.1882	18.8670	19.4428	19.8107	19.9227	19.9090	19.6759	18.9454	18.0316	17.2799 (90)
Living area fraction	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (91)
MIT	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (92)
Temperature adjustment	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (93)
adjusted MIT	17.6537	17.9860	18.4695	19.1176	19.6723	20.0330	20.1487	20.1329	19.8970	19.1904	18.3187	17.6036 (93)

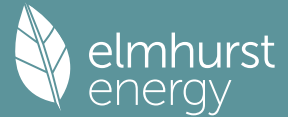
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Utilisation	0.9745	0.9580	0.9321	0.8753	0.7756	0.6165	0.4539	0.5027	0.7262	0.8967	0.9590	0.9779	(94)	
Useful gains	924.3010	1073.0230	1156.0557	1206.4157	1135.4591	894.3663	630.2799	650.6413	873.2278	951.8597	909.7542	881.8765	(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	2545.5453	2489.6094	2272.8223	1922.5570	1497.5042	1012.3807	661.2606	694.5505	1083.5632	1613.6171	2114.6206	2535.5976	(97)	
Space heating kWh	1206.2058	951.9460	830.8743	515.6217	269.3615	0.0000	0.0000	0.0000	0.0000	492.3475	867.5038	1230.3685	(98a)	
Space heating requirement - total per year (kWh/year)	6364.2293													
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	1206.2058	951.9460	830.8743	515.6217	269.3615	0.0000	0.0000	0.0000	0.0000	492.3475	867.5038	1230.3685	(98c)	
Space heating requirement after solar contribution - total per year (kWh/year)	6364.2293													
Space heating per m2											(98c) / (4) =		39.4950	(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	1206.2058	951.9460	830.8743	515.6217	269.3615	0.0000	0.0000	0.0000	0.0000	492.3475	867.5038	1230.3685 (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)	1306.8319	1031.3608	900.1889	558.6368	291.8326	0.0000	0.0000	0.0000	0.0000	533.4209	939.8741	1333.0103 (211)
Space heating efficiency (main heating system 2)												

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Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating requirement	259.3340	229.3216	243.8444	215.2355	209.1408	189.0205	187.0992	194.3024	196.1538	218.0168	230.8970	256.6416 (64)
Efficiency of water heater (217)m	87.0625	86.8974	86.5844	85.9454	84.6283	79.8000	79.8000	79.8000	79.8000	85.8291	86.7435	79.8000 (216)
Fuel for water heating, kWh/month	297.8712	263.8992	281.6264	250.4328	247.1286	236.8678	234.4602	243.4868	245.8068	254.0126	266.1837	87.1045 (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	35.8299	28.7440	25.8808	18.9614	14.6463	11.9662	13.3609	17.3670	22.5580	29.5973	33.4301	36.8257 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-76.2637	-102.9704	-141.7676	-152.3693	-158.4858	-145.7295	-143.7259	-138.3360	-128.2480	-114.1119	-82.1214	-66.4630 (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	-58.0764	-120.0780	-234.9937	-347.8544	-455.2616	-455.9057	-450.7121	-383.8849	-284.3136	-170.1916	-77.0058	-46.1032 (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												6895.1563 (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												3116.4124 (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)												289.1674 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4534.9736 (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												5851.7625 (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	6895.1563	0.2100	1447.9828 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3116.4124	0.2100	654.4466 (264)
Space and water heating			2102.4294 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	289.1674	0.1443	41.7358 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1450.5926	0.1356	-196.6397
PV Unit electricity exported	-3084.3810	0.1263	-389.6222
Total			-586.2619 (269)
Total CO2, kg/year			1569.8326 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			9.7400 (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	6895.1563	1.1300	7791.5267 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3116.4124	1.1300	3521.5460 (278)
Space and water heating			11313.0726 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	289.1674	1.5338	443.5347 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1450.5926	1.5011	-2177.4174
PV Unit electricity exported	-3084.3810	0.4637	-1430.2381
Total			-3607.6555 (283)
Total Primary energy kWh/year			8279.0526 (286)
Target Primary Energy Rate (TPER)			51.3800 (287)

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Property Reference	Top Floor Flat (2)_Copy			Issued on Date	28/06/2024
Assessment Reference	00001_Copy_Copy_Copy	Prop Type Ref	Mid Floor Flat		
Property	Block C				
SAP Rating	72 C	DER	5.81	TER	13.94
Environmental	94 A	% DER < TER			58.32
CO ₂ Emissions (t/year)	0.39	DFEE	31.20	TFEE	32.26
Compliance Check	See BREL	% DFEE < TFEE			3.28
% DPER < TPER	17.41	DPER	61.10	TPER	73.98
Assessor Details	Miss Eleanor Ballinger			Assessor ID	M976-0001
Client					

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)
Ground floor	51.1200 (1b)	2.5000 (2b)	127.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1200		127.8000 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	127.8000 (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		3.5000	(17)
Infiltration rate		0.1750	(18)
Number of sides sheltered		2	(19)

Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.1487	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Mechanical extract ventilation - centralised												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

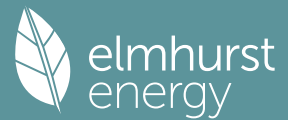
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Window (Uw = 1.20)			4.8000	1.1450	5.4962		(27)
Door			2.0300	1.0000	2.0300		(26)
External Wall 1	37.8500	4.8000	33.0500	0.2000	6.6100	60.0000	1983.0000 (29a)
Corridor Wall	4.5800	2.0300	2.5500	0.1800	0.4590	60.0000	153.0000 (29a)
External Roof 1	51.1200		51.1200	0.1200	6.1344	9.0000	460.0800 (30)
Total net area of external elements Aum(A, m ²)			93.5500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	20.7296		(33)
Party Wall 1			29.0800	0.0000	0.0000	180.0000	5234.4000 (32)
Party Floor 1			51.1200			40.0000	2044.8000 (32d)
Internal Wall 1			70.0000			9.0000	630.0000 (32c)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	10505.2800	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K		205.5023	(35)

List of Thermal Bridges

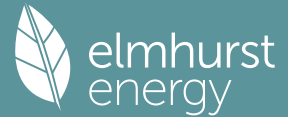
K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	15.1400	0.0430	0.6510

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E16 Corner (normal)									5.0000	0.0390	0.1950	
E25 Staggered party wall between dwellings									5.0000	0.0350	0.1750	
E7 Party floor between dwellings (in blocks of flats)									1.8300	0.0430	0.0787	
E25 Staggered party wall between dwellings									5.0000	0.0350	0.1750	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)									11.6300	0.0000	0.0000	
E10 Baves (insulation at ceiling level)									15.1400	0.0430	0.6510	
E14 Flat roof									1.8300	0.1600	0.2928	
P4 Party wall - Roof (insulation at ceiling level)									11.6300	0.0330	0.3838	
E2 Other lintels (including other steel lintels)									4.7300	0.0660	0.3122	
E3 Sill									3.7500	0.0210	0.0788	
E4 Jamb									11.8200	0.1000	1.1820	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												4.1753 (36)
Point Thermal Bridges												0.0000
Total fabric heat loss												(33) + (36) + (36a) = 24.9048 (37)
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870	21.0870
Average = Sum(39)m / 12 =	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918	45.9918
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997	0.8997
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												1.7231 (42)
Hot water usage for mixer showers												
Hot water usage for baths	53.1104	52.3122	51.1492	48.9239	47.2817	45.4503	44.4093	45.5636	46.8289	48.7952	51.0683	52.9069 (42a)
Hot water usage for other uses	22.9624	22.6214	22.1412	21.2557	20.5927	19.8575	19.4604	19.9373	20.4565	21.2432	22.1469	22.8848 (42b)
Average daily hot water use (litres/day)	32.2764	31.1027	29.9290	28.7553	27.5816	26.4079	26.4079	27.5816	28.7553	29.9290	31.1027	32.2764 (42c)
												99.5979 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	108.3492	106.0363	103.2194	98.9349	95.4560	91.7157	90.2777	93.0825	96.0407	99.9674	104.3179	108.0681 (44)
Energy content (annual)	171.5986	150.9943	158.6443	135.4370	128.5021	112.7752	109.1830	115.2555	118.4277	135.6548	148.6199	169.2085 (45)
Distribution loss (46)m = 0.15 x (45)m	25.7398	22.6491	23.7966	20.3155	19.2753	16.9163	16.3775	17.2883	17.7642	20.3482	22.2930	25.3813 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0640 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1146 (55)
Total storage loss	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (56)
If cylinder contains dedicated solar storage	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	206.1500	182.2020	193.1957	168.8738	163.0535	146.2120	143.7344	149.8069	151.8645	170.2061	182.0567	203.7599 (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	206.1500	182.2020	193.1957	168.8738	163.0535	146.2120	143.7344	149.8069	151.8645	170.2061	182.0567	203.7599 (64)
12Total per year (kWh/year)												2061.1154 (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	57.0565	50.2056	52.7492	45.0328	42.7270	37.4978	36.3034	38.3225	39.3772	45.1052	49.4161	56.2618 (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	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	86.1409	95.3703	86.1409	89.0123	86.1409	89.0123	86.1409	86.1409	89.0123	86.1409	89.0123	86.1409 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1423	151.7003	147.7742	139.4159	128.8651	118.9489	112.3242	110.7662	114.6923	123.0506	133.6014	143.5177 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244 (71)
Water heating gains (Table 5)	76.6889	74.7107	70.8995	62.5455	57.4287	52.0802	48.7948	51.5087	54.6906	60.6253	68.6335	75.6207 (72)
Total internal gains	361.8188	370.6280	353.6613	339.8204	321.2814	308.8880	296.1066	297.2625	307.2418	318.6634	340.0938	354.1260 (73)
6. Solar gains												
[Jan]	Area	Solar flux	g	FF	Access	Gains						
	m2	Table 6a	Specific data	Specific data	factor	W						
		W/m2	or Table 6b	or Table 6c	Table 6d							
North	3.9200	10.6334	0.4500	0.8000	0.7700	10.3990 (74)						
West	0.8800	19.6403	0.4500	0.8000	0.7700	4.3119 (80)						

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Solar gains	14.7109	28.3080	47.6604	74.5015	97.8977	103.6392	97.2284	78.7260	56.7576	33.6651	18.2050	12.2150 (83)
Total gains	376.5297	398.9361	401.3217	414.3219	419.1792	412.5272	393.3350	375.9885	363.9994	352.3286	358.2988	366.3410 (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	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	63.4489	
alpha	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	5.2299	
util living area	0.9876	0.9814	0.9708	0.9351	0.8478	0.6737	0.5066	0.5502	0.7769	0.9374	0.9781	0.9893 (86)	
Living	19.9790	20.1008	20.2854	20.5642	20.8136	20.9576	20.9920	20.9879	20.9110	20.6185	20.2557	19.9428	
Non living	19.2424	19.3625	19.5439	19.8117	20.0360	20.1460	20.1652	20.1635	20.1161	19.8662	19.5163	19.2067	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4777	20.1008	20.2854	20.5642	20.8136	20.9576	20.9920	20.9879	20.9110	20.6185	20.2557	20.0906 (87)	
Th 2	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678	20.1678 (88)	
util rest of house	0.9846	0.9769	0.9632	0.9173	0.8071	0.6002	0.4146	0.4565	0.7116	0.9169	0.9719	0.9866 (89)	
MIT 2	19.6944	19.3625	19.5439	19.8117	20.0360	20.1460	20.1652	20.1635	20.1161	19.8662	19.5163	19.3411 (90)	
Living area fraction	20.0882	19.7336	19.9167	20.1900	20.4269	20.5540	20.5809	20.5780	fLA = Living area / (4) =				0.5027 (91)
MIT	20.0882	19.7336	19.9167	20.1900	20.4269	20.5540	20.5809	20.5780	20.5157	20.2444	19.8880	19.7179 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0882	19.7336	19.9167	20.1900	20.4269	20.5540	20.5809	20.5780	20.5157	20.2444	19.8880	19.7179 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9842	0.9740	0.9604	0.9178	0.8207	0.6354	0.4609	0.5035	0.7405	0.9190	0.9693	0.9849 (94)
Useful gains	370.5864	388.5578	385.4434	380.2658	344.0273	262.1266	181.2792	189.3021	269.5255	323.8003	347.3141	360.8040 (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	726.1271	682.2264	617.0593	519.2486	401.3672	273.8369	183.0884	192.1525	295.0696	443.5657	588.1445	713.6979 (97)
Space heating kWh	264.5223	197.3453	172.3222	100.0676	42.6609	0.0000	0.0000	0.0000	0.0000	89.1055	173.3979	262.5531 (98a)
Space heating requirement - total per year (kWh/year)												1301.9747
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	264.5223	197.3453	172.3222	100.0676	42.6609	0.0000	0.0000	0.0000	0.0000	89.1055	173.3979	262.5531 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1301.9747
Space heating per m2										(98c) / (4) =		25.4690 (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 %)												166.2243 (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	264.5223	197.3453	172.3222	100.0676	42.6609	0.0000	0.0000	0.0000	0.0000	89.1055	173.3979	262.5531 (98)
Space heating efficiency (main heating system 1)	166.2243	166.2243	166.2243	166.2243	166.2243	0.0000	0.0000	0.0000	0.0000	166.2243	166.2243	166.2243 (210)
Space heating fuel (main heating system)	159.1357	118.7223	103.6685	60.2003	25.6647	0.0000	0.0000	0.0000	0.0000	53.6056	104.3156	157.9511 (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	206.1500	182.2020	193.1957	168.8738	163.0535	146.2120	143.7344	149.8069	151.8645	170.2061	182.0567	203.7599 (64)
Efficiency of water heater (217)m	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530	219.3530 (216)
Fuel for water heating, kWh/month	93.9809	83.0634	88.0752	76.9872	74.3338	66.6560	65.5265	68.2949	69.2329	77.5946	82.9971	92.8913 (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	13.1316	11.8608	13.1316	12.7080	13.1316	12.7080	13.1316	13.1316	12.7080	13.1316	12.7080	13.1316 (231)
Lighting	18.3130	14.6914	13.2279	9.6914	7.4859	6.1160	6.8289	8.8764	11.5296	15.1275	17.0864	18.8220 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity) (233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												783.2637 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												219.3530
Water heating fuel used												939.6339 (219)

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Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.8450)	
mechanical ventilation fans (SFP = 0.8450)	154.6139 (230a)
Total electricity for the above, kWh/year	154.6139 (231)
Electricity for lighting (calculated in Appendix L)	147.7964 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2025.3078 (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	783.2637	0.1552	121.5804 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	939.6339	0.1410	132.5001 (264)
Space and water heating			254.0805 (265)
Pumps, fans and electric keep-hot	154.6139	0.1387	21.4469 (267)
Energy for lighting	147.7964	0.1443	21.3316 (268)
Total CO2, kg/year			296.8589 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			5.8100 (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	783.2637	1.5747	1233.3820 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	939.6339	1.5214	1429.5765 (278)
Space and water heating			2662.9585 (279)
Pumps, fans and electric keep-hot	154.6139	1.5128	233.8999 (281)
Energy for lighting	147.7964	1.5338	226.6950 (282)
Total Primary energy kWh/year			3123.5533 (286)
Dwelling Primary energy Rate (DPER)			61.1000 (287)

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

1. Overall dwelling characteristics

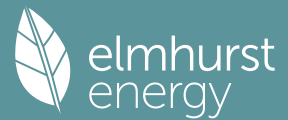
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	51.1200 (1b)	x 2.5000 (2b)	= 127.8000 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	51.1200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 127.8000 (5)

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) = 0.1565 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4065 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3455 (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	0.4405	0.4319	0.4233	0.3801	0.3714	0.3282	0.3282	0.3196	0.3455	0.3714	0.3887	0.4060 (22b)
Effective ac	0.5970	0.5933	0.5896	0.5722	0.5690	0.5539	0.5539	0.5511	0.5597	0.5690	0.5755	0.5824 (25)

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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	
TER Opaque door			2.0300	1.0000	2.0300			(26)
TER Opening Type (Uw = 1.20)			4.8000	1.1450	5.4962			(27)
External Wall 1	37.8500	4.8000	33.0500	0.1800	5.9490			(29a)
Corridor Wall	4.5800	2.0300	2.5500	0.1800	0.4590			(29a)
External Roof 1	51.1200		51.1200	0.1100	5.6232			(30)
Total net area of external elements A _{um} (A, m ²)			93.5500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	19.5574			(33)
Party Wall 1			29.0800	0.0000	0.0000			(32)

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

205.5023 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E7 Party floor between dwellings (in blocks of flats)	15.1400	0.0700	1.0598
E16 Corner (normal)	5.0000	0.0900	0.4500
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
E7 Party floor between dwellings (in blocks of flats)	1.8300	0.0700	0.1281
E25 Staggered party wall between dwellings	5.0000	0.0600	0.3000
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	11.6300	0.0000	0.0000
E10 Baves (insulation at ceiling level)	15.1400	0.0600	0.9084
E14 Flat roof	1.8300	0.0800	0.1464
P4 Party wall - Roof (insulation at ceiling level)	11.6300	0.1200	1.3956
E2 Other lintels (including other steel lintels)	4.7300	0.0500	0.2365
E3 Sill	3.7500	0.0500	0.1875
E4 Jamb	11.8200	0.0500	0.5910

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

5.7033 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 25.2607 (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	25.1794	25.0205	24.8648	24.1331	23.9962	23.3590	23.3590	23.2410	23.6045	23.9962	24.2732	24.5627	(38)
Heat transfer coeff	50.4401	50.2812	50.1254	49.3938	49.2569	48.6197	48.6197	48.5017	48.8651	49.2569	49.5338	49.8233	(39)
Average = Sum(39)m / 12 =												49.3932	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9867	0.9836	0.9805	0.9662	0.9636	0.9511	0.9511	0.9488	0.9559	0.9636	0.9690	0.9746	(40)
HLP (average)												0.9662	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

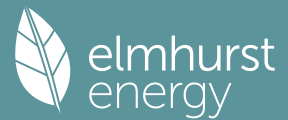
4. Water heating energy requirements (kWh/year)

Assumed occupancy													1.7231 (42)
Hot water usage for mixer showers	53.1104	52.3122	51.1492	48.9239	47.2817	45.4503	44.4093	45.5636	46.8289	48.7952	51.0683	52.9069	(42a)
Hot water usage for baths	22.9624	22.6214	22.1412	21.2557	20.5927	19.8575	19.4604	19.9373	20.4565	21.2432	22.1469	22.8848	(42b)
Hot water usage for other uses	32.2764	31.1027	29.9290	28.7553	27.5816	26.4079	26.4079	27.5816	28.7553	29.9290	31.1027	32.2764	(42c)
Average daily hot water use (litres/day)												99.5979	(43)
Daily hot water use	108.3492	106.0363	103.2194	98.9349	95.4560	91.7157	90.2777	93.0825	96.0407	99.9674	104.3179	108.0681	(44)
Energy conte	171.5986	150.9943	158.6443	135.4370	128.5021	112.7752	109.1830	115.2555	118.4277	135.6548	148.6199	169.2085	(45)
Energy content (annual)										Total = Sum(45)m =		1654.3010	
Distribution loss (46)m = 0.15 x (45)m	25.7398	22.6491	23.7966	20.3155	19.2753	16.9163	16.3775	17.2883	17.7642	20.3482	22.2930	25.3813	(46)
Water storage 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	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	218.1935	193.0800	205.2392	180.5288	175.0970	157.8670	155.7779	161.8505	163.5196	182.2497	193.7118	215.8034	(62)
WWHRS	-24.2799	-21.4733	-22.4856	-18.6190	-17.3522	-14.8484	-13.9180	-14.8004	-15.3627	-18.1110	-20.5175	-23.8302	(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	193.9137	171.6067	182.7536	161.9098	157.7448	143.0186	141.8599	147.0500	148.1569	164.1387	173.1942	191.9732	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		1977.3202	(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	94.3325	83.8742	90.0252	81.1063	80.0029	73.5712	73.5793	75.5984	75.4507	82.3811	85.4896	93.5377	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	86.1555	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	88.5960	98.0884	88.5960	91.5492	88.5960	91.5492	88.5960	88.5960	91.5492	88.5960	91.5492	88.5960	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	150.1423	151.7003	147.7742	139.4159	128.8651	118.9489	112.3242	110.7662	114.6923	123.0506	133.6014	143.5177	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	31.6156	(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)	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	-68.9244	(71)

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Water heating gains (Table 5)	126.7910	124.8128	121.0016	112.6476	107.5307	102.1823	98.8969	101.6107	104.7926	110.7273	118.7355	125.7228 (72)
Total internal gains	417.3759	426.4482	409.2184	395.4594	376.8385	361.5270	348.6637	349.8196	359.8808	374.2206	395.7328	409.6831 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				3.9200	10.6334	0.6300		0.7000		0.7700		12.7388 (74)
West				0.8800	19.6403	0.6300		0.7000		0.7700		5.2820 (80)
Solar gains	18.0209	34.6774	58.3840	91.2644	119.9247	126.9580	119.1048	96.4394	69.5280	41.2398	22.3011	14.9634 (83)
Total gains	435.3968	461.1256	467.6024	486.7237	496.7633	488.4850	467.7685	446.2589	429.4088	415.4603	418.0339	424.6465 (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	57.8534	58.0363	58.2166	59.0789	59.2431	60.0196	60.0196	60.1656	59.7181	59.2431	58.9119	58.5696
alpha	4.8569	4.8691	4.8811	4.9386	4.9495	5.0013	5.0013	5.0110	4.9812	4.9495	4.9275	4.9046
util living area	0.9800	0.9712	0.9552	0.9044	0.7965	0.6110	0.4523	0.4921	0.7191	0.9059	0.9646	0.9820 (86)
MIT	19.9493	20.0850	20.2909	20.6002	20.8414	20.9677	20.9940	20.9910	20.9277	20.6547	20.2760	19.9354 (87)
Th 2	20.0944	20.0970	20.0996	20.1116	20.1138	20.1243	20.1243	20.1262	20.1203	20.1138	20.1093	20.1045 (88)
util rest of house	0.9752	0.9643	0.9440	0.8804	0.7488	0.5371	0.3648	0.4024	0.6485	0.8778	0.9549	0.9777 (89)
MIT 2	18.8875	19.0600	19.3192	19.7034	19.9754	20.1039	20.1219	20.1224	20.0689	19.7750	19.3107	18.8776 (90)
Living area fraction	19.4213	19.5753	19.8077	20.1543	20.4108	20.5381	20.5604	20.5591	20.5007	20.2173	19.7960	19.4094 (92)
MIT	19.4213	19.5753	19.8077	20.1543	20.4108	20.5381	20.5604	20.5591	20.5007	20.2173	19.7960	19.4094 (93)
Temperature adjustment												0.0000
adjusted MIT	19.4213	19.5753	19.8077	20.1543	20.4108	20.5381	20.5604	20.5591	20.5007	20.2173	19.7960	19.4094 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9707	0.9594	0.9397	0.8817	0.7657	0.5728	0.4088	0.4474	0.6804	0.8815	0.9508	0.9735 (94)
Useful gains	422.6460	442.4094	439.4276	429.1516	380.3905	279.8224	191.2084	199.6383	292.1519	366.2167	397.4699	413.3757 (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	762.7196	737.8937	667.0539	555.8912	429.0658	288.7107	192.5524	201.7240	312.7698	473.7163	628.8814	757.7831 (97)
Space heating kWh	253.0148	198.5654	169.3539	91.2525	36.2144	0.0000	0.0000	0.0000	0.0000	79.9797	166.6162	256.2391 (98a)
Space heating requirement - total per year (kWh/year)												1251.2360
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	253.0148	198.5654	169.3539	91.2525	36.2144	0.0000	0.0000	0.0000	0.0000	79.9797	166.6162	256.2391 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1251.2360
Space heating per m ²										(98c) / (4) =		24.4764 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	253.0148	198.5654	169.3539	91.2525	36.2144	0.0000	0.0000	0.0000	0.0000	79.9797	166.6162	256.2391 (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)	274.1222	215.1305	183.4821	98.8651	39.2355	0.0000	0.0000	0.0000	0.0000	86.6519	180.5160	277.6155 (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	193.9137	171.6067	182.7536	161.9098	157.7448	143.0186	141.8599	147.0500	148.1569	164.1387	173.1942	191.9732 (64)
Efficiency of water heater	84.6574	84.3879	83.8894	82.8258	81.3392	79.8000	79.8000	79.8000	79.8000	82.5408	83.9730	84.7081 (217)
Fuel for water heating, kWh/month	229.0570	203.3548	217.8507	195.4823	193.9345	179.2213	177.7693	184.2732	185.6602	198.8577	206.2499	226.6290 (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	18.4085	14.7680	13.2969	9.7419	7.5249	6.1479	6.8645	8.9227	11.5897	15.2064	17.1755	18.9201 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-17.6288	-25.7754	-38.4094	-44.8333	-49.7961	-47.0398	-46.5086	-43.2221	-37.6163	-30.2547	-19.7223	-15.1386 (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)

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Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-7.3211	-15.6496	-31.5635	-48.0693	-64.1903	-64.6971	-63.8916	-53.7658	-39.0055	-22.5467	-9.8312	-5.7674 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1355.6186 (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												2398.3400 (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)												148.5671 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-842.2447 (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												3146.2811 (238)

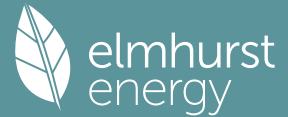
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1355.6186	0.2100	284.6799 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2398.3400	0.2100	503.6514 (264)
Space and water heating			788.3313 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	148.5671	0.1443	21.4428 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.9456	0.1338	-55.6561
PV Unit electricity exported	-426.2991	0.1255	-53.5030
Total			-109.1590 (269)
Total CO2, kg/year			712.5444 (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	1355.6186	1.1300	1531.8490 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2398.3400	1.1300	2710.1242 (278)
Space and water heating			4241.9733 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	148.5671	1.5338	227.8772 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-415.9456	1.4945	-621.6225
PV Unit electricity exported	-426.2991	0.4607	-196.3853
Total			-818.0078 (283)
Total Primary energy kWh/year			3781.9434 (286)
Target Primary Energy Rate (TPER)			73.9800 (287)

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Property Reference	Mid Floor Flat (2)_Copy				Issued on Date	28/06/2024	
Assessment Reference	00001_Copy_Copy_Copy			Prop Type Ref	Mid Floor Flat		
Property	Block C						
SAP Rating	84 B		DER	4.23		TER	10.90
Environmental	97 A		% DER < TER				61.19
CO ₂ Emissions (t/year)	0.27		DFEE	25.17		TFEE	25.72
Compliance Check	See BREL		% DFEE < TFEE				2.15
% DPER < TPER	22.45		DPER	44.51		TPER	57.39
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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)
Ground floor	70.9700 (1b)	x 2.6500 (2b)	= 188.0705 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9700		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 188.0705 (5)

2. Ventilation rate

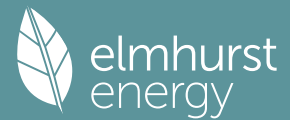
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.5000 (17)
Infiltration rate	0.1750 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.1487 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.1897	0.1859	0.1822	0.1636	0.1599	0.1413	0.1413	0.1376	0.1487	0.1599	0.1673	0.1748 (22b)
Mechanical extract ventilation - centralised												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
Window (Uw = 1.20)			6.3400	1.1450	7.2595		(27)
Door			2.0300	1.0000	2.0300		(26)
External Wall 1	46.2200	6.3400	39.8800	0.2000	7.9760	60.0000	2392.8000 (29a)
Stair Wall	17.3300		17.3300	0.2200	3.8126	60.0000	1039.8000 (29a)
Corridor Wall	11.4200	2.0300	9.3900	0.1800	1.6902	60.0000	563.4000 (29a)
Total net area of external elements Aum(A, m ²)			74.9700				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	22.7683		(33)
Party Wall 1			17.4600	0.0000	0.0000	180.0000	3142.8000 (32)
Party Floor 1			70.9700			40.0000	2838.8000 (32d)
Party Ceiling 1			70.9700			30.0000	2129.1000 (32b)
Internal Wall 1			105.0000			9.0000	945.0000 (32c)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	13051.7000 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							183.9045 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	

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E7 Party floor between dwellings (in blocks of flats)	8.6200	0.0430	0.3707
E16 Corner (normal)	5.3000	0.0390	0.2067
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0860	-0.2279
E16 Corner (normal)	7.9500	0.0390	0.3100
E7 Party floor between dwellings (in blocks of flats)	31.6100	0.0430	1.3592
E7 Party floor between dwellings (in blocks of flats)	13.0800	0.0430	0.5624
E17 Corner (inverted - internal area greater than external area)	2.6500	0.0000	0.0000
E2 Other lintels (including other steel lintels)	5.9700	0.0660	0.3940
E3 Sill	4.9900	0.0210	0.1048
E4 Jamb	14.3200	0.1000	1.4320
E25 Staggered party wall between dwellings	2.6500	0.0180	0.0477
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1800	0.0000	0.0000
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.0430	0.1406
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.7003 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	27.4686 (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	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316	31.0316 (38)
Average = Sum(39)m / 12 =	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003	58.5003 (39)
HLP	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243	0.8243 (40)
HLP (average)												0.8243
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.2694 (42)
Hot water usage for mixer showers	62.2707	61.3349	59.9713	57.3622	55.4367	53.2895	52.0690	53.4223	54.9058	57.2113	59.8764	62.0321 (42a)
Hot water usage for baths	26.9017	26.5022	25.9395	24.9022	24.1254	23.2641	22.7988	23.3575	23.9658	24.8875	25.9462	26.8107 (42b)
Hot water usage for other uses	37.8714	36.4942	35.1171	33.7399	32.3628	30.9857	30.9857	32.3628	33.7399	35.1171	36.4942	37.8714 (42c)
Average daily hot water use (litres/day)												116.7821 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	127.0438	124.3313	121.0279	116.0043	111.9249	107.5392	105.8535	109.1426	112.6116	117.2158	122.3169	126.7142 (44)
Energy content (annual)	201.2063	177.0461	186.0153	158.8040	150.6724	132.2320	128.0206	135.1413	138.8613	159.0608	174.2628	198.4039 (45)
Distribution loss (46)m = 0.15 x (45)m	30.1809	26.5569	27.9023	23.8206	22.6009	19.8348	19.2031	20.2712	20.8292	23.8591	26.1394	29.7606 (46)
Water storage loss:												
Store volume												180.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.0640 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.1146 (55)
Total storage loss	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (56)
If cylinder contains dedicated solar storage	34.5514	31.2077	34.5514	33.4368	34.5514	33.4368	34.5514	34.5514	33.4368	34.5514	33.4368	34.5514 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	235.7576	208.2538	220.5667	192.2408	185.2238	165.6688	162.5719	169.6927	172.2981	193.6121	207.6996	232.9552 (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	235.7576	208.2538	220.5667	192.2408	185.2238	165.6688	162.5719	169.6927	172.2981	193.6121	207.6996	232.9552 (64)
12Total per year (kWh/year)												2346.5412 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	66.9011	58.8678	61.8501	52.8023	50.0986	43.9671	42.5668	44.9345	46.1714	52.8877	57.9424	65.9693 (65)

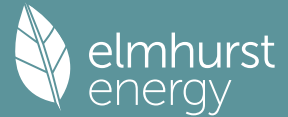
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	115.7153	128.1134	115.7153	119.5725	115.7153	119.5725	115.7153	115.7153	119.5725	115.7153	119.5725	115.7153 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5503	201.6210	196.4029	185.2941	171.2713	158.0919	149.2872	147.2165	152.4346	163.5434	177.5662	190.7456 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777 (71)
Water heating gains (Table 5)	89.9208	87.6009	83.1319	73.3366	67.3368	61.0655	57.2135	60.3958	64.1269	71.0856	80.4755	88.6684 (72)
Total internal gains	462.2281	474.3770	452.2917	435.2449	411.3651	395.7715	379.2576	380.3693	393.1757	407.3859	434.6558	452.1710 (73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East	0.8700	19.6403	0.4500	0.8000	0.7700	4.2629 (76)
South	5.4700	46.7521	0.4500	0.8000	0.7700	63.8005 (78)

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Solar gains	68.0633	112.8278	146.8334	170.4612	181.3060	175.9874	171.3217	163.6941	155.0111	122.5959	80.9406	58.6351 (83)
Total gains	530.2914	587.2048	599.1251	605.7060	592.6711	571.7588	550.5793	544.0633	548.1868	529.9819	515.5964	510.8060 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	61.9736	
alpha	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	5.1316	
util living area	0.9796	0.9647	0.9440	0.8946	0.7991	0.6270	0.4624	0.4878	0.6887	0.8888	0.9624	0.9830 (86)	
Living	20.0556	20.2251	20.4165	20.6573	20.8546	20.9672	20.9942	20.9923	20.9461	20.7164	20.3457	20.0077	
Non living	19.3760	19.5415	19.7271	19.9544	20.1289	20.2147	20.2303	20.2294	20.2009	20.0116	19.6612	19.3289	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.5169	20.2251	20.4165	20.6573	20.8546	20.9672	20.9942	20.9923	20.9461	20.7164	20.3457	20.1465 (87)	
Th 2	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323	20.2323 (88)	
util rest of house	0.9754	0.9576	0.9324	0.8722	0.7576	0.5613	0.3841	0.4095	0.6267	0.8614	0.9535	0.9794 (89)	
MIT 2	19.7943	19.5415	19.7271	19.9544	20.1289	20.2147	20.2303	20.2294	20.2009	20.0116	19.6612	19.4553 (90)	
Living area fraction									FLA = Living area / (4) =				0.4037 (91)
MIT	20.0860	19.8174	20.0054	20.2382	20.4218	20.5185	20.5387	20.5374	20.5017	20.2961	19.9375	19.7343 (92)	
Temperature adjustment												0.0000	
adjusted MIT	20.0860	19.8174	20.0054	20.2382	20.4218	20.5185	20.5387	20.5374	20.5017	20.2961	19.9375	19.7343 (93)	

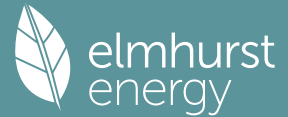
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9744	0.9530	0.9284	0.8724	0.7685	0.5865	0.4157	0.4410	0.6493	0.8639	0.9495	0.9765 (94)
Useful gains	516.7352	559.6245	556.2524	528.4289	455.4596	335.3175	228.8730	239.9200	355.9121	457.8773	489.5386	498.8209 (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	923.4840	872.6742	790.0697	663.2862	510.2298	346.2315	230.4140	242.0394	374.5036	567.2251	750.9998	908.7604 (97)
Space heating kWh	302.6211	210.3694	173.9601	97.0972	40.7491	0.0000	0.0000	0.0000	0.0000	81.3548	188.2520	304.9950 (98a)
Space heating requirement - total per year (kWh/year)												1399.3988
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	302.6211	210.3694	173.9601	97.0972	40.7491	0.0000	0.0000	0.0000	0.0000	81.3548	188.2520	304.9950 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1399.3988
Space heating per m2										(98c) / (4) =		19.7182 (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 %)												191.5487 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	302.6211	210.3694	173.9601	97.0972	40.7491	0.0000	0.0000	0.0000	0.0000	81.3548	188.2520	304.9950 (98)
Space heating efficiency (main heating system 1)	191.5487	191.5487	191.5487	191.5487	191.5487	0.0000	0.0000	0.0000	0.0000	191.5487	191.5487	191.5487 (210)
Space heating fuel (main heating system)	157.9865	109.8256	90.8177	50.6906	21.2735	0.0000	0.0000	0.0000	0.0000	42.4721	98.2790	159.2258 (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	235.7576	208.2538	220.5667	192.2408	185.2238	165.6688	162.5719	169.6927	172.2981	193.6121	207.6996	232.9552 (64)
Efficiency of water heater												244.3139 (216)
(217)m	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139	244.3139 (217)
Fuel for water heating, kWh/month	96.4978	85.2402	90.2800	78.6860	75.8138	67.8098	66.5422	69.4568	70.5232	79.2473	85.0134	95.3508 (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	13.2273	11.9473	13.2273	12.8006	13.2273	12.8006	13.2273	13.2273	12.8006	13.2273	12.8006	13.2273 (231)
Lighting	25.0112	20.0649	18.0663	13.2361	10.2240	8.3531	9.3266	12.1231	15.7467	20.6605	23.3360	25.7064 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												730.5708 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	244.3139	
Water heating fuel used	960.4615 (219)	
Space cooling fuel	0.0000 (221)	
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.8450)		
mechanical ventilation fans (SFP = 0.8450)	155.7412 (230a)	
Total electricity for the above, kWh/year	155.7412 (231)	
Electricity for lighting (calculated in Appendix L)	201.8550 (232)	
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	0.0000 (233)	
Wind generation	0.0000 (234)	
Hydro-electric generation (Appendix N)	0.0000 (235a)	
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)	
Appendix Q - special features		
Energy saved or generated	-0.0000 (236)	
Energy used	0.0000 (237)	
Total delivered energy for all uses	2048.6284 (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	730.5708	0.1558	113.8460 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	960.4615	0.1411	135.5031 (264)	
Space and water heating			249.3491 (265)	
Pumps, fans and electric keep-hot	155.7412	0.1387	21.6032 (267)	
Energy for lighting	201.8550	0.1443	29.1339 (268)	
Total CO2, kg/year			300.0863 (272)	
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.2300 (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	730.5708	1.5769	1152.0338 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	960.4615	1.5217	1461.5116 (278)	
Space and water heating			2613.5455 (279)	
Pumps, fans and electric keep-hot	155.7412	1.5128	235.6053 (281)	
Energy for lighting	201.8550	1.5338	309.6119 (282)	
Total Primary energy kWh/year			3158.7626 (286)	
Dwelling Primary energy Rate (DPER)			44.5100 (287)	

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

1. Overall dwelling characteristics

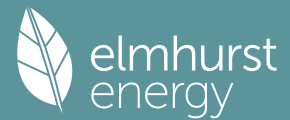
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	70.9700 (1b)	x 2.6500 (2b)	= 188.0705 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	70.9700		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 188.0705 (5)	

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) =	0.1595 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000 (17)	
Infiltration rate	0.4095 (18)	
Number of sides sheltered	2 (19)	
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3481 (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	0.4438	0.4351	0.4264	0.3829	0.3742	0.3307	0.3307	0.3220	0.3481	0.3742	0.3916	0.4090 (22b)
Effective ac	0.5985	0.5947	0.5909	0.5733	0.5700	0.5547	0.5547	0.5518	0.5606	0.5700	0.5767	0.5836 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
TER Opaque door			2.0300	1.0000	2.0300			(26)
TER Opening Type (Uw = 1.20)			6.3400	1.1450	7.2595			(27)
External Wall 1	46.2200	6.3400	39.8800	0.1800	7.1784			(29a)
Stair Wall	17.3300		17.3300	0.1800	3.1194			(29a)
Corridor Wall	11.4200	2.0300	9.3900	0.1800	1.6902			(29a)
Total net area of external elements Aum(A, m2)			74.9700					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		21.2775			(33)
Party Wall 1			17.4600	0.0000	0.0000			(32)

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

193.9045 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E7 Party floor between dwellings (in blocks of flats)	8.6200	0.0700	0.6034	
E16 Corner (normal)	5.3000	0.0900	0.4770	
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385	
E16 Corner (normal)	7.9500	0.0900	0.7155	
E7 Party floor between dwellings (in blocks of flats)	31.6100	0.0700	2.2127	
E7 Party floor between dwellings (in blocks of flats)	13.0800	0.0700	0.9156	
E17 Corner (inverted - internal area greater than external area)	2.6500	-0.0900	-0.2385	
E2 Other lintels (including other steel lintels)	5.9700	0.0500	0.2985	
E3 Sill	4.9900	0.0500	0.2495	
E4 Jamb	14.3200	0.0500	0.7160	
E25 Staggered party wall between dwellings	2.6500	0.0600	0.1590	
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	13.1800	0.0000	0.0000	
E24 Eaves (insulation at ceiling level - inverted)	3.2700	0.2400	0.7848	

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

6.6550 (36)

Point Thermal bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 27.9325 (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	37.1439	36.9065	36.6739	35.5812	35.3767	34.4250	34.4250	34.2487	34.7916	35.3767	35.7903	36.2227	(38)
Heat transfer coeff	65.0764	64.8391	64.6064	63.5137	63.3093	62.3575	62.3575	62.1813	62.7241	63.3093	63.7229	64.1552	(39)
Average = Sum(39)m / 12 =												63.5127	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9170	0.9136	0.9103	0.8949	0.8921	0.8786	0.8786	0.8762	0.8838	0.8921	0.8979	0.9040	(40)
HLP (average)												0.8949	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.2694 (42)
Hot water usage for mixer showers	62.2707	61.3349	59.9713	57.3622	55.4367	53.2895	52.0690	53.4223	54.9058	57.2113	59.8764	62.0321	(42a)
Hot water usage for baths	26.9017	26.5022	25.9395	24.9022	24.1254	23.2641	22.7988	23.3575	23.9658	24.8875	25.9462	26.8107	(42b)
Hot water usage for other uses	37.8714	36.4942	35.1171	33.7399	32.3628	30.9857	30.9857	32.3628	33.7399	35.1171	36.4942	37.8714	(42c)
Average daily hot water use (litres/day)												116.7821	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	127.0438	124.3313	121.0279	116.0043	111.9249	107.5392	105.8535	109.1426	112.6116	117.2158	122.3169	126.7142	(44)
Energy conte	201.2063	177.0461	186.0153	158.8040	150.6724	132.2320	128.0206	135.1413	138.8613	159.0608	174.2628	198.4039	(45)
Energy content (annual)										Total =	Sum(45)m =	1939.7268	
Distribution loss (46)m = 0.15 x (45)m	30.1809	26.5569	27.9023	23.8206	22.6009	19.8348	19.2031	20.2712	20.8292	23.8591	26.1394	29.7606	(46)

Water storage 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)

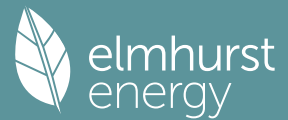
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325	(57)
Primary loss	23.2624	21.0112	23.2624	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	247.8012	219.1318	232.6102	203.8959	197.2673	177.3238	174.6155	181.7363	183.9532	205.6557	219.3546	244.9988	(62)
WWHRS	-28.4676	-25.1770	-26.3639	-21.8303	-20.3451	-17.4094	-16.3186	-17.3532	-18.0125	-21.2347	-24.0563	-27.9404	(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	219.3336	193.9549	206.2464	182.0656	176.9222	159.9144	158.2969	164.3831	165.9407	184.4210	195.2983	217.0584	(64)
Total per year (kWh/year)										Total per year (kWh/year) =	Sum(64)m =	2223.8354	(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	104.1770	92.5364	99.1260	88.8758	87.3745	80.0406	79.8428	82.2104	82.2449	90.1636	94.0158	103.2452	(65)
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5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	113.4721	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	118.9392	131.6827	118.9392	122.9039	118.9392	122.9039	118.9392	118.9392	122.9039	118.9392	122.9039	118.9392	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	199.5503	201.6210	196.4029	185.2941	171.2713	158.0919	149.2872	147.2165	152.4346	163.5434	177.5662	190.7456	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	34.3472	(69)

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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)											
Water heating gains (Table 5)	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777	-90.7777 (71)
Total internal gains	140.0229	137.7030	133.2339	123.4386	117.4388	111.1675	107.3155	110.4979	114.2290	121.1877	130.5776	138.7704 (72)
	518.5540	531.0483	508.6177	491.6783	467.6911	449.2049	432.5836	433.6952	446.6091	463.7119	491.0892	508.4969 (73)

6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W			
East				0.8700	19.6403	0.6300	0.7000	0.7700	5.2220 (76)			
South				5.4700	46.7521	0.6300	0.7000	0.7700	78.1556 (78)			
Solar gains	83.3776	138.2141	179.8709	208.8149	222.0998	215.5845	209.8690	200.5252	189.8887	150.1800	99.1522	71.8279 (83)
Total gains	601.9316	669.2624	688.4886	700.4932	689.7909	664.7894	642.4526	634.2205	636.4977	613.8919	590.2415	580.3249 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	58.7403	58.9554	59.1676	60.1856	60.3800	61.3015	61.3015	61.4753	60.9432	60.3800	59.9881	59.5838
alpha	4.9160	4.9304	4.9445	5.0124	5.0253	5.0868	5.0868	5.0984	5.0629	5.0253	4.9992	4.9723
util living area	0.9748	0.9568	0.9311	0.8698	0.7618	0.5816	0.4238	0.4467	0.6458	0.8618	0.9519	0.9782 (86)
MIT	20.0319	20.2181	20.4266	20.6901	20.8768	20.9757	20.9959	20.9947	20.9576	20.7481	20.3702	20.0094 (87)
Th 2	20.1531	20.1559	20.1587	20.1718	20.1743	20.1857	20.1857	20.1878	20.1813	20.1743	20.1693	20.1641 (88)
util rest of house	0.9693	0.9477	0.9165	0.8426	0.7151	0.5144	0.3470	0.3699	0.5805	0.8287	0.9403	0.9734 (89)
MIT 2	19.0396	19.2736	19.5331	19.8580	20.0662	20.1699	20.1840	20.1854	20.1513	19.9308	19.4761	19.0196 (90)
Living area fraction	fLA = Living area / (4) = 0.4037 (91)											
MIT	19.4402	19.6549	19.8938	20.1939	20.3934	20.4952	20.5118	20.5121	20.4768	20.2608	19.8370	19.4192 (92)
Temperature adjustment	0.0000											
adjusted MIT	19.4402	19.6549	19.8938	20.1939	20.3934	20.4952	20.5118	20.5121	20.4768	20.2608	19.8370	19.4192 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9635	0.9413	0.9112	0.8434	0.7281	0.5405	0.3780	0.4008	0.6048	0.8325	0.9349	0.9680 (94)
Ext temp.	579.9680	630.0088	627.3441	590.8037	502.2668	359.3118	242.8268	254.2036	384.9326	511.0531	551.7985	561.7811 (95)
Heat loss rate W	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Space heating kWh	985.2684	956.6919	865.3240	717.3188	550.3754	367.6075	243.9275	255.6960	399.9778	611.6151	811.6395	976.3890 (97)
Space heating requirement - total per year (kWh/year)	301.5435	219.5310	177.0571	91.0909	35.7928	0.0000	0.0000	0.0000	0.0000	74.8181	187.0855	308.4683 (98a)
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)	301.5435	219.5310	177.0571	91.0909	35.7928	0.0000	0.0000	0.0000	0.0000	74.8181	187.0855	308.4683 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1395.3872
Space heating per m2										(98c) / (4) =		19.6616 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.3000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	301.5435	219.5310	177.0571	91.0909	35.7928	0.0000	0.0000	0.0000	0.0000	74.8181	187.0855	308.4683 (98)
Space heating fuel (main heating system)	92.3000	92.3000	92.3000	92.3000	92.3000	0.0000	0.0000	0.0000	0.0000	92.3000	92.3000	92.3000 (210)
Space heating efficiency (main heating system 2)	326.6994	237.8451	191.8278	98.6900	38.7788	0.0000	0.0000	0.0000	0.0000	81.0597	202.6929	334.2018 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Water heating	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating requirement	219.3336	193.9549	206.2464	182.0656	176.9222	159.9144	158.2969	164.3831	165.9407	184.4210	195.2983	217.0584 (64)
Efficiency of water heater (217)m	84.7740	84.3383	83.7195	82.5914	81.1845	79.8000	79.8000	79.8000	79.8000	82.2045	83.9635	79.8000 (216)
Fuel for water heating, kWh/month	258.7274	229.9726	246.3542	220.4412	217.9261	200.3940	198.3671	205.9939	207.9457	224.3440	232.5990	255.8215 (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	24.7132	19.8259	17.8510	13.0784	10.1021	8.2535	9.2155	11.9787	15.5591	20.4144	23.0580	25.4001 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-24.1854	-35.2074	-52.2235	-60.6446	-67.0531	-63.1926	-62.4437	-58.1627	-50.8394	-41.1570	-26.9915	-20.7838 (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)												

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(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	-10.4526	-22.3030	-44.9200	-68.3322	-91.1945	-91.9321	-90.8252	-76.4859	-55.5348	-32.1474	-14.0376	-8.2401	(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												1511.7955	(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												2698.8865	(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)												199.4499	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1169.2900	(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												3326.8419	(238)

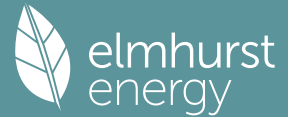
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1511.7955	0.2100	317.4771	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2698.8865	0.2100	566.7662	(264)
Space and water heating			884.2432	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	199.4499	0.1443	28.7868	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-562.8847	0.1339	-75.3806	
PV Unit electricity exported	-606.4054	0.1255	-76.1209	
Total			-151.5015	(269)
Total CO2, kg/year			773.4577	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			10.9000	(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	1511.7955	1.1300	1708.3289	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2698.8865	1.1300	3049.7418	(278)
Space and water heating			4758.0707	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	199.4499	1.5338	305.9229	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-562.8847	1.4949	-841.4574	
PV Unit electricity exported	-606.4054	0.4608	-279.4057	
Total			-1120.8631	(283)
Total Primary energy kWh/year			4073.2312	(286)
Target Primary Energy Rate (TPER)			57.3900	(287)

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Property Reference	M2.2 (2)_Copy_Copy				Issued on Date	28/06/2024	
Assessment Reference	00001_Copy_Copy_Copy			Prop Type Ref	5.11		
Property	143						
SAP Rating	83 B		DER	4.37		TER	12.36
Environmental	97 A		% DER < TER				64.64
CO ₂ Emissions (t/year)	0.28		DFEE	38.34		TFEE	38.42
Compliance Check	See BREL		% DFEE < TFEE				0.20
% DPER < TPER	26.54		DPER	47.54		TPER	64.71
Assessor Details	Miss Eleanor Ballinger				Assessor ID	M976-0001	
Client							

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)
Ground floor	36.6800 (1b)	x 2.4000 (2b)	= 88.0320 (1b) - (3b)
First floor	36.6700 (1c)	x 2.7000 (2c)	= 99.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	73.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 187.0410 (5)

2. Ventilation rate

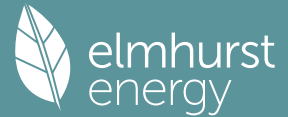
											m3 per hour	
Number of open chimneys											0 * 80 =	0.0000 (6a)
Number of open flues											0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire											0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler											0 * 20 =	0.0000 (6d)
Number of flues attached to other heater											0 * 35 =	0.0000 (6e)
Number of blocked chimneys											0 * 20 =	0.0000 (6f)
Number of intermittent extract fans											0 * 10 =	0.0000 (7a)
Number of passive vents											0 * 10 =	0.0000 (7b)
Number of flueless gas fires											0 * 40 =	0.0000 (7c)
											Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											0.0000 / (5) =	0.0000 (8)
Pressure test											Yes	
Pressure Test Method											Blower Door	
Measured/design AP50											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 - centralised												
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
Window (Uw = 1.20)			11.6000	1.1450	13.2824		(27)
Door			2.0600	1.0000	2.0600		(26)
Ground Floor			36.6700	0.1200	4.4004	110.0000	4033.7000 (28a)
External Wall 1	87.3600	13.6600	73.7000	0.2000	14.7400	60.0000	4422.0000 (29a)
Main Roof	36.6700		36.6700	0.1500	5.5005	9.0000	330.0300 (30a)
Total net area of external elements Aum(A, m ²)			160.7000				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	39.9833		(33)
Party Wall 1			43.6600	0.0000	0.0000	180.0000	7858.8000 (32)
Internal Wall 1			115.0000			9.0000	1035.0000 (32c)
Internal Floor 1			36.6700			18.0000	660.0600 (32d)
Internal Ceiling 1			36.6700			9.0000	330.0300 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	18669.6200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							254.5279 (35)
List of Thermal Bridges							

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Solar gains	56.8383	111.1878	183.1104	267.0556	327.2867	335.0362	318.9681	273.9889	212.9650	131.9336	70.8707	46.7410 (83)
Total gains	573.5362	638.9653	689.6852	755.7959	792.0155	783.3796	750.8401	706.9635	658.6041	592.5286	558.9176	553.1234 (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	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	67.8978	
alpha	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	5.5265	
util living area	0.9933	0.9869	0.9712	0.9180	0.7972	0.6058	0.4447	0.4917	0.7394	0.9410	0.9861	0.9945 (86)	
Living	19.9628	20.1196	20.3568	20.6614	20.8840	20.9791	20.9968	20.9945	20.9411	20.6521	20.2498	19.9227	
Non living	19.1168	19.2716	19.5032	19.7889	19.9762	20.0402	20.0483	20.0476	20.0198	19.7868	19.4014	19.0771	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4694	20.1196	20.3568	20.6614	20.8840	20.9791	20.9968	20.9945	20.9411	20.6521	20.2498	20.0734 (87)	
Th 2	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491	20.0491 (88)	
util rest of house	0.9912	0.9828	0.9619	0.8925	0.7426	0.5236	0.3502	0.3928	0.6597	0.9169	0.9810	0.9928 (89)	
MIT 2	19.5721	19.2716	19.5032	19.7889	19.9762	20.0402	20.0483	20.0476	20.0198	19.7868	19.4014	19.2131 (90)	
Living area fraction									FLA = Living area / (4) =				0.2442 (91)
MIT	19.7912	19.4786	19.7116	20.0020	20.1979	20.2695	20.2799	20.2788	20.2448	19.9981	19.6085	19.4232 (92)	
Temperature adjustment												0.0000	
adjusted MIT	19.7912	19.4786	19.7116	20.0020	20.1979	20.2695	20.2799	20.2788	20.2448	19.9981	19.6085	19.4232 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9905	0.9797	0.9578	0.8910	0.7518	0.5432	0.3733	0.4171	0.6773	0.9153	0.9779	0.9913 (94)
Useful gains	568.0867	625.9726	660.6138	673.4357	595.4445	425.5603	280.2959	294.8499	446.0469	542.3532	546.5598	548.3081 (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	1183.2135	1113.5101	1009.0970	847.9633	649.0651	433.0315	281.0677	296.2619	469.3366	717.8230	955.3966	1162.7381 (97)
Space heating kWh	457.6544	327.6253	259.2715	125.6599	39.8937	0.0000	0.0000	0.0000	0.0000	130.5495	294.3625	457.1360 (98a)
Space heating requirement - total per year (kWh/year)												2092.1528
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000
Space heating kWh	457.6544	327.6253	259.2715	125.6599	39.8937	0.0000	0.0000	0.0000	0.0000	130.5495	294.3625	457.1360 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2092.1528
Space heating per m2										(98c) / (4) =		28.5229 (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 %)												218.2352 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	457.6544	327.6253	259.2715	125.6599	39.8937	0.0000	0.0000	0.0000	0.0000	130.5495	294.3625	457.1360 (98)
Space heating efficiency (main heating system 1)	218.2352	218.2352	218.2352	218.2352	218.2352	0.0000	0.0000	0.0000	0.0000	218.2352	218.2352	218.2352 (210)
Space heating fuel (main heating system)	209.7070	150.1249	118.8037	57.5800	18.2802	0.0000	0.0000	0.0000	0.0000	59.8206	134.8832	209.4694 (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	257.2569	227.6027	241.8400	212.5126	205.9717	185.5455	182.9832	190.2098	192.2735	214.4849	228.2012	254.4128 (64)
Efficiency of water heater (217)m	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346	176.5346 (216)
Fuel for water heating, kWh/month	145.7260	128.9281	136.9930	120.3801	116.6750	105.1043	103.6529	107.7465	108.9155	121.4974	129.2672	144.1150 (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	4.2831	3.8686	4.2831	4.1449	4.2831	4.1449	4.2831	4.2831	4.1449	4.2831	4.1449	4.2831 (231)
Lighting	23.1074	18.5376	16.6911	12.2286	9.4457	7.7172	8.6167	11.2003	14.5481	19.0879	21.5597	23.7496 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-10.7551	-18.1834	-31.6543	-41.8141	-49.7507	-47.8487	-46.9437	-41.3918	-32.3985	-22.6770	-12.6397	-8.8998 (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)	-1.5911	-4.1275	-10.4295	-19.7725	-30.2910	-32.3321	-31.5590	-24.6617	-15.6752	-6.9990	-2.3525	-1.1911 (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												958.6690 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)

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Efficiency of water heater	176.5346	
Water heating fuel used	1469.0009	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans: (MEVCentralised, Database: in-use factor = 1.3000, SFP = 0.2210)		
mechanical ventilation fans (SFP = 0.2210)	50.4300	(230a)
Total electricity for the above, kWh/year	50.4300	(231)
Electricity for lighting (calculated in Appendix L)	186.4898	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-545.9391	(233)
Wind generation	0.0000	(234)
Hydro-electric generation (Appendix N)	0.0000	(235a)
Electricity generated - Micro CHP (Appendix N)	0.0000	(235)
Appendix Q - special features		
Energy saved or generated	-0.0000	(236)
Energy used	0.0000	(237)
Total delivered energy for all uses	2118.6505	(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	958.6690	0.1561	149.6726 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1469.0009	0.1409	206.9642 (264)
Space and water heating			356.6368 (265)
Pumps, fans and electric keep-hot	50.4300	0.1387	6.9953 (267)
Energy for lighting	186.4898	0.1443	26.9162 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-364.9568	0.1316	-48.0365
PV Unit electricity exported	-180.9823	0.1205	-21.8005
Total			-69.8370 (269)
Total CO2, kg/year			320.7113 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			4.3700 (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	958.6690	1.5780	1512.7709 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1469.0009	1.5210	2234.2787 (278)
Space and water heating			3747.0496 (279)
Pumps, fans and electric keep-hot	50.4300	1.5128	76.2905 (281)
Energy for lighting	186.4898	1.5338	286.0443 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-364.9568	1.4863	-542.4315
PV Unit electricity exported	-180.9823	0.4419	-79.9695
Total			-622.4010 (283)
Total Primary energy kWh/year			3486.9835 (286)
Dwelling Primary energy Rate (DPER)			47.5400 (287)

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

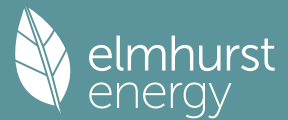
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	36.6800 (1b)	x 2.4000 (2b)	= 88.0320 (1b) - (3b)
First floor	36.6700 (1c)	x 2.7000 (2c)	= 99.0090 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	73.3500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 187.0410 (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) = 0.1604 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4104 (18)
Number of sides sheltered	1 (19)

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Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.3796 (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													
Effective ac	0.4840	0.4745	0.4650	0.4176	0.4081	0.3606	0.3606	0.3511	0.3796	0.4081	0.4271	0.4460	(22b)
	0.6171	0.6126	0.6081	0.5872	0.5833	0.5650	0.5650	0.5617	0.5721	0.5833	0.5912	0.5995	(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	
TER Opaque door			2.0600	1.0000	2.0600			(26)
TER Opening Type (Uw = 1.20)			11.6000	1.1450	13.2824			(27)
Ground Floor			36.6700	0.1300	4.7671			(28a)
External Wall 1	87.3600	13.6600	73.7000	0.1800	13.2660			(29a)
Main Roof	36.6700		36.6700	0.1100	4.0337			(30)
Total net area of external elements Aum(A, m2)			160.7000					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	37.4092		(33)
Party Wall 1			43.6600	0.0000	0.0000			(32)

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

254.5279 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E5 Ground floor (normal)	17.1300	0.1600	2.7408	
E6 Intermediate floor within a dwelling	17.1300	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	8.5800	0.0600	0.5148	
E12 Gable (insulation at ceiling level)	8.5600	0.0600	0.5136	
E16 Corner (normal)	10.2000	0.0900	0.9180	
E18 Party wall between dwellings	10.2000	0.0600	0.6120	
P1 Party wall - Ground floor	8.5600	0.0800	0.6848	
P4 Party wall - Roof (insulation at ceiling level)	8.5600	0.1200	1.0272	
P2 Party wall - Intermediate floor within a dwelling	0.0000	0.0000	0.0000	
E2 Other lintels (including other steel lintels)	8.1900	0.0500	0.4095	
E3 Sill	7.2100	0.0500	0.3605	
E4 Jamb	15.9000	0.0500	0.7950	

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

8.5762 (36)

Point Thermal Bridges

(36a) = 0.0000

Total fabric heat loss

(33) + (36) + (36a) = 45.9854 (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	38.0915	37.8108	37.5356	36.2431	36.0013	34.8755	34.8755	34.6670	35.3091	36.0013	36.4905	37.0019	(38)
Heat transfer coeff	84.0770	83.7962	83.5210	82.2285	81.9867	80.8610	80.8610	80.6525	81.2946	81.9867	82.4759	82.9874	(39)
Average = Sum(39)m / 12 =												82.2274	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.1462	1.1424	1.1387	1.1210	1.1177	1.1024	1.1024	1.0996	1.1083	1.1177	1.1244	1.1314	(40)
HLP (average)												1.1210	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.3246 (42)
Hot water usage for mixer showers	63.1961	62.2464	60.8625	58.2146	56.2605	54.0814	52.8427	54.2162	55.7217	58.0615	60.7662	62.9540	(42a)
Hot water usage for baths	27.2996	26.8942	26.3232	25.2705	24.4823	23.6082	23.1361	23.7030	24.3203	25.2556	26.3300	27.2073	(42b)
Hot water usage for other uses	38.4366	37.0389	35.6412	34.2435	32.8458	31.4481	31.4481	32.8458	34.2435	35.6412	37.0389	38.4366	(42c)
Average daily hot water use (litres/day)												118.5181	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	128.9323	126.1795	122.8269	117.7286	113.5886	109.1377	107.4269	110.7650	114.2856	118.9583	124.1351	128.5979	(44)
Energy conte	204.1973	179.6779	188.7804	161.1646	152.9121	134.1975	129.9236	137.1502	140.9255	161.4253	176.8532	201.3532	(45)
Energy content (annual)										Total = Sum(45)m =		1968.5608	
Distribution loss (46)m = 0.15 x (45)m	30.6296	26.9517	28.3171	24.1747	22.9368	20.1296	19.4885	20.5725	21.1388	24.2138	26.5280	30.2030	(46)

Water storage loss:

Store volume													250.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8903 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.0208 (55)
Total storage loss													

If cylinder contains dedicated solar storage

31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	(56)
31.6444	28.5820	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	30.6236	31.6444	30.6236	31.6444	31.6444	(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

Total heat required for water heating calculated for each month												
	259.1041	229.2711	243.6872	214.3002	207.8189	187.3331	184.8304	192.0570	194.0611	216.3321	229.9889	256.2600 (62)
WWHRS	-28.8906	-25.5511	-26.7556	-22.1547	-20.6474	-17.6681	-16.5611	-17.6110	-18.2801	-21.5503	-24.4138	-28.3556 (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	230.2134	203.7200	216.9315	192.1455	187.1715	169.6650	168.2693	174.4460	175.7810	194.7818	205.5750	227.9044	(64)
Total per year (kWh/year)												2346.6043	(64)
Electric shower(s)												2347	(64)

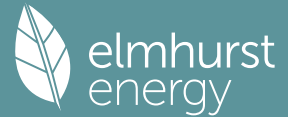
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
												0.0000	(64a)

Heat gains from water heating, kWh/month

111.8210	99.4175	106.6949	96.0957	94.7687	87.1292	87.1250	89.5279	89.3662	97.5993	101.3122	110.8754	(65)
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5. Internal gains (see Table 5 and 5a)

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Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316	116.2316 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	108.1168	119.7007	108.1168	111.7207	108.1168	111.7207	108.1168	108.1168	111.7207	108.1168	111.7207	108.1168 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	204.9862	207.1133	201.7530	190.3417	175.9369	162.3984	153.3539	151.2267	156.5870	167.9984	182.4032	195.9416 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232	34.6232 (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)												
	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853	-92.9853 (71)
Water heating gains (Table 5)												
	150.2971	147.9427	143.4071	133.4663	127.3773	121.0127	117.1035	120.3332	124.1198	131.1819	140.7114	149.0260 (72)
Total internal gains												
	524.2695	535.6262	514.1464	496.3981	472.3004	453.0013	436.4436	437.5462	450.2969	468.1665	495.7047	513.9539 (73)

6. Solar gains

[Jan]		Area m ²	Solar flux Table 6a W/m ²	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W
East		3.7100	19.6403	0.6300	0.7000	0.7700	22.2686 (76)
West		7.8900	19.6403	0.6300	0.7000	0.7700	47.3583 (80)
Solar gains							
	69.6269	136.2050	224.3103	327.1431	400.9262	410.4193	390.7359
Total gains							
	593.8964	671.8312	738.4567	823.5412	873.2266	863.4206	827.1795
							335.6364
							260.8821
							161.6187
							86.8166
							57.2578 (83)
							571.2117 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	61.6816	61.8883	62.0922	63.0682	63.2542	64.1349	64.1349	64.3006	63.7928	63.2542	62.8790	62.4915
alpha	5.1121	5.1259	5.1395	5.2045	5.2169	5.2757	5.2757	5.2867	5.2529	5.2169	5.1919	5.1661
util living area												
	0.9929	0.9857	0.9678	0.9068	0.7774	0.5826	0.4272	0.4746	0.7268	0.9365	0.9851	0.9941 (86)
MIT												
	19.8258	20.0090	20.2833	20.6405	20.8787	20.9789	20.9965	20.9942	20.9360	20.6191	20.1713	19.8054 (87)
Th 2												
	19.9632	19.9663	19.9694	19.9837	19.9864	19.9989	19.9989	20.0012	19.9941	19.9864	19.9809	19.9753 (88)
util rest of house												
	0.9906	0.9812	0.9573	0.8782	0.7190	0.4987	0.3316	0.3743	0.6436	0.9104	0.9796	0.9922 (89)
MIT 2												
	18.6152	18.8494	19.1949	19.6339	19.8905	19.9877	19.9979	19.9993	19.9541	19.6215	19.0676	18.5981 (90)
Living area fraction												
									fLA = Living area / (4) =			0.2442 (91)
MIT												
	18.9108	19.1325	19.4606	19.8797	20.1318	20.2297	20.2417	20.2422	20.1939	19.8651	19.3371	18.8929 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	18.9108	19.1325	19.4606	19.8797	20.1318	20.2297	20.2417	20.2422	20.1939	19.8651	19.3371	18.8929 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9873	0.9762	0.9508	0.8748	0.7280	0.5186	0.3550	0.3989	0.6613	0.9066	0.9748	0.9893 (94)
Useful gains	586.3391	655.8752	702.1103	720.4189	635.7215	447.7407	293.6548	308.4010	470.2794	570.9521	567.8357	565.1152 (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												
	1228.4322	1192.6311	1082.4867	902.8450	691.2979	455.2250	294.4717	309.8831	495.3970	759.6138	1009.2627	1219.3241 (97)
Space heating kWh												
	477.7173	360.7000	283.0000	131.3468	41.3489	0.0000	0.0000	0.0000	0.0000	140.3643	317.8275	486.7314 (98a)
Space heating requirement - total per year (kWh/year)												2239.0362
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												
	477.7173	360.7000	283.0000	131.3468	41.3489	0.0000	0.0000	0.0000	0.0000	140.3643	317.8275	486.7314 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2239.0362
Space heating per m ²												(98c) / (4) =
												30.5254 (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												
	477.7173	360.7000	283.0000	131.3468	41.3489	0.0000	0.0000	0.0000	0.0000	140.3643	317.8275	486.7314 (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)												
	517.5702	390.7909	306.6089	142.3042	44.7983	0.0000	0.0000	0.0000	0.0000	152.0740	344.3418	527.3363 (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												
	230.2134	203.7200	216.9315	192.1455	187.1715	169.6650	168.2693	174.4460	175.7810	194.7818	205.5750	227.9044 (64)
Efficiency of water heater												
												79.8000 (216)
(217)m												
	85.6584	85.3266	84.6570	83.2248	81.2908	79.8000	79.8000	79.8000	79.8000	83.3375	85.0333	85.7170 (217)
Fuel for water heating, kWh/month												

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	268.7575	238.7532	256.2476	230.8752	230.2493	212.6128	210.8638	218.6040	220.2769	233.7266	241.7583	265.8801	(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	22.4645	18.0219	16.2267	11.8884	9.1829	7.5025	8.3770	10.8887	14.1434	18.5568	20.9599	23.0889	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	-34.3770	-48.4932	-69.7482	-78.4803	-84.6846	-79.0748	-78.1074	-73.7155	-65.9620	-55.4878	-37.8075	-29.7185	(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	-19.3297	-40.6776	-80.8742	-121.5002	-160.6806	-161.4482	-159.5382	-135.0590	-98.9727	-58.1716	-25.8087	-15.2835	(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												2425.8247	(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												2828.6052	(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)												181.3016	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1813.0009	(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												3708.7306	(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	2425.8247	0.2100	509.4232 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2828.6052	0.2100	594.0071 (264)
Space and water heating			1103.4303 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	181.3016	0.1443	26.1674 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-735.6567	0.1346	-98.9967
PV Unit electricity exported	-1077.3442	0.1259	-135.6264
Total			-234.6230 (269)
Total CO2, kg/year			906.9039 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.3600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2425.8247	1.1300	2741.1819 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2828.6052	1.1300	3196.3239 (278)
Space and water heating			5937.5058 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	181.3016	1.5338	278.0865 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-735.6567	1.4973	-1101.5309
PV Unit electricity exported	-1077.3442	0.4621	-497.8419
Total			-1599.3729 (283)
Total Primary energy kWh/year			4746.3202 (286)
Target Primary Energy Rate (TPER)			64.7100 (287)