

Energy and Sustainability Statement

Project

Rollys Lane, Ashwell

Client

Urbanspace Planning

Dated

14.04.2026

G2 Architecture

Office 3, Broadmeads

Pumping Station

Hertford Road, Ware

SG12 9LH

T : 01279 626262

E : STUDIO@G2.CO.UK

W : G2.co.uk



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Proposed development: Two new dwellings (Plot 01 Type 02 and Plot 02 Type 01) – Tennis Courts, Rollys Lane, Baldock, SG7 (minor residential development)

1.0 Purpose and policy context

1.1 This statement has been prepared to demonstrate that the proposed development responds positively to North Hertfordshire District Council's Sustainability Supplementary Planning Document (SPD, 02 September 2024), and to summarise the sustainability measures incorporated within the scheme.

1.2 The proposal is a minor residential scheme (less than 10 dwellings). The SPD requires, as a minimum, an EPC of C or above and submission of a Sustainability Statement including Energy Use Intensity (EUI) and Space Heating Demand (SHD) calculations, alongside recommendations toward the Council's targets.

1.3 The design meets the SPD Bronze requirements and also aligns with key elements of the SPD Silver expectations under Checklist 1 (passive design / fabric performance), including high energy performance, low-carbon heating, and a substantial improvement over Part L targets (see Section 2).

2.0 Checklist 1: Optimising passive design and fabric performance (SAP-led evidence)

2.1 Site layout, orientation and glazing approach

2.1.1 The submitted site plans include a north point; the dwellings are arranged to provide good daylight and solar access where practicable while maintaining residential amenity.

2.1.2 SAP opening schedules confirm glazing is distributed across north/east/south aspects, with south-facing openings included to support useful solar gain, balanced against heat-loss control via high-performance glazing.

2.1.3 Overheating risk will be managed through a balanced glazing strategy, controllable ventilation (including purge ventilation via openable windows), and compliance with Building Regulations Part O at detailed design stage (with assessment provided if required).

2.2 High-performance fabric (fabric-first)

2.2.1 The SAP/BREL outputs and SAP summary confirm a strong fabric specification, with (typical averages):

- External walls: 0.18 W/m²K
- Ground floor: 0.12 W/m²K
- Roofs: SAP includes multiple roof constructions (joisted roof 0.11 W/m²K; rafted roof 0.14 W/m²K; eaves void 0.10 W/m²K), with an average roof U-value reported around 0.12 W/m²K.
- Windows: typically, 1.0 W/m²K (openings listed in SAP)

2.2.2 Airtightness is specified at 3.2 m³/h·m² @50Pa (design value) for both plots, supporting reduced heat loss and improved comfort.

2.2.3 Mechanical Ventilation with Heat Recovery (MVHR) is specified, with heat recovery efficiency 85% (and SFP 1.3 W/(l/s)), improving indoor air quality while limiting ventilation heat losses.

2.3 Low-carbon heating and hot water (no fossil fuel heating)

2.3.1 Both dwellings use an electric air source heat pump system with low temperature operation (45°C flow) and stated efficiency in the SAP compliance report (approx. 285%).

2.3.2 No on-site fossil fuel (e.g. gas boiler) heating is proposed, supporting the SPD's direction toward lower-carbon alternatives.

2.4 SAP results: EPC/SAP rating, carbon compliance, EUI and SHD

2.4.1 SAP rating and EPC banding

- Plot 01: SAP rating 81 (Band B); Environmental Impact 96 (Band A).
- Plot 02: SAP rating 81 (Band B); Environmental Impact 96 (Band A).

This exceeds the SPD Bronze requirement of EPC C or above and supports the SPD Silver aim for the majority of homes to achieve EPC B.

2.4.2 Building Regulations Part L performance (carbon reduction over TER)

- Plot 01: DER 3.95 vs TER 11.31 kgCO₂/m²/yr (approx. 65% better than TER).
- Plot 02: DER 3.89 vs TER 11.05 kgCO₂/m²/yr (approx. 65% better than TER).

This exceeds the SPD Silver expectation for significant on-site CO₂ reductions beyond Part L (the SPD references 35% as a Silver benchmark for Checklist 1).

2.4.3 Energy Use Intensity (EUI) – derived from SAP delivered energy (regulated uses)

In line with the SPD requirement to report EUI, the SAP outputs show total delivered energy for regulated uses of:

- Plot 01: 3,544 kWh/year over 134.94 m² = approx. 26.3 kWh/m²/year.
- Plot 02: 3,777 kWh/year over 142.92 m² = approx. 26.4 kWh/m²/year.

The SPD's EUI benchmark is expressed as operational energy and includes an allowance for unregulated energy. The regulated EUI reported above demonstrates very low regulated energy demand; a total operational EUI (including the SPD/RIBA unregulated allowance) can be confirmed at technical design stage if required by condition.

2.4.4 Space Heating Demand (SHD)

The SAP outputs indicate:

- Plot 01 SHD: 28.49 kWh/m²/year.
- Plot 02 SHD: 28.69 kWh/m²/year.

This aligns with the SPD's stated SHD benchmark of 30 kWh/m²/year (where referenced as a target).

3.0 Checklist 2: Achieving low carbon energy (renewables)

3.1 The scheme delivers low operational carbon through a fabric-first building envelope, MVHR, and all-electric air source heat pumps, as evidenced in the SAP/BREL outputs.

3.2 The SAP compliance reports record "Local generation: N/A" for both plots (i.e. no on-site electricity generation/PV is included within the current SAP model).

3.3 Solar PV has been considered, but is not proposed at this stage due to the site's heritage sensitivity (nearby listed buildings / Conservation Area) and the potential visual impact on the roofscape in key views. The scheme achieves strong energy and carbon performance without PV (EPC B and Part L compliance demonstrated through SAP).

4.0 Water efficiency (SPD and Part G)

4.1 NHDC is within an area of serious water stress and the SPD requires a 110 litres/person/day target and evidence (Part G2 water calculator) prior to occupation.

4.2 The dwellings will be specified with water-efficient fittings (low-flow taps and showers, dual-flush WCs, efficient appliances) and the Part G water calculation will be provided to demonstrate compliance with the 110 l/p/d requirement.

5.0 Sustainable drainage and flood risk (SuDS)

5.1 A site-specific Flood Risk Assessment (FRA) and SuDS Strategy has been prepared for the development (EAS, January 2026). This confirms the site is located in Flood Zone 1 (low probability of flooding) and sets out an infiltration-led surface water strategy for the two dwellings.

5.2 In line with the SuDS hierarchy and subject to confirmation by infiltration testing at detailed design stage, surface water will be managed on-site via infiltration features (including permeable paving/drive areas, rain garden planters and soakaways), with exceedance routing and a maintenance approach identified within the SuDS Strategy.

6.0 Biodiversity and landscape (BNG)

6.1 The SPD expects biodiversity enhancement and, where applicable, a measurable Biodiversity Net Gain approach.

6.2 A landscape strategy will prioritise native, wildlife-supporting planting and opportunities for habitat features (e.g. bird/bat boxes where appropriate). A BNG calculation (and Habitat Management and Monitoring Plan if required) will be prepared and submitted in line with current BNG requirements.

7.0 Sustainable travel and EV charging

7.1 The SPD requires EV charging to comply with Building Regulations Part S, and references 7kW provision for dwellings.

7.2 Each dwelling will be provided with EV charging infrastructure (minimum Part S compliant provision, with 7kW capability) and secure cycle storage can be accommodated within the plots to support active travel.

8.0 Construction, materials, waste and pollution (proportionate to scale)

8.1 A fabric-first approach inherently reduces whole-life impacts by lowering operational energy demand. Materials will be selected to be durable and responsibly sourced where practicable, with preference for locally available products to reduce transport emissions.

8.2 During construction, good practice measures will be adopted to minimise waste and pollution (segregation and recycling of waste, responsible storage of materials, and dust/noise control).

8.3 Adequate on-plot storage will be provided for refuse and recycling, aligned with local collection requirements.

9.0 Summary of compliance and items to be confirmed by separate submissions

9.1 Confirmed by SAP evidence:

- EPC/SAP: both dwellings achieve SAP 81 (Band B) and Environmental Impact 96 (Band A).
- Part L: approx. 65% better than TER on DER for both plots; ASHP + MVHR specified; airtightness 3.2 m³/h·m² @50Pa.
- SHD: 28.49 and 28.69 kWh/m²/year.

9.2 To be provided/confirmed (typical planning conditions or supporting documents):

- Part G2 water calculation demonstrating 110 l/p/d.

Conclusion

The proposed two-dwelling development is designed around a fabric-first approach and all-electric, low-carbon heating. The SAP evidence demonstrates EPC B performance, strong airtightness, MVHR, low SHD, and a substantial improvement over Part L targets. This satisfies the NHDC Sustainability SPD Bronze requirements for minor residential development and supports many of the SPD's Silver aspirations under Checklist 1, while transparently identifying the further supporting documents to be submitted/secured by condition where applicable.

Appendix 1 – Energy Statement Data



SAP Calculations Compliance Summary

(England Approved Document L (2021 edition) Building Regulations)

Site Address	Plot 01 (Type 02), Rollys Lane, Baldock, SG7 ; Plot 02 (Type 01), Rollys Lane, Baldock, SG7
Project reference	SE453111
Assessment Date	22/01/2026
Version	v0
Assessor ID	WH



Site address	Plot 01 (Type 02), Rollys Lane, Baldock, SG7 ; Plot 02 (Type 01), Rollys Lane, Baldock, SG7
Reference	SE453111
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Version	v0
Assessor ID	WH

The above project has **PASSED** the SAP assessment(s) based on the specification outlined over the following pages.

Please review this document as it outlines the specification used within the design-stage SAP assessment, as well as the photographic requirements during construction.

The specification has been derived by following the details on the drawings provided and/or communication with the architect/client/contractor. If necessary, Energytest recommends the drawings to be updated to match the specification outlined on this summary.

Energytest strongly recommends any proposed deviations from this specification to be communicated with the assessor to ensure compliance in perpetuity. Energytest cannot be held responsible for any deviations from this specification that result in non-compliance.

Also included alongside this summary will be the following documents:

- BREL Report
- Design SAP Calculations
- Predicted Energy Assessment (PEA)

Fabric Specification

<i>Element</i>	<i>U-value**</i>	<i>Specification*</i>
Ground floor	0.12	Screed, on 150mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$), on concrete floor slab
External cavity wall	0.18	Masonry (brickworks) outer leaf, may have render or cladding outer finish, on 100mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$) partially filled cavity, 100mm medium dense concrete blockworks ($\lambda \leq 0.60\text{W/mK}$) inner leaf, plasterboard on dabs
Dormer cheeks	0.14	Cladding on battens external finish, 150mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$) fitted between 150mm timber frame, 50mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$) fitted internally of frame, plasterboard finish
Dwarf wall	0.21	Eaves void externally, 150mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$) fitted between 150mm timber frame, plasterboard finish (U-value adjustment for eaves void applied)
Internal partitions	-	Blockworks partition walls throughout - refer to floor plan
Joisted roof	0.11	Total 400mm mineral wool loft insulation ($\lambda \leq 0.044\text{W/mK}$) fitted between and above ceiling joists, plasterboard ceiling finish
Raftered roof	0.14	Roof finish externally, 150mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$) fitted between roof rafters, 50mm PIR rigid insulation ($\lambda \leq 0.022\text{W/mK}$) fitted underside of rafters, plasterboard ceiling finish
Eaves void	0.10	Total 400mm mineral wool loft insulation ($\lambda \leq 0.044\text{W/mK}$) fitted between and above ceiling joists, plasterboard ceiling finish (U-value adjustment for eaves void applied)
Windows	1.00	Triple glazed windows / glazed door units
Doors	1.40	Composite personnel door, double or triple glazed french doors

* Where specific products are listed, an alternative with the same thermal conductivity (W/mK) may be used

** The U Value stated is the "whole window" U Value (not centre pane)

Thermal Bridging

Lintels	Keystone Hi-therm+ thermally broken lintels, or similar approved
Thermal bridging details	Recognised Construction Details specified on all relevant junctions

Air Tightness

Design air permeability rate	3.20 m ³ /h.m ² @ 50PA
	To be tested post construction

Ventilation*

Ventilation system	Ventilation via a Mechanical Ventilation with Heat Recovery (MVHR) unit. Extract from the kitchen(s) and 3 wet rooms. System to achieve Specific Fan Power (SFP) ≤ 1.30 W/l/s and heat exchange efficiency $\geq 85\%$. Final model ~T.B.C.
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*Please check any alternative models to ensure compliance

Lighting

Lighting efficacy	No less than 75 lm/W
Lighting count	Light fittings efficacy ≥ 75 lm/W throughout, final number of light fittings T.B.C.

Space Heating

Main heating system*	Fuel: Grid supplied electricityType: Air source heat pump - Global energy Systems Thurso (THUR410MOD1) (Preliminary, final model T.B.C.)
Heating emitters	Radiators throughout
Heating controls	• Programmer• Room / appliance thermostat• Thermostatic radiator valves (TRVs)• Time and temperature zone control
Secondary heating system	None Specified

*Please check any alternative models to ensure compliance

Domestic Hot Water

Water heating	From main system: Heat pump feeding into a 300 litres hot water cylinder
Showers	(default)

Low or Zero Carbon Technologies

Summary of Photographic Evidence Requirements for New Dwellings

Under Approved Document L1 (2021), new homes in England must include photographic evidence of build quality, consistent with SAP calculations, as part of the sign-off process.

Key Requirements:

- Photos must be high-quality and geotagged to verify location, date, and time.
- Details to be photographed include foundations, external walls, roofs, openings, airtightness, and building services.
- Photos should be labeled with plot numbers and taken at key construction stages.

Responsibility:

- Builders/contractors must provide the photos, which will be reviewed by the SAP assessor.

Photos can be submitted online. Scan the QR code below:



Failure to supply accurate photos can impact SAP compliance and the Energy Performance Certificate (EPC).

Build stage	AD L Photo Reference	Typical Example	
Oversite Foundations / sub-masonry / drains etc	1 A - GF perimeter insulation (SAP ref. E5)		Photograph should show a continuous strip of insulation in contact with the walls around the perimeter of the ground floor.
	1 B - Door threshold (SAP ref. E3)		Photographs should show a strip of insulation or insulated cavity closer in the threshold zone.
	1 C - Below DPC on external walls		Moisture-resistant insulation should be fitted below damp-proof course level and extend to the foundation block / structure.
Roofed Masonry to plate / joists / roofing etc	2A - GF to external wall junction (SAP ref. E5)		External or cavity wall insulation should extend below the damp proof course.
	2 B - Structural penetrating elements (SAP ref. E1/2)		Lintel type - one photo required per opening type.

Roofed Masonry to plate / joists / roofing etc	3 A - Roof at joist / rafter level	 	Insulation should be installed tight to the structure, without air gaps , and should extend to the wall insulation.
	3 B - Roof at eaves / gables edges (SAP ref. E10, E11, E12, E13)	 	Eaves photographs should show loft insulation extending beyond the wall insulation to minimise cold bridging. Gable photographs should show the insulation against the inner surface of the external / part walls to minimise cold bridging.
	4 A , 4 B - Window / door position to cavity closer / insulation line (SAP ref. E4)		One photo per window / door type is sufficient. Good practice to show a tape measure to check the window / door is in line with the cavity closer / insulation
	5 - Airtightness issues		Other photographs showing items that penetrate the air barrier are sealed. (if not covered by other photographs).
Completion Carpets / decorations / CML etc	6 A - Plant / equipment identification		Photos should show the labels clearly identifying the make and model of the heating system and hot water and hot water cylinder. Other plant could be included too, such as MVHR etc.
	6 B - Primary pipework insulation		Photos to show that all primary pipework is insulated accordingly.
	6 C - Ventilation ductwork insulation		Only needed for ductwork in unheated spaces and should show the insulated ductwork used.

Building Regulations England Part L (BREL) Compliance Report

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

Date: Thu 22 Jan 2026 10:56:37

Project Information			
Assessed By	Yik Shun Wilson Ho	Building Type	House, Detached
OCDEA Registration	EES/022836	Assessment Date	2026-01-22

Dwelling Details			
Assessment Type	As designed	Total Floor Area	135 m ²
Site Reference	SE453111 - Ashwell Tennis 01	Plot Reference	01DSv0
Address	Plot 01 (Type 02) Rollys Lane, Baldock, SG7		

Client Details	
Name	
Company	
Address	

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	11.31 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	3.95 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	59.48 kWh _{PE} /m ²		
Dwelling primary energy	41.43 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	47.5 kWh/m ²		
Dwelling fabric energy efficiency	47.1 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (3) (0.21)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.12	Ground floor (0.12)	OK
Roofs	0.16	0.12	Roof (2) (0.14)	OK
Windows, doors, and roof windows	1.6	1.13	Opening 3 (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

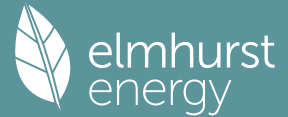
2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	138.54	0.18
Exposed wall: Walls (2)	4.246306	0.14 (!)
Sheltered wall: Walls (3)	12.54	0.21
Ground floor: Ground floor, Ground floor	71.33	0.12
Exposed roof: Roof (1)	48.75	0.11
Exposed roof: Roof (2)	27.13	0.14
Exposed roof: Roof (3)	4.98	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening 1, W	4.88	North	0.7	1 (!)
Opening 2, W	5.63	East	0.7	1 (!)
Opening 3, D	1.68	East	N/A	1.4
Opening 4, W	5.2	South	0.7	1 (!)
Opening 5, D	6.33	South	N/A	1.4
Opening 6, W	1.313694	South	0.7	1 (!)
Opening 7, W	2.36	West	0.7	1 (!)
Opening 8, D	1.77	West	N/A	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.068	Hi-therm+
External wall	E2: Other lintels (including other steel lintels)	SAP table default	1	timber
External wall	E3: Sill	Calculated by person with suitable expertise	0.027 (!)	RCDs
External wall	E3: Sill	SAP table default	0.1	timber
External wall	E4: Jamb	Calculated by person with suitable expertise	0.022 (!)	RCDs
External wall	E4: Jamb	SAP table default	0.1	timber
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.098	RCDs
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCDs
External wall	E6: Intermediate floor within a dwelling	SAP table default	0.14	looks like E24
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.069	RCDs
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.02 (!)	RCDs
External wall	E11: Eaves (insulation at rafter level)	SAP table default	0.15	timber
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.097	RCDs
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.06	RCDs
External wall	E13: Gable (insulation at rafter level)	SAP table default	0.25	timber
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.046	RCDs
External wall	E16: Corner (normal)	SAP table default	0.18	timber
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.081	RCDs
External wall	E17: Corner (inverted - internal area greater than external area)	SAP table default	0 (!)	timber
Roof	R5: Ridge (inverted)	SAP table default	0.12	
Roof	R6: Flat ceiling	SAP table default	0.12	
Roof	R7: Flat ceiling (inverted)	SAP table default	0.12	inverted E13
Roof	R8: Roof to wall (rafter)	SAP table default	0.12	
3 Air permeability (better than typically expected values are flagged with a subsequent (!))				
Maximum permitted air permeability at 50Pa		8 m³/hm²		
Dwelling air permeability at 50Pa		3.2 m³/hm², Design value (!)		OK
Air permeability test certificate reference				
4 Space heating				
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity				
Efficiency	285.0%			
Emitter type	Radiators			
Flow temperature	45°C			
System type	Heat Pump			
Manufacturer	Global Energy Systems			
Model	Thurso			
Commissioning				
Secondary heating system: N/A				
Fuel	N/A			
Efficiency	N/A			
Commissioning				

5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	1.3 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	85%	OK
Manufacturer/Model	(targets)	
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Plot Reference	SE453111 - Ashwell Tennis 01				Issued on Date	22/01/2026	
Assessment Reference	01DSv0		Plot Type Ref		Plot 01 Type 02		
Plot Address	Plot 01 (Type 02), Rollys Lane, Baldock, SG7				SAP Version	10.2	
SAP Rating	81 B	DER	3.95	TER	11.31		
Environmental	96 A	% DER < TER				65.08	
CO ₂ Emissions (t/year)	0.51	DFEE	47.12	TFEE	47.53		
Compliance Check	See BREL	% DFEE < TFEE				0.85	
% DPER < TPER	30.35	DPER	41.43	TPER	59.48		
Assessor Details	Mr. Yik Shun Wilson Ho				Assessor ID	T635-0001	
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)
Main dwelling			
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	345.2920 (5)

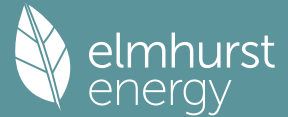
2. Ventilation rate

											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													3.2000 (17)		
Infiltration rate													0.1600 (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) =		0.1480 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)			
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)			
Adj infilt rate															
	0.1887	0.1850	0.1813	0.1628	0.1591	0.1406	0.1406	0.1369	0.1480	0.1591	0.1665	0.1739 (22b)			
Balanced mechanical ventilation with heat recovery															
If mechanical ventilation													0.5000 (23a)		
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)		
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													76.5000 (23c)		
Effective ac	0.3062	0.3025	0.2988	0.2803	0.2766	0.2581	0.2581	0.2544	0.2655	0.2766	0.2840	0.2914 (25)			

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
W			19.3800	0.9615	18.6346		(27)
D			9.7800	1.4000	13.6920		(26a)
Ground floor			71.3300	0.1200	8.5596		(28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372	110.0000	7846.3000 (29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1400	0.5950	9.0000	38.2500 (29a)
Dwarf wall	12.5400		12.5400	0.2100	2.6334	9.0000	112.8600 (29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625	9.0000	438.7500 (30)
Raftered roof	27.1300		27.1300	0.1400	3.7982	9.0000	244.1700 (30)
Eaves void	4.9800		4.9800	0.1043	0.5192	9.0000	44.8200 (30)
Total net area of external elements A _{um} (A, m ²)			336.6800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.7318		(33)
Main dwelling							
Internal wall (masonry)			223.2000			55.0000	12276.0000 (32c)
Internal Floor 1			63.6100			18.0000	1144.9800 (32d)

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Internal Ceiling 1					63.6100					9.0000					572.4900 (32e)									
Heat capacity Cm = Sum(A x k)										(28)...(30) + (32) + (32a)...(32e) =										37958.0200 (34)				
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K																				281.2955 (35)				
List of Thermal Bridges																								
K1 Element					Length					Psi-value					Total									
E2 Other lintels (including other steel lintels)					19.5500					0.0680					1.3294									
E2 Other lintels (including other steel lintels)					1.2400					1.0000					1.2400									
E3 Sill					13.7100					0.0270					0.3702									
E3 Sill					1.2400					0.1000					0.1240									
E4 Jamb					35.4100					0.0220					0.7790									
E4 Jamb					2.1200					0.1000					0.2120									
E5 Ground floor (normal)					38.9200					0.0980					3.8142									
E6 Intermediate floor within a dwelling					26.5200					0.0010					0.0265									
E6 Intermediate floor within a dwelling					12.3000					0.1400					1.7220									
E10 Eaves (insulation at ceiling level)					7.5800					0.0690					0.5230									
E11 Eaves (insulation at rafter level)					13.3200					0.0200					0.2664									
E11 Eaves (insulation at rafter level)					5.9200					0.1500					0.8880									
E12 Gable (insulation at ceiling level)					15.3600					0.0970					1.4899									
E13 Gable (insulation at rafter level)					9.5100					0.0600					0.5706									
E13 Gable (insulation at rafter level)					0.6000					0.2500					0.1500									
E16 Corner (normal)					22.3700					0.0460					1.0290									
E16 Corner (normal)					12.2000					0.1800					2.1960									
E17 Corner (inverted - internal area greater than external area)					5.0700					-0.0810					-0.4107									
E17 Corner (inverted - internal area greater than external area)					3.5700					0.0000					0.0000									
R5 Ridge (inverted)					6.3400					0.1200					0.7608									
R6 Flat ceiling					32.0300					0.1200					3.8436									
R7 Flat ceiling (inverted)					6.6000					0.1200					0.7920									
R8 Roof to wall (rafter)					5.8200					0.1200					0.6984									
Thermal bridges (Sum(L x Psi) calculated using Appendix K)																				22.4144 (36)				
Point Thermal bridges																				(36a) = 0.0000				
Total fabric heat loss										(33) + (36) + (36a) =										101.1461 (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	(38)										
Heat transfer coeff		34.8904	34.4688	34.0472	31.9392	31.5176	29.4096	29.4096	28.9880	30.2528	31.5176	32.3608	33.2040	(38)										
Average = Sum(39)m / 12 =		136.0365	135.6149	135.1933	133.0853	132.6637	130.5557	130.5557	130.1341	131.3989	132.6637	133.5069	134.3501	(39)										
		132.9799																						
HLP		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)										
HLP (average)		1.0081	1.0050	1.0019	0.9863	0.9831	0.9675	0.9675	0.9644	0.9738	0.9831	0.9894	0.9956	(40)										
Days in mont		31	28	31	30	31	30	31	31	30	31	30	31											
													31											

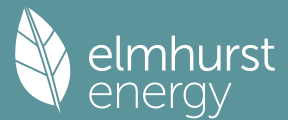
4. Water heating energy requirements (kWh/year)																								

Assumed occupancy																								
Hot water usage for mixer showers																								
		82.0762	80.8428	79.0454	75.6065	73.0686	70.2384	68.6297	70.4135	72.3689	75.4076	78.9204	81.7618	(42a)										
Hot water usage for baths		31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905	(42b)										
Hot water usage for other uses		44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981	(42c)										
Average daily hot water use (litres/day)		145.2362												(43)										
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec											
Daily hot water use		157.9714	154.6557	150.5851	144.3171	139.2553	133.8022	131.6488	135.7012	139.9832	145.7155	152.0824	157.5504	(44)										
Energy conte		250.1880	220.2276	231.4437	197.5629	187.4644	164.5254	159.2178	168.0264	172.6133	197.7346	216.6692	246.6859	(45)										
Energy content (annual)		Total = Sum(45)m = 2412.3592																						
Distribution loss (46)m = 0.15 x (45)m																								
		37.5282	33.0341	34.7166	29.6344	28.1197	24.6788	23.8827	25.2040	25.8920	29.6602	32.5004	37.0029	(46)										
Water storage loss (or HIU loss):																								
Store volume														300.0000 (47)										
a) If manufacturer declared loss factor is known (kWh/day):														2.3300 (48)										
Temperature factor from Table 2b														0.5400 (49)										
Enter (49) or (54) in (55)														1.2582 (55)										
Total storage loss		39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(56)										
If cylinder contains dedicated solar storage		39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(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		289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901	(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		289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901	(64)										
		Total per year (kWh/year) = Sum(64)m = 2871.6022 (64)																						
12Total per year (kWh/year)		2872 (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		83.1875	73.2257	76.9550	65.6897	62.3319	54.7047	52.9399	55.8688	57.3939	65.7467	72.0425	82.0231	(65)										

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

Metabolic gains (Table 5), Watts																								
(66)m		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)										
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5		168.2297	186.2543	168.2297	173.8374	168.2297	173.8374	168.2297	168.2297	173.8374	168.2297	173.8374	168.2297	(67)										
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5		303.5813	306.7315	298.7930	281.8930	260.5597	240.5094	227.1146	223.9644	231.9029	248.8029	270.1362	290.1865	(68)										
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5		37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	(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)		-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	(71)										
Water heating gains (Table 5)																								

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Total internal gains	111.8112	108.9668	103.4342	91.2356	83.7795	75.9787	71.1558	75.0924	79.7138	88.3693	100.0591	110.2460 (72)
	650.2236	668.5540	637.0583	613.5674	579.1703	556.9270	533.1016	533.8880	552.0554	572.0033	610.6341	635.2636 (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				4.8800	10.6334		0.6800		0.7000		0.7700		17.1172 (74)
East				5.6300	19.6403		0.6800		0.7000		0.7700		36.4750 (76)
South				6.5100	46.7521		0.6800		0.7000		0.7700		100.3973 (78)
West				2.3600	19.6403		0.6800		0.7000		0.7700		15.2897 (80)

Solar gains	169.2792	298.3995	431.7990	569.2237	665.0252	671.2818	642.6564	570.1589	479.5801	336.4437	204.6658	143.5910	(83)
Total gains	819.5028	966.9536	1068.8573	1182.7911	1244.1955	1228.2088	1175.7580	1104.0469	1031.6355	908.4470	815.2999	778.8547	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.5078	77.7488	77.9913	79.2266	79.4784	80.7617	80.7617	81.0233	80.2434	79.4784	78.9764	78.4807
alpha	6.1672	6.1833	6.1994	6.2818	6.2986	6.3841	6.3841	6.4016	6.3496	6.2986	6.2651	6.2320
util living area	0.9988	0.9964	0.9893	0.9573	0.8593	0.6606	0.4860	0.5372	0.8023	0.9742	0.9967	0.9991 (86)
Living	19.9242	20.0964	20.3309	20.6448	20.8776	20.9819	20.9977	20.9959	20.9412	20.6322	20.2254	19.9029
Non living	18.8151	19.0371	19.3370	19.7350	19.9973	20.1009	20.1098	20.1118	20.0677	19.7282	19.2126	18.7957
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	20.4496	20.0964	20.3309	20.6448	20.8776	20.9819	20.9977	20.9959	20.9412	20.6322	20.2254	20.0563 (87)
Th 2	20.0766	20.0792	20.0818	20.0948	20.0974	20.1105	20.1105	20.1131	20.1053	20.0974	20.0922	20.0870 (88)
util rest of house	0.9984	0.9950	0.9851	0.9406	0.8110	0.5776	0.3892	0.4364	0.7268	0.9609	0.9953	0.9988 (89)
MIT 2	19.5736	19.0371	19.3370	19.7350	19.9973	20.1009	20.1098	20.1118	20.0677	19.7282	19.2126	19.0284 (90)
Living area fraction												
MIT	19.8238	19.3396	19.6208	19.9948	20.2487	20.3525	20.3634	20.3642	20.3171	19.9863	19.5017	19.3219 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8238	19.3396	19.6208	19.9948	20.2487	20.3525	20.3634	20.3642	20.3171	19.9863	19.5017	19.3219 (93)

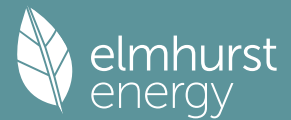
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9935	0.9823	0.9384	0.8199	0.6009	0.4170	0.4653	0.7462	0.9588	0.9940	0.9984 (94)
Useful gains	818.0393	960.6791	1049.9853	1109.8899	1020.1756	738.0502	490.2375	513.7679	769.8059	870.9813	810.3819	777.6330 (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	2111.8001	1958.2253	1773.8406	1476.5519	1134.0959	751.0201	491.3285	515.8830	816.9225	1245.2217	1655.7180	2031.6289 (97)
Space heating kWh	962.5581	670.3510	538.5483	263.9967	84.7567	0.0000	0.0000	0.0000	0.0000	278.4349	608.6419	932.9730 (98a)
Space heating requirement - total per year (kWh/year)												4340.2606
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	962.5581	670.3510	538.5483	263.9967	84.7567	0.0000	0.0000	0.0000	0.0000	278.4349	608.6419	932.9730 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4340.2606
Space heating per m2										(98c) / (4) =		32.1644 (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 %)												284.9881 (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	962.5581	670.3510	538.5483	263.9967	84.7567	0.0000	0.0000	0.0000	0.0000	278.4349	608.6419	932.9730 (98)
Space heating efficiency (main heating system 1)	284.9881	284.9881	284.9881	284.9881	284.9881	0.0000	0.0000	0.0000	0.0000	284.9881	284.9881	284.9881 (210)
Space heating fuel (main heating system)	337.7538	235.2207	188.9722	92.6343	29.7404	0.0000	0.0000	0.0000	0.0000	97.7005	213.5675	327.3726 (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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (64)
Efficiency of water heater (217)m	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482 (216)
Fuel for water heating, kWh/month	104.8755	92.6415	98.0778	85.3347	82.1288	73.3537	71.8851	75.0796	76.2867	85.8532	92.2636	103.6054 (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	65.1158	58.8143	65.1158	63.0153	65.1158	63.0153	65.1158	65.1158	63.0153	65.1158	63.0153	65.1158 (231)
Lighting	35.7645	28.6916	25.8336	18.9268	14.6196	11.9444	13.3365	17.3353	22.5168	29.5433	33.3691	36.7585 (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)

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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													1522.9620	(211)
Space heating fuel - main system 2													0.0000	(213)
Space heating fuel - secondary													0.0000	(215)
Efficiency of water heater													275.7482	
Water heating fuel used													1041.3855	(219)
Space cooling fuel													0.0000	(221)
Electricity for pumps and fans:														
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)														
mechanical ventilation fans (SFP = 1.8200)													766.6864	(230a)
Total electricity for the above, kWh/year													766.6864	(231)
Electricity for lighting (calculated in Appendix L)													288.6403	(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													3619.6741	(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	1522.9620	0.1561	237.6721	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1041.3855	0.1411	146.9602	(264)
Space and water heating			384.6323	(265)
Pumps, fans and electric keep-hot	766.6864	0.1387	106.3488	(267)
Energy for lighting	288.6403	0.1443	41.6597	(268)
Total CO2, kg/year			532.6408	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.9500	(273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	1522.9620	1.5777	2402.8363	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1041.3855	1.5218	1584.8025	(278)
Space and water heating			3987.6388	(279)
Pumps, fans and electric keep-hot	766.6864	1.5128	1159.8431	(281)
Energy for lighting	288.6403	1.5338	442.7261	(282)
Total Primary energy kWh/year			5590.2080	(286)
Dwelling Primary energy Rate (DPER)			41.4300	(287)

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

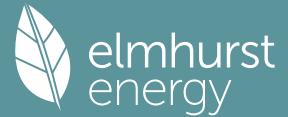
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)	
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400			(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 345.2920 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											
Pressure test	Air changes per hour											
Pressure Test Method	40.0000 / (5) = 0.1158 (8)											
Measured/design AP50	Yes											
Infiltration rate	Blower Door											
Number of sides sheltered	5.0000 (17)											
	0.3658 (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) = 0.3384 (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	0.4315	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976 (22b)
	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5573	0.5662	0.5725	0.5791 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			9.7800	1.0000	9.7800			(26a)
TER Opening Type			19.3800	1.1450	22.1908			(27)
Ground floor			71.3300	0.1300	9.2729			(28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372			(29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1800	0.7650			(29a)
Dwarf wall	12.5400		12.5400	0.1800	2.2572			(29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625			(30)
Raftered roof	27.1300		27.1300	0.1100	2.9843			(30)
Eaves void	4.9800		4.9800	0.1100	0.5478			(30)
Total net area of external elements Aum(A, m2)			336.6800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 78.0977			(33)

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

List of Thermal Bridges 281.2955 (35)

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	19.5500	0.0500	0.9775	
E2 Other lintels (including other steel lintels)	1.2400	0.0500	0.0620	
E3 Sill	13.7100	0.0500	0.6855	
E3 Sill	1.2400	0.0500	0.0620	
E4 Jamb	35.4100	0.0500	1.7705	
E4 Jamb	2.1200	0.0500	0.1060	
E5 Ground floor (normal)	38.9200	0.1600	6.2272	
E6 Intermediate floor within a dwelling	26.5200	0.0000	0.0000	
E6 Intermediate floor within a dwelling	12.3000	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	7.5800	0.0600	0.4548	
E11 Eaves (insulation at rafter level)	13.3200	0.0400	0.5328	
E11 Eaves (insulation at rafter level)	5.9200	0.0400	0.2368	
E12 Gable (insulation at ceiling level)	15.3600	0.0600	0.9216	
E13 Gable (insulation at rafter level)	9.5100	0.0800	0.7608	
E13 Gable (insulation at rafter level)	0.6000	0.0800	0.0480	
E16 Corner (normal)	22.3700	0.0900	2.0133	
E16 Corner (normal)	12.2000	0.0900	1.0980	
E17 Corner (inverted - internal area greater than external area)	5.0700	-0.0900	-0.4563	
E17 Corner (inverted - internal area greater than external area)	3.5700	-0.0900	-0.3213	
R5 Ridge (inverted)	6.3400	0.0400	0.2536	
R6 Flat ceiling	32.0300	0.0600	1.9218	
R7 Flat ceiling (inverted)	6.6000	0.0400	0.2640	
R8 Roof to wall (rafter)	5.8200	0.0600	0.3492	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 17.9678 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 96.0655 (37)

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

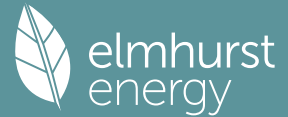
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	67.5795	67.1677	66.7640	64.8678	64.5130	62.8615	62.8615	62.5557	63.4977	64.5130	65.2307	65.9810 (38)
Average = Sum(39)m / 12 =	163.6451	163.2332	162.8295	160.9333	160.5786	158.9271	158.9271	158.6212	159.5632	160.5786	161.2963	162.0466 (39)
												160.9316

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.2127	1.2097	1.2067	1.1926	1.1900	1.1778	1.1778	1.1755	1.1825	1.1900	1.1953	1.2009 (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	2.9068 (42)											
Hot water usage for mixer showers												
Hot water usage for baths	72.9567	71.8603	70.2626	67.2058	64.9499	62.4342	61.0042	62.5898	64.3279	67.0290	70.1515	72.6771 (42a)
Hot water usage for other uses	31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905 (42b)
Average daily hot water use (litres/day)	44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981 (42c)
												136.8282 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	148.8518	145.6731	141.8023	135.9164	131.1366	125.9979	124.0233	127.8774	131.9422	137.3369	143.3134	148.4658 (44)
Energy content (annual)	235.7448	207.4366	217.9448	186.0627	176.5350	154.9291	149.9954	158.3390	162.6979	186.3649	204.1763	232.4615 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):	35.3617	31.1155	32.6917	27.9094	26.4803	23.2394	22.4993	23.7508	24.4047	27.9547	30.6264	34.8692 (46)
Store volume	150.0000 (47)											
a) If manufacturer declared loss factor is known (kWh/day):	1.3938 (48)											
Temperature factor from Table 2b	0.5400 (49)											
Enter (49) or (54) in (55)	0.7527 (55)											
Total storage loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)
If cylinder contains dedicated solar storage	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (57)

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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												
	282.3397	249.5223	264.5397	231.1546	223.1299	200.0210	196.5903	204.9339	207.7898	232.9598	249.2681	279.0564 (62)
WWHRS	-33.3527	-29.4974	-30.8880	-25.5765	-23.8364	-20.3970	-19.1189	-20.3310	-21.1035	-24.8787	-28.1845	-32.7351 (63a)
PV diverter	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Output from w/h	248.9870	220.0249	233.6517	205.5781	199.2935	179.6240	177.4714	184.6028	186.6863	208.0811	221.0836	246.3213 (64)
Total per year (kWh/year)												2511.4058 (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												
	115.6611	102.6412	109.7426	97.9393	95.9738	87.5874	87.1494	89.9236	90.1705	99.2422	103.9621	114.5694 (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	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	163.3668	180.8704	163.3668	168.8123	163.3668	168.8123	163.3668	163.3668	168.8123	163.3668	168.8123	163.3668 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.5813	306.7315	298.7930	281.8930	260.5597	240.5094	227.1146	223.9644	231.9029	248.8029	270.1362	290.1865 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338 (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)	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704 (71)
Water heating gains (Table 5)	155.4584	152.7399	147.5035	136.0268	128.9971	121.6492	117.1363	120.8651	125.2369	133.3901	144.3918	153.9911 (72)
Total internal gains	692.0079	709.9432	679.2647	656.3336	622.5250	597.5724	574.2191	574.7977	592.5535	615.1612	652.9417	677.1457 (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					4.8800	10.6334	0.6300	0.7000	0.7700	15.8585 (74)		
East					5.6300	19.6403	0.6300	0.7000	0.7700	33.7931 (76)		
South					6.5100	46.7521	0.6300	0.7000	0.7700	93.0151 (78)		
West					2.3600	19.6403	0.6300	0.7000	0.7700	14.1655 (80)		

Solar gains	156.8322	276.4584	400.0490	527.3690	616.1262	621.9228	595.4023	528.2354	444.3168	311.7052	189.6169	133.0329 (83)
Total gains	848.8401	986.4016	1079.3137	1183.7026	1238.6512	1219.4952	1169.6214	1103.0331	1036.8703	926.8664	842.5586	810.1786 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.4315	64.5940	64.7542	65.5172	65.6619	66.3442	66.3442	66.4722	66.0797	65.6619	65.3697	65.0671
alpha	5.2954	5.3063	5.3169	5.3678	5.3775	5.4229	5.4229	5.4315	5.4053	5.3775	5.3580	5.3378
util living area	0.9986	0.9965	0.9915	0.9717	0.9104	0.7589	0.5825	0.6360	0.8680	0.9808	0.9967	0.9989 (86)
MIT	19.6512	19.8225	20.0755	20.4279	20.7374	20.9340	20.9871	20.9797	20.8555	20.4535	19.9939	19.6287 (87)
Th 2	19.9098	19.9123	19.9147	19.9259	19.9280	19.9378	19.9378	19.9397	19.9340	19.9280	19.9237	19.9193 (88)
util rest of house	0.9980	0.9952	0.9879	0.9590	0.8691	0.6629	0.4501	0.5026	0.7951	0.9697	0.9952	0.9985 (89)
MIT 2	18.3425	18.5632	18.8873	19.3371	19.7025	19.9009	19.9341	19.9331	19.8358	19.3760	18.7914	18.3204 (90)
Living area fraction	18.7162	18.9227	19.2266	19.6485	19.9980	20.1959	20.2348	20.2319	20.1269	19.6837	19.1348	18.6939 (91)
MIT	18.7162	18.9227	19.2266	19.6485	19.9980	20.1959	20.2348	20.2319	20.1269	19.6837	19.1348	18.6939 (92)
Temperature adjustment	18.7162	18.9227	19.2266	19.6485	19.9980	20.1959	20.2348	20.2319	20.1269	19.6837	19.1348	18.6939 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9971	0.9934	0.9848	0.9548	0.8723	0.6882	0.4884	0.5411	0.8104	0.9663	0.9935	0.9978 (94)
Useful gains	846.4133	979.9233	1062.9280	1130.1499	1080.4471	839.2993	571.2216	596.8662	840.3312	895.6351	837.0824	808.3673 (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	2359.1370	2288.9773	2072.2603	1729.7984	1332.4789	889.3434	577.6663	607.8250	961.6785	1458.6424	1941.1609	2348.6921 (97)
Space heating kWh	1125.4665	879.6843	750.9432	431.7470	187.5116	0.0000	0.0000	0.0000	0.0000	418.8774	794.9365	1146.0016 (98a)
Space heating requirement - total per year (kWh/year)												5735.1682
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	1125.4665	879.6843	750.9432	431.7470	187.5116	0.0000	0.0000	0.0000	0.0000	418.8774	794.9365	1146.0016 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5735.1682
Space heating per m2										(98c) / (4) =		42.5016 (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)

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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	1125.4665	879.6843	750.9432	431.7470	187.5116	0.0000	0.0000	0.0000	0.0000	418.8774	794.9365	1146.0016	(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)	1219.3570	953.0708	813.5896	467.7648	203.1545	0.0000	0.0000	0.0000	0.0000	453.8217	861.2530	1241.6052	(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	248.9870	220.0249	233.6517	205.5781	199.2935	179.6240	177.4714	184.6028	186.6863	208.0811	221.0836	246.3213	(64)
Efficiency of water heater	87.0221	86.8405	86.4853	85.6829	83.9233	79.8000	79.8000	79.8000	79.8000	85.5960	86.6730	79.8000	(216)
Fuel for water heating, kWh/month	286.1194	253.3668	270.1634	239.9289	237.4710	225.0928	222.3952	231.3319	233.9427	243.0966	255.0780	282.9235	(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)
(217)m	87.0221	86.8405	86.4853	85.6829	83.9233	79.8000	79.8000	79.8000	79.8000	85.5960	86.6730	79.8000	(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	(221)
Lighting	33.9444	27.2314	24.5189	17.9636	13.8756	11.3365	12.6578	16.4531	21.3709	28.0398	31.6709	34.8878	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-62.1436	-85.3478	-119.5007	-130.6994	-137.8312	-127.4440	-125.7547	-120.1570	-109.9304	-95.7438	-67.4650	-53.9865	(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)	-42.2975	-88.0586	-173.4081	-258.1939	-339.3198	-340.2905	-336.3844	-285.8377	-210.8110	-125.2848	-56.2466	-33.5268	(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												6213.6166	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.8000	(216)
Water heating fuel used												2980.9103	(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) 273.9507 (232)

Energy saving/generation technologies (Appendices M ,N and Q)
 PV generation -3525.6640 (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 6028.8136 (238)

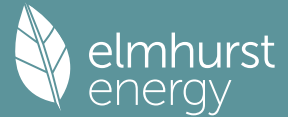
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	6213.6166	0.2100	1304.8595	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2980.9103	0.2100	625.9912	(264)
Space and water heating			1930.8506	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	273.9507	0.1443	39.5395	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1236.0041	0.1352	-167.0817	
PV Unit electricity exported	-2289.6599	0.1261	-288.8338	
Total			-455.9156	(269)
Total CO2, kg/year			1526.4039	(272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.3100	(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	6213.6166	1.1300	7021.3868	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2980.9103	1.1300	3368.4286	(278)
Space and water heating			10389.8154	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	273.9507	1.5338	420.1947	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1236.0041	1.4996	-1853.5507	
PV Unit electricity exported	-2289.6599	0.4631	-1060.2434	
Total			-2913.7941	(283)
Total Primary energy kWh/year			8026.3167	(286)
Target Primary Energy Rate (TPER)			59.4800	(287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	345.2920 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1158 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.2000 (17)
Infiltration rate	0.2758 (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) = 0.2552 (21)

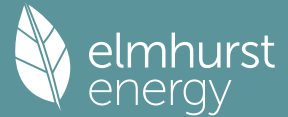
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	3.8000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.3253	0.3189	0.3126	0.2807	0.2743	0.2424	0.2424	0.2360	0.2552	0.2743	0.2871	0.2998 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5529	0.5509	0.5488	0.5394	0.5376	0.5294	0.5294	0.5279	0.5326	0.5376	0.5412	0.5449 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
W			19.3800	0.9615	18.6346		(27)
D			9.7800	1.4000	13.6920		(26a)
Ground floor			71.3300	0.1200	8.5596	110.0000	7846.3000 (28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372	110.0000	15239.4000 (29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1400	0.5950	9.0000	38.2500 (29a)
Dwarf wall	12.5400		12.5400	0.2100	2.6334	9.0000	112.8600 (29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625	9.0000	438.7500 (30)
Raftered roof	27.1300		27.1300	0.1400	3.7982	9.0000	244.1700 (30)
Eaves void	4.9800		4.9800	0.1043	0.5192	9.0000	44.8200 (30)
Total net area of external elements Aum(A, m ²)			336.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.7318		(33)
Main dwelling							
Internal wall (masonry)			223.2000			55.0000	12276.0000 (32c)
Internal Floor 1			63.6100			18.0000	1144.9800 (32d)
Internal Ceiling 1			63.6100			9.0000	572.4900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	37958.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							281.2955 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.5500	0.0680	1.3294
E2 Other lintels (including other steel lintels)	1.2400	1.0000	1.2400
E2 Other lintels (including other steel lintels)	13.7100	0.0270	0.3702
E3 Sill	1.2400	0.1000	0.1240
E4 Jamb	35.4100	0.0220	0.7790
E4 Jamb	2.1200	0.1000	0.2120
E5 Ground floor (normal)	38.9200	0.0980	3.8142
E6 Intermediate floor within a dwelling	26.5200	0.0010	0.0265
E6 Intermediate floor within a dwelling	12.3000	0.1400	1.7220
E10 Eaves (insulation at ceiling level)	7.5800	0.0690	0.5230
E11 Eaves (insulation at rafter level)	13.3200	0.0200	0.2664
E11 Eaves (insulation at rafter level)	5.9200	0.1500	0.8880
E12 Gable (insulation at ceiling level)	15.3600	0.0970	1.4899
E13 Gable (insulation at rafter level)	9.5100	0.0600	0.5706
E13 Gable (insulation at rafter level)	0.6000	0.2500	0.1500
E16 Corner (normal)	22.3700	0.0460	1.0290
E16 Corner (normal)	12.2000	0.1800	2.1960
E17 Corner (inverted - internal area greater than external area)	5.0700	-0.0810	-0.4107
E17 Corner (inverted - internal area greater than external area)	3.5700	0.0000	0.0000
R5 Ridge (inverted)	6.3400	0.1200	0.7608
R6 Flat ceiling	32.0300	0.1200	3.8436
R7 Flat ceiling (inverted)	6.6000	0.1200	0.7920
R8 Roof to wall (rafter)	5.8200	0.1200	0.6984
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.4144 (36)

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Point Thermal bridges
Total fabric heat loss

$$(33) + (36) + (36a) = 0.0000$$

$$101.1461 \quad (37)$$

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	63.0030	62.7688	62.5393	61.4613	61.2596	60.3207	60.3207	60.1469	60.6824	61.2596	61.6676	62.0942	(38)
Heat transfer coeff	164.1491	163.9149	163.6854	162.6074	162.4057	161.4669	161.4669	161.2930	161.8285	162.4057	162.8138	163.2403	(39)
Average = Sum(39)m / 12 =												162.6065	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2165	1.2147	1.2130	1.2050	1.2035	1.1966	1.1966	1.1953	1.1993	1.2035	1.2066	1.2097	(40)
HLP (average)												1.2050	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9068 (42)
Hot water usage for mixer showers													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths													
31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905	31.3905	(42b)
Hot water usage for other uses													
44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981	44.3981	(42c)
Average daily hot water use (litres/day)												69.5646	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	75.8951	73.8129	71.5397	68.7106	66.1867	63.5638	63.0191	65.2876	67.6143	70.3079	73.1619	75.7886	(44)
Energy conte	120.1993	105.1085	109.9538	94.0614	89.1000	78.1591	76.2161	80.8397	83.3752	95.4071	104.2326	118.6667	(45)
Energy content (annual)										Total = Sum(45)m =		1155.3196	
Distribution loss (46)m = 0.15 x (45)m													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	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	102.1694	89.3423	93.4607	79.9522	75.7350	66.4352	64.7837	68.7138	70.8690	81.0961	88.5977	100.8667	(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	102.1694	89.3423	93.4607	79.9522	75.7350	66.4352	64.7837	68.7138	70.8690	81.0961	88.5977	100.8667	(64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		982.0217	(64)
Electric shower(s)	58.4261	52.0582	56.8455	54.2470	55.2649	52.7174	54.4746	55.2649	54.2470	56.8455	55.7766	58.4261	(64a)
												664.5938	(64a)
Heat gains from water heating, kWh/month	40.1489	35.3501	37.5766	33.5498	32.7500	29.7881	29.8146	30.9947	31.2790	34.4854	36.0936	39.8232	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	168.2297	186.2543	168.2297	173.8374	168.2297	173.8374	168.2297	173.8374	168.2297	173.8374	168.2297	173.8374	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.5813	306.7315	298.7930	281.8930	260.5597	240.5094	227.1146	223.9644	231.9029	248.8029	270.1362	290.1865	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	(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)	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	(71)
Water heating gains (Table 5)	53.9636	52.6043	50.5061	46.5969	44.0188	41.3724	40.0733	41.6595	43.4430	46.3513	50.1300	53.5258	(72)
Total internal gains	592.3760	612.1916	584.1303	568.9287	539.4096	522.3207	502.0191	500.4551	515.7847	529.9854	560.7050	578.5434	(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				4.8800	10.6334		0.6800		0.7000		0.7700		17.1172 (74)
East				5.6300	19.6403		0.6800		0.7000		0.7700		36.4750 (76)
South				6.5100	46.7521		0.6800		0.7000		0.7700		100.3973 (78)
West				2.3600	19.6403		0.6800		0.7000		0.7700		15.2897 (80)
Solar gains	169.2792	298.3995	431.7990	569.2237	665.0252	671.2818	642.6564	570.1589	479.5801	336.4437	204.6658		143.5910 (83)
Total gains	761.6552	910.5911	1015.9293	1138.1524	1204.4348	1193.6024	1144.6756	1070.6139	995.3648	866.4291	765.3708		722.1345 (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	64.2337	64.3254	64.4156	64.8426	64.9232	65.3007	65.3007	65.3711	65.1547	64.9232	64.7605	64.5912	
alpha	5.2822	5.2884	5.2944	5.3228	5.3282	5.3534	5.3534	5.3581	5.3436	5.3282	5.3174	5.3061	
util living area													

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	0.9992	0.9976	0.9936	0.9764	0.9203	0.7762	0.6014	0.6600	0.8865	0.9859	0.9979	0.9994 (86)
MIT	19.5841	19.7623	20.0242	20.3866	20.7120	20.9233	20.9842	20.9746	20.8321	20.4018	19.9262	19.5536 (87)
Th 2	19.9069	19.9082	19.9096	19.9160	19.9172	19.9227	19.9227	19.9238	19.9206	19.9172	19.9148	19.9122 (88)
util rest of house												
	0.9988	0.9967	0.9908	0.9654	0.8818	0.6804	0.4644	0.5223	0.8182	0.9774	0.9969	0.9991 (89)
MIT 2	18.6191	18.7979	19.0595	19.4199	19.7220	19.8888	19.9192	19.9172	19.8292	19.4398	18.9670	18.5928 (90)
Living area fraction									fLA = Living area / (4) =			0.2855 (91)
MIT	18.8946	19.0733	19.3349	19.6959	20.0047	20.1842	20.2233	20.2191	20.1155	19.7145	19.2409	18.8671 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8946	19.0733	19.3349	19.6959	20.0047	20.1842	20.2233	20.2191	20.1155	19.7145	19.2409	18.8671 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9984	0.9957	0.9889	0.9626	0.8855	0.7059	0.5041	0.5623	0.8329	0.9753	0.9960	0.9988	(94)
Useful gains	760.4332	906.6706	1004.6106	1095.5380	1066.5291	842.5879	577.0568	602.0538	828.9914	845.0003	762.3428	721.2618	(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	2395.6971	2323.2109	2100.8890	1755.5011	1348.7239	901.6585	585.0378	616.0015	973.4846	1480.2429	1976.7049	2394.2658	(97)
Space heating kWh	1216.6364	951.9151	815.6312	475.1734	209.9529	0.0000	0.0000	0.0000	0.0000	472.6205	874.3407	1244.7150	(98a)
Space heating requirement - total per year (kWh/year)												6260.9851	
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	1216.6364	951.9151	815.6312	475.1734	209.9529	0.0000	0.0000	0.0000	0.0000	472.6205	874.3407	1244.7150	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6260.9851	
Space heating per m2												46.3983	(99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1517.7884	1194.8547	1225.8267	0.0000	0.0000	0.0000	0.0000	(100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7759	0.8640	0.8249	0.0000	0.0000	0.0000	0.0000	(101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1177.5987	1032.3033	1011.2031	0.0000	0.0000	0.0000	0.0000	(102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1313.1588	1259.5947	1176.5105	0.0000	0.0000	0.0000	0.0000	(103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	97.6033	169.1048	122.9887	0.0000	0.0000	0.0000	0.0000	(104)
Cooled fraction									fC = cooled area / (4) =			1.0000	(105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	(106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	24.4008	42.2762	30.7472	0.0000	0.0000	0.0000	0.0000	(107)
Space cooling requirement												97.4242	(107)
Energy for space heating												46.3983	(99)
Energy for space cooling												0.7220	(108)
Total												47.1203	(109)
Fabric Energy Efficiency (DFEE)												47.1	(109)

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

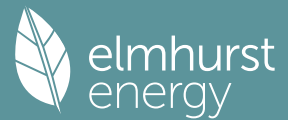
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 345.2920 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1158 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.3658 (18)
Number of sides sheltered	1 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.9250 (20)

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Infiltration rate adjusted to include shelter factor

(21) = (18) x (20) = 0.3384 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4315	0.4230	0.4145	0.3722	0.3638	0.3215	0.3215	0.3130	0.3384	0.3638	0.3807	0.3976	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5931	0.5895	0.5859	0.5693	0.5662	0.5517	0.5517	0.5490	0.5573	0.5662	0.5725	0.5791	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			9.7800	1.0000	9.7800			(26a)
TER Opening Type			19.3800	1.1450	22.1908			(27)
Ground floor			71.3300	0.1300	9.2729			(28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372			(29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1800	0.7650			(29a)
Dwarf wall	12.5400		12.5400	0.1800	2.2572			(29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625			(30)
Raftered roof	27.1300		27.1300	0.1100	2.9843			(30)
Eaves void	4.9800		4.9800	0.1100	0.5478			(30)
Total net area of external elements Aum(A, m2)			336.6800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 78.0977			(33)

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

281.2955 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.5500	0.0500	0.9775
E2 Other lintels (including other steel lintels)	1.2400	0.0500	0.0620
E3 Sill	13.7100	0.0500	0.6855
E3 Sill	1.2400	0.0500	0.0620
E4 Jamb	35.4100	0.0500	1.7705
E4 Jamb	2.1200	0.0500	0.1060
E5 Ground floor (normal)	38.9200	0.1600	6.2272
E6 Intermediate floor within a dwelling	26.5200	0.0000	0.0000
E6 Intermediate floor within a dwelling	12.3000	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	7.5800	0.0600	0.4548
E11 Eaves (insulation at rafter level)	13.3200	0.0400	0.5328
E11 Eaves (insulation at rafter level)	5.9200	0.0400	0.2368
E12 Gable (insulation at ceiling level)	15.3600	0.0600	0.9216
E13 Gable (insulation at rafter level)	9.5100	0.0800	0.7608
E13 Gable (insulation at rafter level)	0.6000	0.0800	0.0480
E16 Corner (normal)	22.3700	0.0900	2.0133
E16 Corner (normal)	12.2000	0.0900	1.0980
E17 Corner (inverted - internal area greater than external area)	5.0700	-0.0900	-0.4563
E17 Corner (inverted - internal area greater than external area)	3.5700	-0.0900	-0.3213
R5 Ridge (inverted)	6.3400	0.0400	0.2536
R6 Flat ceiling	32.0300	0.0600	1.9218
R7 Flat ceiling (inverted)	6.6000	0.0400	0.2640
R8 Roof to wall (rafter)	5.8200	0.0600	0.3492

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

Point Thermal bridges	(36a) =	0.0000	(36)
Total fabric heat loss	(33) + (36) + (36a) =	96.0655	(37)

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

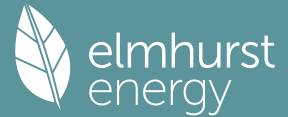
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	67.5795	67.1677	66.7640	64.8678	64.5130	62.8615	62.8615	62.5557	63.4977	64.5130	65.2307	65.9810	(38)
Heat transfer coeff	163.6451	163.2332	162.8295	160.9333	160.5786	158.9271	158.9271	158.6212	159.5632	160.5786	161.2963	162.0466	(39)
Average = Sum(39)m / 12 =													160.9316

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.2127	1.2097	1.2067	1.1926	1.1900	1.1778	1.1778	1.1755	1.1825	1.1900	1.1953	1.2009	(40)
HLP (average)													1.1926
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9068 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905	(42b)
Hot water usage for other uses	44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981	(42c)
Average daily hot water use (litres/day)													69.5646 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	75.8951	73.8129	71.5397	68.7106	66.1867	63.5638	63.0191	65.2876	67.6143	70.3079	73.1619	75.7886	(44)
Energy conte	120.1993	105.1085	109.9538	94.0614	89.1000	78.1591	76.2161	80.8397	83.3752	95.4071	104.2326	118.6667	(45)
Energy content (annual)										Total = Sum(45)m =			1155.3196
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	102.1694	89.3423	93.4607	79.9522	75.7350	66.4352	64.7837	68.7138	70.8690	81.0961	88.5977	100.8667	(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	102.1694	89.3423	93.4607	79.9522	75.7350	66.4352	64.7837	68.7138	70.8690	81.0961	88.5977	100.8667	(64)
Total per year (kWh/year) = Sum(64)m =													982.0217 (64)

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12Total per year (kWh/year)												982 (64)
Electric shower(s)	58.4261	52.0582	56.8455	54.2470	55.2649	52.7174	54.4746	55.2649	54.2470	56.8455	55.7766	58.4261 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												664.5938 (64a)
Heat gains from water heating, kWh/month	40.1489	35.3501	37.5766	33.5498	32.7500	29.7881	29.8146	30.9947	31.2790	34.4854	36.0936	39.8232 (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	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381	145.3381 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	163.3668	180.8704	163.3668	168.8123	163.3668	168.8123	163.3668	163.3668	168.8123	163.3668	168.8123	163.3668 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	303.5813	306.7315	298.7930	281.8930	260.5597	240.5094	227.1146	223.9644	231.9029	248.8029	270.1362	290.1865 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338	37.5338 (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)	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704 (71)
Water heating gains (Table 5)	53.9636	52.6043	50.5061	46.5969	44.0188	41.3724	40.0733	41.6595	43.4430	46.3513	50.1300	53.5258 (72)
Total internal gains	587.5130	606.8076	579.2673	563.9037	534.5467	517.2956	497.1562	495.5921	510.7597	525.1224	555.6799	573.6805 (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	4.8800	10.6334	0.6300	0.7000	0.7700	15.8585 (74)
East	5.6300	19.6403	0.6300	0.7000	0.7700	33.7931 (76)
South	6.5100	46.7521	0.6300	0.7000	0.7700	93.0151 (78)
West	2.3600	19.6403	0.6300	0.7000	0.7700	14.1655 (80)
Solar gains	156.8322	276.4584	400.0490	527.3690	616.1262	621.9228
Total gains	744.3452	883.2660	979.3164	1091.2727	1150.6729	1139.2184
595.4023 528.2354 444.3168 311.7052 189.6169 133.0329 (83)						
1092.5585 1023.8275 955.0765 836.8276 745.2968 706.7133 (84)						

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	64.4315	64.5940	64.7542	65.5172	65.6619	66.3442	66.3442	66.4722	66.0797	65.6619	65.3697	65.0671
alpha	5.2954	5.3063	5.3169	5.3678	5.3775	5.4229	5.4229	5.4315	5.4053	5.3775	5.3580	5.3378
util living area	0.9993	0.9980	0.9945	0.9799	0.9303	0.7928	0.6183	0.6760	0.8972	0.9877	0.9982	0.9994 (86)
MIT	19.5769	19.7498	20.0067	20.3698	20.6963	20.9180	20.9829	20.9730	20.8245	20.3943	19.9252	19.5548 (87)
Th 2	19.9098	19.9123	19.9147	19.9259	19.9280	19.9378	19.9378	19.9397	19.9340	19.9280	19.9237	19.9193 (88)
util rest of house	0.9990	0.9971	0.9922	0.9703	0.8952	0.6994	0.4805	0.5387	0.8329	0.9802	0.9973	0.9992 (89)
MIT 2	18.6143	18.7887	19.0462	19.4123	19.7189	19.9007	19.9339	19.9325	19.8367	19.4414	18.9730	18.5996 (90)
Living area fraction	18.8891	19.0631	19.3205	19.6857	19.9980	20.1912	20.2334	20.2296	20.1187	19.7135	19.2449	18.8723 (91)
MIT	18.8891	19.0631	19.3205	19.6857	19.9980	20.1912	20.2334	20.2296	20.1187	19.7135	19.2449	18.8723 (92)
Temperature adjustment												0.0000
adjusted MIT	18.8891	19.0631	19.3205	19.6857	19.9980	20.1912	20.2334	20.2296	20.1187	19.7135	19.2449	18.8723 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9986	0.9962	0.9904	0.9676	0.8980	0.7241	0.5205	0.5786	0.8462	0.9782	0.9965	0.9989 (94)
Useful gains	743.2750	879.9494	969.9447	1055.8774	1033.2719	824.8605	568.7303	592.4323	808.1860	818.5709	742.6867	705.9481 (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	2387.4410	2311.8879	2087.5529	1735.7762	1332.4818	888.5932	577.4495	607.4563	960.3654	1463.4331	1958.9210	2377.5999 (97)
Space heating kWh	1223.2595	962.2627	831.5005	489.5271	222.6122	0.0000	0.0000	0.0000	0.0000	479.7775	875.6887	1243.7089 (98a)
Space heating requirement - total per year (kWh/year)	6328.3371											
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	1223.2595	962.2627	831.5005	489.5271	222.6122	0.0000	0.0000	0.0000	0.0000	479.7775	875.6887	1243.7089 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6328.3371											
Space heating per m2	(98c) / (4) = 46.8974 (99)											

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	1493.9144	1176.0603	1205.5213	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7626	0.8540	0.8147	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1139.1976	1004.3712	982.1235	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1255.0410	1203.9028	1126.9115	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh												
	0.0000	0.0000	0.0000	0.0000	0.0000	83.4073	148.4516	107.7223	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction	fc = cooled area / (4) = 1.0000 (105)											
Intermittency factor (Table 10b)												
	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)

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Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	20.8518	37.1129	26.9306	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												84.8953 (107)
Energy for space heating												46.8974 (99)
Energy for space cooling												0.6291 (108)
Total												47.5265 (109)
Fabric Energy Efficiency (TFEE)												47.5 (109)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	345.2920 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	3.2000	(17)
Infiltration rate	0.1600	(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) =	0.1480 (21)

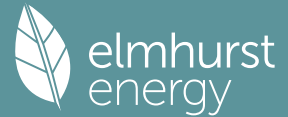
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.1887	0.1850	0.1813	0.1628	0.1591	0.1406	0.1406	0.1369	0.1480	0.1591	0.1665	0.1739 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.3062	0.3025	0.2988	0.2803	0.2766	0.2581	0.2581	0.2544	0.2655	0.2766	0.2840	0.2914 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
W			19.3800	0.9615	18.6346		(27)
D			9.7800	1.4000	13.6920		(26a)
Ground floor			71.3300	0.1200	8.5596	110.0000	7846.3000 (28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372	110.0000	15239.4000 (29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1400	0.5950	9.0000	38.2500 (29a)
Dwarf wall	12.5400		12.5400	0.2100	2.6334	9.0000	112.8600 (29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625	9.0000	438.7500 (30)
Raftered roof	27.1300		27.1300	0.1400	3.7982	9.0000	244.1700 (30)
Eaves void	4.9800		4.9800	0.1043	0.5192	9.0000	44.8200 (30)
Total net area of external elements Aum(A, m2)			336.6800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		78.7318		(33)
Main dwelling							
Internal wall (masonry)			223.2000			55.0000	12276.0000 (32c)
Internal Floor 1			63.6100			18.0000	1144.9800 (32d)
Internal Ceiling 1			63.6100			9.0000	572.4900 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	37958.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							281.2955 (35)

List of Thermal Bridges			
K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	19.5500	0.0680	1.3294
E2 Other lintels (including other steel lintels)	1.2400	1.0000	1.2400
E3 Sill	13.7100	0.0270	0.3702
E3 Sill	1.2400	0.1000	0.1240
E4 Jamb	35.4100	0.0220	0.7790
E4 Jamb	2.1200	0.1000	0.2120
E5 Ground floor (normal)	38.9200	0.0980	3.8142
E6 Intermediate floor within a dwelling	26.5200	0.0010	0.0265
E6 Intermediate floor within a dwelling	12.3000	0.1400	1.7220
E10 Eaves (insulation at ceiling level)	7.5800	0.0690	0.5230

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E11 Eaves (insulation at rafter level)	13.3200	0.0200	0.2664
E11 Eaves (insulation at rafter level)	5.9200	0.1500	0.8880
E12 Gable (insulation at ceiling level)	15.3600	0.0970	1.4899
E13 Gable (insulation at rafter level)	9.5100	0.0600	0.5706
E13 Gable (insulation at rafter level)	0.6000	0.2500	0.1500
E16 Corner (normal)	22.3700	0.0460	1.0290
E16 Corner (normal)	12.2000	0.1800	2.1960
E17 Corner (inverted - internal area greater than external area)	5.0700	-0.0810	-0.4107
E17 Corner (inverted - internal area greater than external area)	3.5700	0.0000	0.0000
R5 Ridge (inverted)	6.3400	0.1200	0.7608
R6 Flat ceiling	32.0300	0.1200	3.8436
R7 Flat ceiling (inverted)	6.6000	0.1200	0.7920
R8 Roof to wall (rafter)	5.8200	0.1200	0.6984
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			22.4144 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	101.1461 (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	34.8904	34.4688	34.0472	31.9392	31.5176	29.4096	29.4096	28.9880	30.2528	31.5176	32.3608	33.2040	(38)
Heat transfer coeff	136.0365	135.6149	135.1933	133.0853	132.6637	130.5557	130.5557	130.1341	131.3989	132.6637	133.5069	134.3501	(39)
Average = Sum(39)m / 12 =												132.9799	
HLP	1.0081	1.0050	1.0019	0.9863	0.9831	0.9675	0.9675	0.9644	0.9738	0.9831	0.9894	0.9956	(40)
HLP (average)												0.9855	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9068 (42)
Hot water usage for mixer showers	82.0762	80.8428	79.0454	75.6065	73.0686	70.2384	68.6297	70.4135	72.3689	75.4076	78.9204	81.7618	(42a)
Hot water usage for baths	31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905	(42b)
Hot water usage for other uses	44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981	(42c)
Average daily hot water use (litres/day)												145.2362	(43)
Daily hot water use	157.9714	154.6557	150.5851	144.3171	139.2553	133.8022	131.6488	135.7012	139.9832	145.7155	152.0824	157.5504	(44)
Energy conte	250.1880	220.2276	231.4437	197.5629	187.4644	164.5254	159.2178	168.0264	172.6133	197.7346	216.6692	246.6859	(45)
Energy content (annual)										Total = Sum(45)m =		2412.3592	
Distribution loss (46)m = 0.15 x (45)m	37.5282	33.0341	34.7166	29.6344	28.1197	24.6788	23.8827	25.2040	25.8920	29.6602	32.5004	37.0029	(46)
Water storage loss (or HIU loss):													
Store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3300	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2582	(55)
Total storage loss	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(56)
If cylinder contains dedicated solar storage	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901	(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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901	(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	83.1875	73.2257	76.9550	65.6897	62.3319	54.7047	52.9399	55.8688	57.3939	65.7467	72.0425	82.0231	(65)

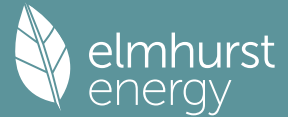
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.8600	36.2915	29.5142	22.3442	16.7025	14.1010	15.2366	19.8051	26.5824	33.7525	39.3941	41.9956	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	453.1064	457.8082	445.9597	420.7358	388.8951	358.9693	338.9771	334.2752	346.1237	371.3476	403.1883	433.1141	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	(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)	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	(71)
Water heating gains (Table 5)	111.8112	108.9668	103.4342	91.2356	83.7795	75.9787	71.1558	75.0924	79.7138	88.3693	100.0591	110.2460	(72)
Total internal gains	719.2601	716.5490	692.3907	647.7982	602.8596	562.5316	538.8520	542.6554	565.9024	606.9519	656.1241	698.8384	(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	4.8800	10.6334	0.6800	0.7000	0.7700	17.1172	(74)
East	5.6300	19.6403	0.6800	0.7000	0.7700	36.4750	(76)
South	6.5100	46.7521	0.6800	0.7000	0.7700	100.3973	(78)

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West	2.3600		19.6403		0.6800		0.7000		0.7700		15.2897 (80)	
Solar gains	169.2792	298.3995	431.7990	569.2237	665.0252	671.2818	642.6564	570.1589	479.5801	336.4437	204.6658	143.5910 (83)
Total gains	888.5393	1014.9486	1124.1897	1217.0219	1267.8848	1233.8134	1181.5085	1112.8142	1045.4825	943.3956	860.7899	842.4294 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.5078	77.7488	77.9913	79.2266	79.4784	80.7617	80.7617	81.0233	80.2434	79.4784	78.9764	78.4807
alpha	6.1672	6.1833	6.1994	6.2818	6.2986	6.3841	6.3841	6.4016	6.3496	6.2986	6.2651	6.2320
util living area	0.9981	0.9953	0.9862	0.9516	0.8509	0.6580	0.4837	0.5332	0.7954	0.9692	0.9956	0.9987 (86)
Living	19.9748	20.1310	20.3689	20.6640	20.8849	20.9823	20.9978	20.9961	20.9441	20.6541	20.2583	19.9497
Non living	18.8798	19.0811	19.3843	19.7573	20.0040	20.1012	20.1099	20.1119	20.0698	19.7538	19.2544	18.8556
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	20.4755	20.1310	20.3689	20.6640	20.8849	20.9823	20.9978	20.9961	20.9441	20.6541	20.2583	20.0966 (87)
Th 2	20.0766	20.0792	20.0818	20.0948	20.0974	20.1105	20.1105	20.1131	20.1053	20.0974	20.0922	20.0870 (88)
util rest of house	0.9974	0.9936	0.9809	0.9333	0.8014	0.5752	0.3873	0.4330	0.7193	0.9538	0.9937	0.9982 (89)
MIT 2	19.5994	19.0811	19.3843	19.7573	20.0040	20.1012	20.1099	20.1119	20.0698	19.7538	19.2544	19.0775 (90)
Living area fraction									FLA = Living area / (4) =			
MIT	19.8496	19.3809	19.6655	20.0162	20.2555	20.3528	20.3634	20.3643	20.3194	20.0109	19.5410	19.3685 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8496	19.3809	19.6655	20.0162	20.2555	20.3528	20.3634	20.3643	20.3194	20.0109	19.5410	19.3685 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9918	0.9778	0.9314	0.8109	0.5984	0.4150	0.4618	0.7390	0.9519	0.9921	0.9976 (94)
Useful gains	886.0860	1006.5950	1099.2877	1133.5640	1028.1461	738.3744	490.2712	513.8702	772.5800	898.0599	853.9830	840.4170 (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	2115.3124	1963.8271	1779.8817	1479.4018	1135.0035	751.0550	491.3325	515.8946	817.2275	1248.4829	1660.9654	2037.8888 (97)
Space heating kWh	914.5445	643.2599	506.3619	249.0032	79.5019	0.0000	0.0000	0.0000	0.0000	260.7147	581.0273	890.9190 (98a)
Space heating requirement - total per year (kWh/year)												4125.3324
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	914.5445	643.2599	506.3619	249.0032	79.5019	0.0000	0.0000	0.0000	0.0000	260.7147	581.0273	890.9190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4125.3324
Space heating per m2										(98c) / (4) =		30.5716 (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 %)												284.9881 (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	914.5445	643.2599	506.3619	249.0032	79.5019	0.0000	0.0000	0.0000	0.0000	260.7147	581.0273	890.9190 (98)
Space heating efficiency (main heating system 1)	284.9881	284.9881	284.9881	284.9881	284.9881	0.0000	0.0000	0.0000	0.0000	284.9881	284.9881	284.9881 (210)
Space heating fuel (main heating system)	320.9062	225.7147	177.6783	87.3732	27.8966	0.0000	0.0000	0.0000	0.0000	91.4827	203.8777	312.6162 (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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (64)
Efficiency of water heater (217)m	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482 (216)
Fuel for water heating, kWh/month	104.8755	92.6415	98.0778	85.3347	82.1288	73.3537	71.8851	75.0796	76.2867	85.8532	92.2636	103.6054 (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	65.1158	58.8143	65.1158	63.0153	65.1158	63.0153	65.1158	65.1158	63.0153	65.1158	63.0153	65.1158 (231)
Lighting	35.7645	28.6916	25.8336	18.9268	14.6196	11.9444	13.3365	17.3353	22.5168	29.5433	33.3691	36.7585 (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												1447.5454 (211)
Space heating fuel - main system 2												0.0000 (213)

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Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	275.7482
Water heating fuel used	1041.3855 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)	
mechanical ventilation fans (SFP = 1.8200)	766.6864 (230a)
Total electricity for the above, kWh/year	766.6864 (231)
Electricity for lighting (calculated in Appendix L)	288.6403 (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	3544.2576 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1447.5454	16.4900	238.7002 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1041.3855	16.4900	171.7245 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	766.6864	16.4900	126.4266 (249)
Energy for lighting	288.6403	16.4900	47.5968 (250)
Additional standing charges			0.0000 (251)
Total energy cost			584.4481 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	[(255) x (256)] / [(4) + 45.0] = 1.1693 (257)
SAP value	81.0459
SAP rating (Section 12)	81 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1447.5454	0.1561	225.9672 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1041.3855	0.1411	146.9602 (264)
Space and water heating			372.9274 (265)
Pumps, fans and electric keep-hot	766.6864	0.1387	106.3488 (267)
Energy for lighting	288.6403	0.1443	41.6597 (268)
Total CO2, kg/year			520.9359 (272)
CO2 emissions per m2			3.8600 (273)
EI value			96.1206
EI rating			96 (274)
EI band			A

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

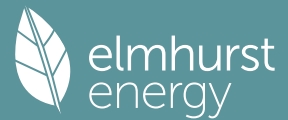
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	345.2920 (5)

2. Ventilation rate

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

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Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												3.2000 (17)
Infiltration rate												0.1600 (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) = 0.1480 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.8000	4.6000	4.6000	4.1000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	4.1000	4.3000 (22)
Adj infilt rate	1.2000	1.1500	1.1500	1.0250	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	1.0250	1.0750 (22a)
	0.1776	0.1702	0.1702	0.1517	0.1480	0.1295	0.1332	0.1332	0.1406	0.1480	0.1517	0.1591 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2951	0.2877	0.2877	0.2692	0.2655	0.2470	0.2507	0.2507	0.2581	0.2655	0.2692	0.2766 (25)

3. Heat losses and heat loss parameter

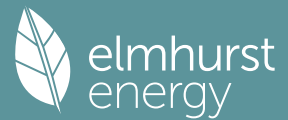
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
W			19.3800	0.9615	18.6346		(27)
D			9.7800	1.4000	13.6920		(26a)
Ground floor			71.3300	0.1200	8.5596	110.0000	7846.3000 (28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372	110.0000	15239.4000 (29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1400	0.5950	9.0000	38.2500 (29a)
Dwarf wall	12.5400		12.5400	0.2100	2.6334	9.0000	112.8600 (29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625	9.0000	438.7500 (30)
Raftered roof	27.1300		27.1300	0.1400	3.7982	9.0000	244.1700 (30)
Eaves void	4.9800		4.9800	0.1043	0.5192	9.0000	44.8200 (30)
Total net area of external elements Aum(A, m2)			336.6800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	78.7318		(33)
Main dwelling							
Internal wall (masonry)			223.2000			55.0000	12276.0000 (32c)
Internal Floor 1			63.6100			18.0000	1144.9800 (32d)
Internal Ceiling 1			63.6100			9.0000	572.4900 (32e)
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) = 37958.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							281.2955 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				19.5500	0.0680	1.3294	
E2 Other lintels (including other steel lintels)				1.2400	1.0000	1.2400	
E3 Sill				13.7100	0.0270	0.3702	
E3 Sill				1.2400	0.1000	0.1240	
E4 Jamb				35.4100	0.0220	0.7790	
E4 Jamb				2.1200	0.1000	0.2120	
E5 Ground floor (normal)				38.9200	0.0980	3.8142	
E6 Intermediate floor within a dwelling				26.5200	0.0010	0.0265	
E6 Intermediate floor within a dwelling				12.3000	0.1400	1.7220	
E10 Eaves (insulation at ceiling level)				7.5800	0.0690	0.5230	
E11 Eaves (insulation at rafter level)				13.3200	0.0200	0.2664	
E11 Eaves (insulation at rafter level)				5.9200	0.1500	0.8880	
E12 Gable (insulation at ceiling level)				15.3600	0.0970	1.4899	
E13 Gable (insulation at rafter level)				9.5100	0.0600	0.5706	
E13 Gable (insulation at rafter level)				0.6000	0.2500	0.1500	
E16 Corner (normal)				22.3700	0.0460	1.0290	
E16 Corner (normal)				12.2000	0.1800	2.1960	
E17 Corner (inverted - internal area greater than external area)				5.0700	-0.0810	-0.4107	
E17 Corner (inverted - internal area greater than external area)				3.5700	0.0000	0.0000	
R5 Ridge (inverted)				6.3400	0.1200	0.7608	
R6 Flat ceiling				32.0300	0.1200	3.8436	
R7 Flat ceiling (inverted)				6.6000	0.1200	0.7920	
R8 Roof to wall (rafter)				5.8200	0.1200	0.6984	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							22.4144 (36)
Point Thermal bridges							(36a) = 0.0000
Total fabric heat loss							(33) + (36) + (36a) = 101.1461 (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	33.6256	32.7824	32.7824	30.6744	30.2528	28.1448	28.5664	28.5664	29.4096	30.2528	30.6744	31.5176 (38)
Average = Sum(39)m / 12 =	134.7717	133.9285	133.9285	131.8205	131.3989	129.2909	129.7125	129.7125	130.5557	131.3989	131.8205	132.6637 (39)
												131.7502
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9988	0.9925	0.9925	0.9769	0.9738	0.9581	0.9613	0.9613	0.9675	0.9738	0.9769	0.9831 (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												2.9068 (42)
Hot water usage for mixer showers												
Hot water usage for baths	82.0762	80.8428	79.0454	75.6065	73.0686	70.2384	68.6297	70.4135	72.3689	75.4076	78.9204	81.7618 (42a)
Hot water usage for other uses	31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905 (42b)
Average daily hot water use (litres/day)	44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981 (42c)
												145.2362 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	157.9714	154.6557	150.5851	144.3171	139.2553	133.8022	131.6488	135.7012	139.9832	145.7155	152.0824	157.5504 (44)
Energy content (annual)	250.1880	220.2276	231.4437	197.5629	187.4644	164.5254	159.2178	168.0264	172.6133	197.7346	216.6692	246.6859 (45)
Distribution loss (46)m = 0.15 x (45)m												
Water storage loss (or HIU loss):	37.5282	33.0341	34.7166	29.6344	28.1197	24.6788	23.8827	25.2040	25.8920	29.6602	32.5004	37.0029 (46)

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store volume												300.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3300	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.2582	(55)
Total storage loss	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(56)
If cylinder contains dedicated solar storage	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901	(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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901	(64)
	Total per year (kWh/year) = Sum(64)m =											2871.6022	(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	83.1875	73.2257	76.9550	65.6897	62.3319	54.7047	52.9399	55.8688	57.3939	65.7467	72.0425	82.0231	(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	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	40.8600	36.2915	29.5142	22.3442	16.7025	14.1010	15.2366	19.8051	26.5824	33.7525	39.3941	41.9956 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	453.1064	457.8082	445.9597	420.7358	388.8951	358.9693	338.9771	334.2752	346.1237	371.3476	403.1883	433.1141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473 (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)	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704 (71)
Water heating gains (Table 5)	111.8112	108.9668	103.4342	91.2356	83.7795	75.9787	71.1558	75.0924	79.7138	88.3693	100.0591	110.2460 (72)
Total internal gains	719.2601	716.5490	692.3907	647.7982	602.8596	562.5316	538.8520	542.6554	565.9024	606.9519	656.1241	698.8384 (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												4.8800	12.0392		0.6800		0.7000		0.7700		19.3802 (74)		
East												5.6300	22.4002		0.6800		0.7000		0.7700		41.6007 (76)		
South												6.5100	51.5965		0.6800		0.7000		0.7700		110.8005 (78)		
West												2.3600	22.4002		0.6800		0.7000		0.7700		17.4383 (80)		
Solar gains	189.2196	311.0421	438.6550	592.7798	677.7513	724.9312	683.1380	611.6937	513.8845	361.6872	228.3962	158.9374	(83)										
Total gains	908.4798	1027.5911	1131.0457	1240.5780	1280.6109	1287.4628	1221.9901	1154.3491	1079.7869	968.6391	884.5202	857.7758	(84)										

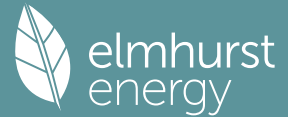
7. Mean internal temperature (heating season)

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	78.2352	78.7278	78.7278	79.9868	80.2434	81.5517	81.2867	81.2867	80.7617	80.2434	79.9868	79.4784
alpha	6.2157	6.2485	6.2485	6.3325	6.3496	6.4368	6.4191	6.4191	6.3841	6.3496	6.3325	6.2986
util living area												
	0.9977	0.9949	0.9844	0.9403	0.8217	0.5840	0.4027	0.4260	0.7248	0.9576	0.9944	0.9984 (86)
Living	20.0233	20.1584	20.4049	20.7105	20.9128	20.9918	20.9994	20.9991	20.9703	20.7122	20.3106	19.9896
Non living	18.9477	19.1239	19.4357	19.8181	20.0379	20.1146	20.1156	20.1156	20.0942	19.8291	19.3289	18.9147
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
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10
MIT	20.5003	20.1584	20.4049	20.7105	20.9128	20.9918	20.9994	20.9991	20.9703	20.7122	20.3106	20.1310 (87)
Th 2	20.0844	20.0896	20.0896	20.1026	20.1053	20.1184	20.1157	20.1157	20.1105	20.1053	20.1026	20.0974 (88)
util rest of house												
	0.9969	0.9930	0.9785	0.9183	0.7664	0.5009	0.3094	0.3275	0.6384	0.9368	0.9920	0.9979 (89)
MIT 2	19.6312	19.1239	19.4357	19.8181	20.0379	20.1146	20.1156	20.1156	20.0942	19.8291	19.3289	19.1278 (90)
Living area fraction									fLA =	Living area / (4) =		0.2855 (91)
MIT	19.8794	19.4193	19.7125	20.0729	20.2877	20.3651	20.3679	20.3678	20.3444	20.0813	19.6092	19.4143 (92)
Temperature adjustment												0.0000
adjusted MIT	19.8794	19.4193	19.7125	20.0729	20.2877	20.3651	20.3679	20.3678	20.3444	20.0813	19.6092	19.4143 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9967	0.9911	0.9754	0.9175	0.7786	0.5246	0.3361	0.3557	0.6624	0.9361	0.9901	0.9973 (94)
Useful gains	905.4434	1018.4959	1103.1877	1138.2218	997.0531	675.3741	410.6724	410.5586	715.2000	906.7793	875.7890	855.4363 (95)
Ext temp.	4.5000	4.9000	6.7000	9.2000	12.1000	15.1000	17.2000	17.2000	14.7000	11.0000	7.3000	4.3000 (96)
Heat loss rate W												
2072.7067	1944.5443	1742.7389	1433.2771	1075.8597	680.7271	410.9222	410.9080	736.9063	1193.2723	1622.6043	2005.1134	2005.1134 (97)
Space heating kWh												
868.4438	622.3045	475.8261	212.4398	58.6321	0.0000	0.0000	0.0000	0.0000	213.1508	537.7070	855.3597	855.3597 (98a)
Space heating requirement - total per year (kWh/year)												3843.8639
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	0.0000 (98b)
Solar heating contribution - total per year (kWh/year)												0.0000

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Space heating kWh	868.4438	622.3045	475.8261	212.4398	58.6321	0.0000	0.0000	0.0000	0.0000	213.1508	537.7070	855.3597 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												3843.8639
Space heating per m2												(98c) / (4) = 28.4857 (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 %)												285.3362 (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	868.4438	622.3045	475.8261	212.4398	58.6321	0.0000	0.0000	0.0000	0.0000	213.1508	537.7070	855.3597 (98)
Space heating efficiency (main heating system 1)	285.3362	285.3362	285.3362	285.3362	285.3362	0.0000	0.0000	0.0000	0.0000	285.3362	285.3362	285.3362 (210)
Space heating fuel (main heating system)	304.3581	218.0951	166.7598	74.4525	20.5484	0.0000	0.0000	0.0000	0.0000	74.7016	188.4468	299.7726 (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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (64)
Efficiency of water heater (217)m	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745 (216)
Fuel for water heating, kWh/month	104.8655	92.6326	98.0685	85.3265	82.1209	73.3467	71.8783	75.0724	76.2794	85.8450	92.2548	103.5955 (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	65.1158	58.8143	65.1158	63.0153	65.1158	63.0153	65.1158	65.1158	63.0153	65.1158	65.1158	65.1158 (231)
Lighting	35.7645	28.6916	25.8336	18.9268	14.6196	11.9444	13.3365	17.3353	22.5168	29.5433	33.3691	36.7585 (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												1347.1349 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												275.7745
Water heating fuel used												1041.2862 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)												
mechanical ventilation fans (SFP = 1.8200)												766.6864 (230a)
Total electricity for the above, kWh/year												766.6864 (231)
Electricity for lighting (calculated in Appendix L)												288.6403 (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												3443.7477 (238)

10a. Fuel costs - using BEDF prices (589)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1347.1349	28.4300	382.9904 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1041.2862	28.4300	296.0377 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	766.6864	28.4300	217.9689 (249)
Energy for lighting	288.6403	28.4300	82.0604 (250)
Additional standing charges			0.0000 (251)
Total energy cost			979.0575 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1347.1349	0.1565	210.8567 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1041.2862	0.1411	146.9462 (264)
Space and water heating			357.8029 (265)
Pumps, fans and electric keep-hot	766.6864	0.1387	106.3488 (267)
Energy for lighting	288.6403	0.1443	41.6597 (268)
Total CO2, kg/year			505.8115 (272)

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

	Energy kWh/year	Primary energy factor kg CO ₂ /kWh	Primary energy kWh/year
Space heating - main system 1	1347.1349	1.5795	2127.7408 (275)
Total CO ₂ associated with community systems			0.0000 (473)
Water heating (other fuel)	1041.2862	1.5218	1584.6513 (278)
Space and water heating			3712.3922 (279)
Pumps, fans and electric keep-hot	766.6864	1.5128	1159.8431 (281)
Energy for lighting	288.6403	1.5338	442.7261 (282)
Total Primary energy kWh/year			5314.9614 (286)

SAP 10 EPC IMPROVEMENTS

01DSv0

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating SAP increase too small
U Solar photovoltaic panels Recommended
V2 Wind turbine Not applicable

Recommended measures:
U Solar photovoltaic panels SAP change + 5.1 Cost change -£ 285 CO₂ change -134 kg (26.6%)

Measures omitted - SAP change or cost saving too small:
N Solar water heating + 0.8 -£ 49 -21 kg (4.1%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar photovoltaic panels	£285 1.00 kg/m ²	B 86	A 97
Total Savings	£285 1.00 kg/m ²		

Potential energy efficiency rating: B 86
Potential environmental impact rating: A 97

Fuel prices for cost data on this page from database revision number 589 TEST (12 Dec 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current	Potential	Saving
Electricity	£979	£979	£0
Space heating	£601	£601	£0
Water heating	£296	£296	£0
Lighting	£82	£82	£0
Generated (PV)	-£0	-£285	£285
Total cost of fuels	£979	£694	£285
Total cost of uses	£979	£694	£285
Delivered energy	26 kWh/m ²	18 kWh/m ²	7 kWh/m ²
Carbon dioxide emissions	0.5 tonnes	0.4 tonnes	0.1 tonnes
CO ₂ emissions per m ²	4 kg/m ²	3 kg/m ²	1 kg/m ²
Primary energy	39 kWh/m ²	28 kWh/m ²	11 kWh/m ²

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

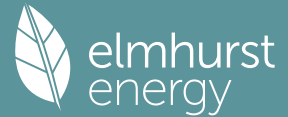
1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 345.2920 (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)

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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 3.2000 (17)
Infiltration rate 0.1600 (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) = 0.1480 (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	0.1887	0.1850	0.1813	0.1628	0.1591	0.1406	0.1406	0.1369	0.1480	0.1591	0.1665	0.1739 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.3062	0.3025	0.2988	0.2803	0.2766	0.2581	0.2581	0.2544	0.2655	0.2766	0.2840	0.2914 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
W			19.3800	0.9615	18.6346		(27)
D			9.7800	1.4000	13.6920		(26a)
Ground floor			71.3300	0.1200	8.5596	110.0000	7846.3000 (28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372	110.0000	15239.4000 (29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1400	0.5950	9.0000	38.2500 (29a)
Dwarf wall	12.5400		12.5400	0.2100	2.6334	9.0000	112.8600 (29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625	9.0000	438.7500 (30)
Raftered roof	27.1300		27.1300	0.1400	3.7982	9.0000	244.1700 (30)
Eaves void	4.9800		4.9800	0.1043	0.5192	9.0000	44.8200 (30)
Total net area of external elements Aum(A, m2)			336.6800				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 78.7318		(33)
Main dwelling							
Internal wall (masonry)			223.2000			55.0000	12276.0000 (32c)
Internal Floor 1			63.6100			18.0000	1144.9800 (32d)
Internal Ceiling 1			63.6100			9.0000	572.4900 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 37958.0200 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 281.2955 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	19.5500	0.0680	1.3294
E2 Other lintels (including other steel lintels)	1.2400	1.0000	1.2400
E2 Other lintels (including other steel lintels)	13.7100	0.0270	0.3702
E3 Sill	1.2400	0.1000	0.1240
E4 Jamb	35.4100	0.0220	0.7790
E4 Jamb	2.1200	0.1000	0.2120
E5 Ground floor (normal)	38.9200	0.0980	3.8142
E6 Intermediate floor within a dwelling	26.5200	0.0010	0.0265
E6 Intermediate floor within a dwelling	12.3000	0.1400	1.7220
E10 Eaves (insulation at ceiling level)	7.5800	0.0690	0.5230
E11 Eaves (insulation at rafter level)	13.3200	0.0200	0.2664
E11 Eaves (insulation at rafter level)	5.9200	0.1500	0.8880
E12 Gable (insulation at ceiling level)	15.3600	0.0970	1.4899
E13 Gable (insulation at rafter level)	9.5100	0.0600	0.5706
E13 Gable (insulation at rafter level)	0.6000	0.2500	0.1500
E16 Corner (normal)	22.3700	0.0460	1.0290
E16 Corner (normal)	12.2000	0.1800	2.1960
E17 Corner (inverted - internal area greater than external area)	5.0700	-0.0810	-0.4107
E17 Corner (inverted - internal area greater than external area)	3.5700	0.0000	0.0000
R5 Ridge (inverted)	6.3400	0.1200	0.7608
R6 Flat ceiling	32.0300	0.1200	3.8436
R7 Flat ceiling (inverted)	6.6000	0.1200	0.7920
R8 Roof to wall (rafter)	5.8200	0.1200	0.6984

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 22.4144 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 101.1461 (37)

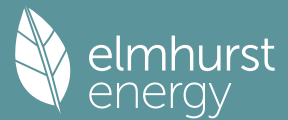
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)
(38)m Jan 34.8904 Feb 34.4688 Mar 34.0472 Apr 31.9392 May 31.5176 Jun 29.4096 Jul 29.4096 Aug 28.9880 Sep 30.2528 Oct 31.5176 Nov 32.3608 Dec 33.2040 (38)
Heat transfer coeff 136.0365 135.6149 135.1933 133.0853 132.6637 130.5557 130.5557 130.1341 131.3989 132.6637 133.5069 134.3501 (39)
Average = Sum(39)m / 12 = 132.9799

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	1.0081	1.0050	1.0019	0.9863	0.9831	0.9675	0.9675	0.9644	0.9738	0.9831	0.9894	0.9956 (40)
HLP (average)												0.9855
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9068 (42)
Hot water usage for mixer showers												
82.0762	80.8428	79.0454	75.6065	73.0686	70.2384	68.6297	70.4135	72.3689	75.4076	78.9204	81.7618 (42a)	
Hot water usage for baths												
31.4970	31.0292	30.3705	29.1559	28.2465	27.2380	26.6933	27.3474	28.0596	29.1387	30.3783	31.3905 (42b)	
Hot water usage for other uses												
44.3981	42.7837	41.1692	39.5547	37.9402	36.3258	36.3258	37.9402	39.5547	41.1692	42.7837	44.3981 (42c)	
Average daily hot water use (litres/day)												145.2362 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
157.9714	154.6557	150.5851	144.3171	139.2553	133.8022	131.6488	135.7012	139.9832	145.7155	152.0824	157.5504 (44)	
Energy conte	250.1880	220.2276	231.4437	197.5629	187.4644	164.5254	159.2178	168.0264	172.6133	197.7346	216.6692	246.6859 (45)
Energy content (annual)												Total = Sum(45)m = 2412.3592
Distribution loss (46)m = 0.15 x (45)m												

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	37.5282	33.0341	34.7166	29.6344	28.1197	24.6788	23.8827	25.2040	25.8920	29.6602	32.5004	37.0029 (46)
Water storage loss (or HIU loss):												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2582 (55)
Total storage loss												
	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042 (56)
If cylinder contains dedicated solar storage												
	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042 (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												
	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (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												
	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (64)
												2871.6022 (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												
	83.1875	73.2257	76.9550	65.6897	62.3319	54.7047	52.9399	55.8688	57.3939	65.7467	72.0425	82.0231 (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	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057	174.4057 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
	40.8600	36.2915	29.5142	22.3442	16.7025	14.1010	15.2366	19.8051	26.5824	33.7525	39.3941	41.9956 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
	453.1064	457.8082	445.9597	420.7358	388.8951	358.9693	338.9771	334.2752	346.1237	371.3476	403.1883	433.1141 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473	55.3473 (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)												
	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704 (71)
Water heating gains (Table 5)												
	111.8112	108.9668	103.4342	91.2356	83.7795	75.9787	71.1558	75.0924	79.7138	88.3693	100.0591	110.2460 (72)
Total internal gains												
	719.2601	716.5490	692.3907	647.7982	602.8596	562.5316	538.8520	542.6554	565.9024	606.9519	656.1241	698.8384 (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		4.8800	10.6334	0.6800	0.7000	0.7700	17.1172 (74)
East		5.6300	19.6403	0.6800	0.7000	0.7700	36.4750 (76)
South		6.5100	46.7521	0.6800	0.7000	0.7700	100.3973 (78)
West		2.3600	19.6403	0.6800	0.7000	0.7700	15.2897 (80)

Solar gains	169.2792	298.3995	431.7990	569.2237	665.0252	671.2818	642.6564	570.1589	479.5801	336.4437	204.6658	143.5910 (83)
Total gains	888.5393	1014.9486	1124.1897	1217.0219	1267.8848	1233.8134	1181.5085	1112.8142	1045.4825	943.3956	860.7899	842.4294 (84)

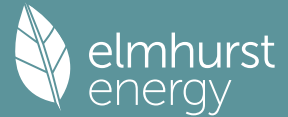
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	77.5078	77.7488	77.9913	79.2266	79.4784	80.7617	80.7617	81.0233	80.2434	79.4784	78.9764	78.4807
alpha	6.1672	6.1833	6.1994	6.2818	6.2986	6.3841	6.3841	6.4016	6.3496	6.2986	6.2651	6.2320
util living area	0.9981	0.9953	0.9862	0.9516	0.8509	0.6580	0.4837	0.5332	0.7954	0.9692	0.9956	0.9987 (86)
Living	19.9748	20.1310	20.3689	20.6640	20.8849	20.9823	20.9978	20.9961	20.9441	20.6541	20.2583	19.9497
Non living	18.8798	19.0811	19.3843	19.7573	20.0040	20.1012	20.1099	20.1119	20.0698	19.7538	19.2544	18.8556
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	20.4755	20.1310	20.3689	20.6640	20.8849	20.9823	20.9978	20.9961	20.9441	20.6541	20.2583	20.0966 (87)
Th 2	20.0766	20.0792	20.0818	20.0948	20.0974	20.1105	20.1105	20.1131	20.1053	20.0974	20.0922	20.0870 (88)
util rest of house												
	0.9974	0.9936	0.9809	0.9333	0.8014	0.5752	0.3873	0.4330	0.7193	0.9538	0.9937	0.9982 (89)
MIT 2	19.5994	19.0811	19.3843	19.7573	20.0040	20.1012	20.1099	20.1119	20.0698	19.7538	19.2544	19.0775 (90)
Living area fraction												
MIT	19.8496	19.3809	19.6655	20.0162	20.2555	20.3528	20.3634	20.3643	20.3194	20.0109	19.5410	19.3685 (91)
Temperature adjustment												0.0000
adjusted MIT	19.8496	19.3809	19.6655	20.0162	20.2555	20.3528	20.3634	20.3643	20.3194	20.0109	19.5410	19.3685 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9972	0.9918	0.9778	0.9314	0.8109	0.5984	0.4150	0.4618	0.7390	0.9519	0.9921	0.9976 (94)
Useful gains	886.0860	1006.5950	1099.2877	1133.5640	1028.1461	738.3744	490.2712	513.8702	772.5800	898.0599	853.9830	840.4170 (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												
	2115.3124	1963.8271	1779.8817	1479.4018	1135.0035	751.0550	491.3325	515.8946	817.2275	1248.4829	1660.9654	2037.8888 (97)
Space heating kWh												
	914.5445	643.2599	506.3619	249.0032	79.5019	0.0000	0.0000	0.0000	0.0000	260.7147	581.0273	890.9190 (98a)
Space heating requirement - total per year (kWh/year)												4125.3324
Solar heating kWh												

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Solar heating contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98b)
Space heating kWh	914.5445	643.2599	506.3619	249.0032	79.5019	0.0000	0.0000	0.0000	0.0000	260.7147	581.0273	890.9190 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4125.3324
Space heating per m2										(98c) / (4) =		30.5716 (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 %)												284.9881 (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	914.5445	643.2599	506.3619	249.0032	79.5019	0.0000	0.0000	0.0000	0.0000	260.7147	581.0273	890.9190 (98)
Space heating efficiency (main heating system 1)	284.9881	284.9881	284.9881	284.9881	284.9881	0.0000	0.0000	0.0000	0.0000	284.9881	284.9881	284.9881 (210)
Space heating fuel (main heating system)	320.9062	225.7147	177.6783	87.3732	27.8966	0.0000	0.0000	0.0000	0.0000	91.4827	203.8777	312.6162 (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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (64)
Efficiency of water heater (217)m	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482	275.7482 (217)
Fuel for water heating, kWh/month	104.8755	92.6415	98.0778	85.3347	82.1288	73.3537	71.8851	75.0796	76.2867	85.8532	92.2636	103.6054 (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	65.1158	58.8143	65.1158	63.0153	65.1158	63.0153	65.1158	65.1158	63.0153	65.1158	63.0153	65.1158 (231)
Lighting	35.7645	28.6916	25.8336	18.9268	14.6196	11.9444	13.3365	17.3353	22.5168	29.5433	33.3691	36.7585 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-39.5131	-59.5315	-90.8031	-106.3648	-116.9148	-109.0616	-107.8156	-99.3503	-84.7219	-68.9627	-44.4073	-33.6539 (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												1447.5454 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												275.7482
Water heating fuel used												1041.3855 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)												
mechanical ventilation fans (SFP = 1.8200)												766.6864 (230a)
Total electricity for the above, kWh/year												766.6864 (231)
Electricity for lighting (calculated in Appendix L)												288.6403 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-961.1005 (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												2583.1570 (238)

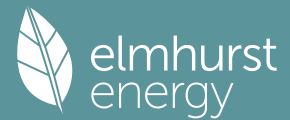
10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1447.5454	16.4900	238.7002 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1041.3855	16.4900	171.7245 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	766.6864	16.4900	126.4266 (249)
Energy for lighting	288.6403	16.4900	47.5968 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-961.1005	16.4900	-158.4855
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-158.4855 (252)
Total energy cost			425.9626 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.8522 (257)

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SAP value
SAP rating (Section 12)
SAP band

86.1857
86 (258)
B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1447.5454	0.1561	225.9672	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1041.3855	0.1411	146.9602	(264)
Space and water heating			372.9274	(265)
Pumps, fans and electric keep-hot	766.6864	0.1387	106.3488	(267)
Energy for lighting	288.6403	0.1443	41.6597	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-961.1005	0.1338	-128.5897	
PV Unit electricity exported	0.0000	0.0000	0.0000	
Total			-128.5897	(269)
Total CO2, kg/year			392.3462	(272)
CO2 emissions per m2			2.9100	(273)
EI value			97.0782	
EI rating			97	(274)
EI band			A	

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	71.3300 (1b)	x 2.5400 (2b)	= 181.1782 (1b) - (3b)	
First floor	63.6100 (1c)	x 2.5800 (2c)	= 164.1138 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	134.9400		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 345.2920 (5)	

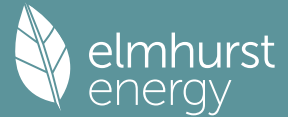
2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) =	0.0000 (8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		3.2000 (17)	
Infiltration rate		0.1600 (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) =	0.1480 (21)	
Wind speed	Jan 4.8000 Feb 4.6000 Mar 4.6000 Apr 4.1000 May 4.0000 Jun 3.5000 Jul 3.6000 Aug 3.6000 Sep 3.8000 Oct 4.0000 Nov 4.1000 Dec 4.3000 (22)		
Wind factor	1.2000 1.1500 1.1500 1.0250 1.0000 0.8750 0.9000 0.9000 0.9500 1.0000 1.0250 1.0750 (22a)		
Adj infilt rate	0.1776 0.1702 0.1702 0.1517 0.1480 0.1295 0.1332 0.1332 0.1406 0.1480 0.1517 0.1591 (22b)		
Balanced mechanical ventilation with heat recovery			
If mechanical ventilation			0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)			0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =			76.5000 (23c)
Effective ac	0.2951 0.2877 0.2877 0.2692 0.2655 0.2470 0.2507 0.2507 0.2581 0.2655 0.2692 0.2766 (25)		

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
W			19.3800	0.9615	18.6346			(27)
D			9.7800	1.4000	13.6920			(26a)
Ground floor			71.3300	0.1200	8.5596	110.0000	7846.3000	(28a)
External wall	166.3900	27.8500	138.5400	0.1800	24.9372	110.0000	15239.4000	(29a)
Dormer cheeks	5.5600	1.3100	4.2500	0.1400	0.5950	9.0000	38.2500	(29a)
Dwarf wall	12.5400		12.5400	0.2100	2.6334	9.0000	112.8600	(29a)
Joisted roof	48.7500		48.7500	0.1100	5.3625	9.0000	438.7500	(30)
Raftered roof	27.1300		27.1300	0.1400	3.7982	9.0000	244.1700	(30)
Eaves void	4.9800		4.9800	0.1043	0.5192	9.0000	44.8200	(30)
Total net area of external elements Aum(A, m2)			336.6800					(31)

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Fabric heat loss, W/K = Sum (A x U)											
Main dwelling											
(26)...(30) + (32) = 78.7318 (33)											
Internal wall (masonry)											
Internal Floor 1											
Internal Ceiling 1											
Heat capacity Cm = Sum(A x k)											
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											
List of Thermal Bridges											
(28)...(30) + (32) + (32a)...(32e) = 37958.0200 (34)											
K1 Element											
E2 Other lintels (including other steel lintels)											
E2 Other lintels (including other steel lintels)											
E3 Sill											
E3 Sill											
E4 Jamb											
E4 Jamb											
E5 Ground floor (normal)											
E6 Intermediate floor within a dwelling											
E6 Intermediate floor within a dwelling											
E10 Eaves (insulation at ceiling level)											
E11 Eaves (insulation at rafter level)											
E11 Eaves (insulation at rafter level)											
E12 Gable (insulation at ceiling level)											
E13 Gable (insulation at rafter level)											
E13 Gable (insulation at rafter level)											
E16 Corner (normal)											
E16 Corner (normal)											
E17 Corner (inverted - internal area greater than external area)											
E17 Corner (inverted - internal area greater than external area)											
R5 Ridge (inverted)											
R6 Flat ceiling											
R7 Flat ceiling (inverted)											
R8 Roof to wall (rafter)											
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											
Point Thermal bridges											
Total fabric heat loss											
(33) + (36) + (36a) = 101.1461 (37)											
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)											
(38)m											
Heat transfer coeff											
Average = Sum(39)m / 12 =											
HLP											
HLP (average)											
Days in mont											

4. Water heating energy requirements (kWh/year)											
Assumed occupancy											
Hot water usage for mixer showers											
Hot water usage for baths											
Hot water usage for other uses											
Average daily hot water use (litres/day)											
Daily hot water use											
Energy conte											
Energy content (annual)											
Distribution loss (46)m = 0.15 x (45)m											
Water storage loss (or HIU loss):											
Store volume											
a) If manufacturer declared loss factor is known (kWh/day):											
Temperature factor from Table 2b											
Enter (49) or (54) in (55)											
Total storage loss											
If cylinder contains dedicated solar storage											
Primary loss											
Combi loss											
Total heat required for water heating calculated for each month											
WWHRS											
PV diverter											
Solar input											
FGHRS											
Output from w/h											
Electric shower(s)											
Heat gains from water heating, kWh/month											

5. Internal gains (see Table 5 and 5a)											
Metabolic gains (Table 5), Watts											
(66)m											
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
Pumps, fans											

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Losses e.g. evaporation (negative values) (Table 5)												
	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	-116.2704	(71)
Water heating gains (Table 5)												
	111.8112	108.9668	103.4342	91.2356	83.7795	75.9787	71.1558	75.0924	79.7138	88.3693	100.0591	(72)
Total internal gains												
	719.2601	716.5490	692.3907	647.7982	602.8596	562.5316	538.8520	542.6554	565.9024	606.9519	656.1241	(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					4.8800	12.0392	0.6800	0.7000			0.7700			19.3802 (74)
East					5.6300	22.4002	0.6800	0.7000			0.7700			41.6007 (76)
South					6.5100	51.5965	0.6800	0.7000			0.7700			110.8005 (78)
West					2.3600	22.4002	0.6800	0.7000			0.7700			17.4383 (80)
Solar gains	189.2196	311.0421	438.6550	592.7798	677.7513	724.9312	683.1380	611.6937	513.8845	361.6872	228.3962			158.9374 (83)
Total gains	908.4798	1027.5911	1131.0457	1240.5780	1280.6109	1287.4628	1221.9901	1154.3491	1079.7869	968.6391	884.5202			857.7758 (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	78.2352	78.7278	78.7278	79.9868	80.2434	81.5517	81.2867	81.2867	80.7617	80.2434	79.9868	79.4784
alpha	6.2157	6.2485	6.2485	6.3325	6.3496	6.4368	6.4191	6.4191	6.3841	6.3496	6.3325	6.2986
util living area												
	0.9977	0.9949	0.9844	0.9403	0.8217	0.5840	0.4027	0.4260	0.7248	0.9576	0.9944	0.9984 (86)
Living												
	20.0233	20.1584	20.4049	20.7105	20.9128	20.9918	20.9994	20.9991	20.9703	20.7122	20.3106	19.9896
Non living												
	18.9477	19.1239	19.4357	19.8181	20.0379	20.1146	20.1156	20.1156	20.0942	19.8291	19.3289	18.9147
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												
	20.5003	20.1584	20.4049	20.7105	20.9128	20.9918	20.9994	20.9991	20.9703	20.7122	20.3106	20.1310 (87)
Th 2												
	20.0844	20.0896	20.0896	20.1026	20.1053	20.1184	20.1157	20.1157	20.1105	20.1053	20.1026	20.0974 (88)
util rest of house												
	0.9969	0.9930	0.9785	0.9183	0.7664	0.5009	0.3094	0.3275	0.6384	0.9368	0.9920	0.9979 (89)
MIT 2												
	19.6312	19.1239	19.4357	19.8181	20.0379	20.1146	20.1156	20.1156	20.0942	19.8291	19.3289	19.1278 (90)
Living area fraction												
									fLA = Living area / (4) =			0.2855 (91)
MIT												
	19.8794	19.4193	19.7125	20.0729	20.2877	20.3651	20.3679	20.3678	20.3444	20.0813	19.6092	19.4143 (92)
Temperature adjustment												
												0.0000
adjusted MIT												
	19.8794	19.4193	19.7125	20.0729	20.2877	20.3651	20.3679	20.3678	20.3444	20.0813	19.6092	19.4143 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9967	0.9911	0.9754	0.9175	0.7786	0.5246	0.3361	0.3557	0.6624	0.9361	0.9901	0.9973 (94)
Useful gains	905.4434	1018.4959	1103.1877	1138.2218	997.0531	675.3741	410.6724	410.5586	715.2000	906.7793	875.7890	855.4363 (95)
Ext temp.	4.5000	4.9000	6.7000	9.2000	12.1000	15.1000	17.2000	17.2000	14.7000	11.0000	7.3000	4.3000 (96)
Heat loss rate W												
	2072.7067	1944.5443	1742.7389	1433.2771	1075.8597	680.7271	410.9222	410.9080	736.9063	1193.2723	1622.6043	2005.1134 (97)
Space heating kWh												
	868.4438	622.3045	475.8261	212.4398	58.6321	0.0000	0.0000	0.0000	0.0000	213.1508	537.7070	855.3597 (98a)
Space heating requirement - total per year (kWh/year)												
												3843.8639
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												
	868.4438	622.3045	475.8261	212.4398	58.6321	0.0000	0.0000	0.0000	0.0000	213.1508	537.7070	855.3597 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												
												3843.8639
Space heating per m ²												
									(98c) / (4) =			28.4857 (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 %)												285.3362 (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	868.4438	622.3045	475.8261	212.4398	58.6321	0.0000	0.0000	0.0000	0.0000	213.1508	537.7070	855.3597 (98)
Space heating efficiency (main heating system 1)	285.3362	285.3362	285.3362	285.3362	285.3362	0.0000	0.0000	0.0000	0.0000	285.3362	285.3362	285.3362 (210)
Space heating fuel (main heating system)	304.3581	218.0951	166.7598	74.4525	20.5484	0.0000	0.0000	0.0000	0.0000	74.7016	188.4468	299.7726 (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	289.1922	255.4572	270.4479	235.3089	226.4686	202.2714	198.2220	207.0306	210.3593	236.7388	254.4152	285.6901 (64)
Efficiency of water heater (217)m	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745	275.7745 (216)
Fuel for water heating, kWh/month	104.8655	92.6326	98.0685	85.3265	82.1209	73.3467	71.8783	75.0724	76.2794	85.8450	92.2548	103.5955 (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	65.1158	58.8143	65.1158	63.0153	65.1158	63.0153	65.1158	65.1158	63.0153	65.1158	63.0153	65.1158 (231)

Full SAP Calculation Printout



Lighting	35.7645	28.6916	25.8336	18.9268	14.6196	11.9444	13.3365	17.3353	22.5168	29.5433	33.3691	36.7585 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-43.7904	-61.9355	-92.1079	-109.0216	-117.8951	-114.3862	-112.0436	-104.1464	-89.1922	-72.8833	-48.9264	-37.0387 (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	(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	(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	(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	(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												1347.1349 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												275.7745
Water heating fuel used												1041.2862 (219)
Space cooling fuel												0.0000 (221)

Electricity for pumps and fans:												
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)												
mechanical ventilation fans (SFP = 1.8200)												766.6864 (230a)
Total electricity for the above, kWh/year												766.6864 (231)
Electricity for lighting (calculated in Appendix L)												288.6403 (232)

Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1003.3673 (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												2440.3804 (238)

10a. Fuel costs - using BEDF prices (589)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1347.1349	28.4300	382.9904 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1041.2862	28.4300	296.0377 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	766.6864	28.4300	217.9689 (249)
Energy for lighting	288.6403	28.4300	82.0604 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1003.3673	28.4300	-285.2573
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-285.2573 (252)
Total energy cost			693.8001 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1347.1349	0.1565	210.8567 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1041.2862	0.1411	146.9462 (264)
Space and water heating			357.8029 (265)
Pumps, fans and electric keep-hot	766.6864	0.1387	106.3488 (267)
Energy for lighting	288.6403	0.1443	41.6597 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1003.3673	0.1339	-134.3386
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-134.3386 (269)
Total CO2, kg/year			371.4729 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1347.1349	1.5795	2127.7408 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1041.2862	1.5218	1584.6513 (278)
Space and water heating			3712.3922 (279)
Pumps, fans and electric keep-hot	766.6864	1.5128	1159.8431 (281)
Energy for lighting	288.6403	1.5338	442.7261 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1003.3673	1.4948	-1499.8180
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1499.8180 (283)
Total Primary energy kWh/year			3815.1434 (286)

Predicted Energy Assessment

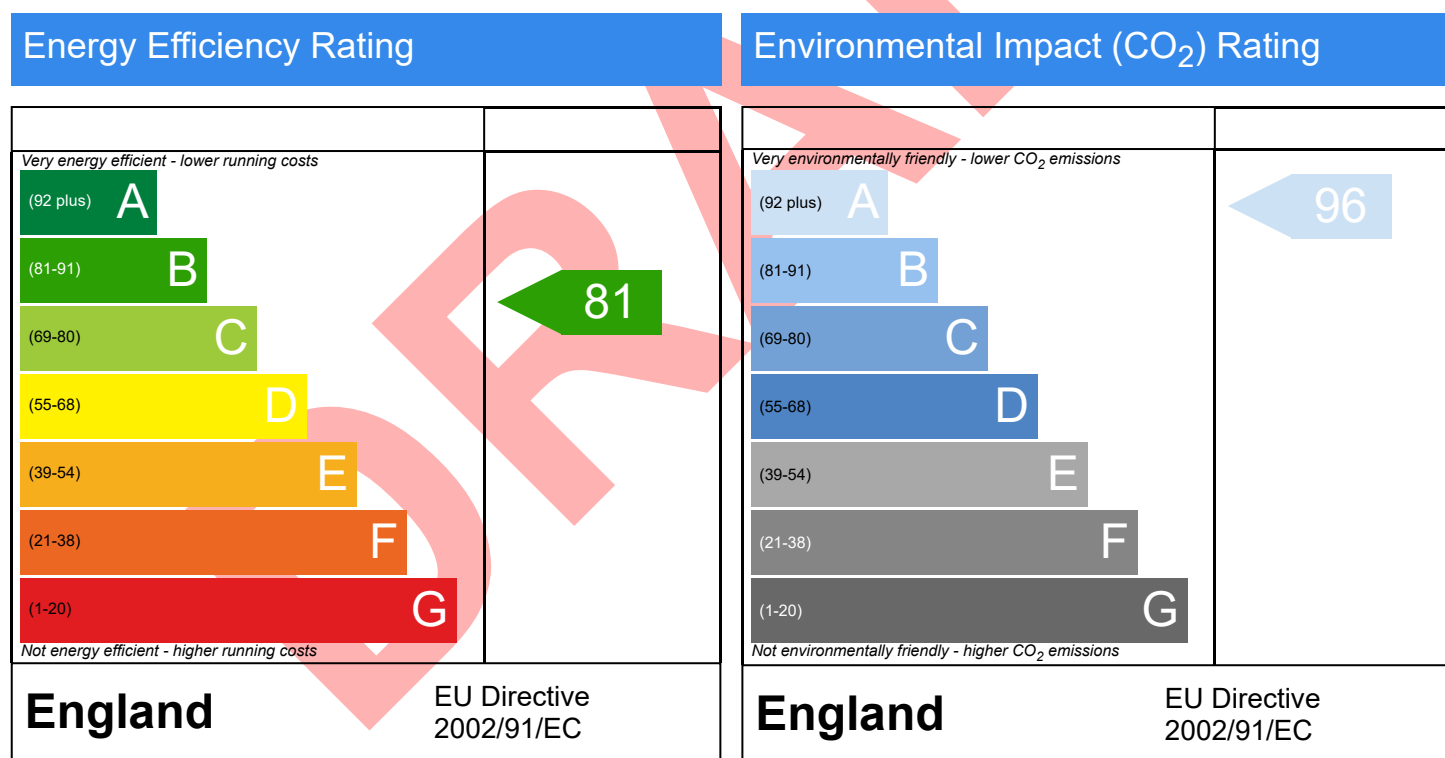


Plot 01 (Type 02), Rollys Lane, Baldock, SG7

Dwelling type: House, Detached
Date of assessment: 22/01/2026
SAP Version: 10.2
Produced by: Yik Shun Wilson Ho
Total floor area: 134.94 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.

Building Regulations England Part L (BREL) Compliance Report

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

Date: Thu 22 Jan 2026 10:56:39

Project Information			
Assessed By	Yik Shun Wilson Ho	Building Type	House, Detached
OCDEA Registration	EES/022836	Assessment Date	2026-01-22

Dwelling Details			
Assessment Type	As designed	Total Floor Area	143 m ²
Site Reference	SE453111 - Ashwell Tennis 02	Plot Reference	02DSv0
Address	Plot 02 (Type 01) Rollys Lane, Baldock, SG7		

Client Details	
Name	
Company	
Address	

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Electricity		
Target carbon dioxide emission rate	11.05 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	3.89 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	58.2 kWh _{PE} /m ²		
Dwelling primary energy	40.81 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	46.8 kWh/m ²		
Dwelling fabric energy efficiency	46.8 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (3) (0.21)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.12	Ground floor (0.12)	OK
Roofs	0.16	0.12	Roof (2) (0.14)	OK
Windows, doors, and roof windows	1.6	1.16	Opening 3 (1.4)	OK
Rooflights	2.2	N/A	N/A	N/A

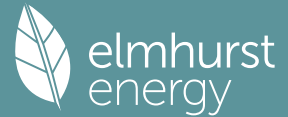
2b Envelope elements (better than typically expected values are flagged with a subsequent (!))		
Name	Net area [m ²]	U-Value [W/m ² K]
Exposed wall: Walls (1)	151.36	0.18
Exposed wall: Walls (2)	4.144339	0.14 (!)
Sheltered wall: Walls (3)	9.61	0.21
Ground floor: Ground floor, Ground floor	74.64	0.12
Exposed roof: Roof (1)	52.27	0.11
Exposed roof: Roof (2)	28.89	0.14
Exposed roof: Roof (3)	3.62	0.1 (!)

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Opening 1, W	2.81	North	0.7	1 (!)
Opening 2, W	2.14	East	0.7	1 (!)
Opening 3, D	1.78	East	N/A	1.4
Opening 4, W	2.77	South	0.7	1 (!)
Opening 5, D	6.37	South	N/A	1.4
Opening 6, W	1.365661	South	0.7	1 (!)
Opening 7, W	5.83	West	0.7	1 (!)
Opening 8, D	1.68	West	N/A	1.4

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Calculated by person with suitable expertise	0.068	Hi-therm+
External wall	E2: Other lintels (including other steel lintels)	SAP table default	1	timber
External wall	E3: Sill	Calculated by person with suitable expertise	0.027 (!)	RCDs
External wall	E3: Sill	SAP table default	0.1	timber
External wall	E4: Jamb	Calculated by person with suitable expertise	0.022 (!)	RCDs
External wall	E4: Jamb	SAP table default	0.1	timber
External wall	E5: Ground floor (normal)	Calculated by person with suitable expertise	0.098	RCDs
External wall	E6: Intermediate floor within a dwelling	Calculated by person with suitable expertise	0.001 (!)	RCDs
External wall	E6: Intermediate floor within a dwelling	SAP table default	0.14	looks like E24
External wall	E10: Eaves (insulation at ceiling level)	Calculated by person with suitable expertise	0.069	RCDs
External wall	E11: Eaves (insulation at rafter level)	Calculated by person with suitable expertise	0.02 (!)	RCDs
External wall	E11: Eaves (insulation at rafter level)	SAP table default	0.15	timber
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.097	RCDs
External wall	E12: Gable (insulation at ceiling level)	Calculated by person with suitable expertise	0.097	timber
External wall	E13: Gable (insulation at rafter level)	Calculated by person with suitable expertise	0.06	RCDs
External wall	E13: Gable (insulation at rafter level)	SAP table default	0.25	timber
External wall	E16: Corner (normal)	Calculated by person with suitable expertise	0.046	RCDs
External wall	E16: Corner (normal)	SAP table default	0.18	timber
External wall	E17: Corner (inverted - internal area greater than external area)	Calculated by person with suitable expertise	-0.081	RCDs
External wall	E17: Corner (inverted - internal area greater than external area)	SAP table default	0 (!)	timber
Roof	R5: Ridge (inverted)	SAP table default	0.12	
Roof	R6: Flat ceiling	SAP table default	0.12	
Roof	R7: Flat ceiling (inverted)	SAP table default	0.12	inverted E13
Roof	R8: Roof to wall (rafter)	SAP table default	0.12	
3 Air permeability (better than typically expected values are flagged with a subsequent (!))				
Maximum permitted air permeability at 50Pa		8 m³/hm²		
Dwelling air permeability at 50Pa		3.2 m³/hm², Design value (!)		OK
Air permeability test certificate reference				
4 Space heating				
Main heating system 1: Heat pump with radiators or underfloor heating - Electricity				
Efficiency		285.1%		
Emitter type		Radiators		
Flow temperature		45°C		
System type		Heat Pump		
Manufacturer		Global Energy Systems		
Model		Thurso		
Commissioning				
Secondary heating system: N/A				
Fuel		N/A		
Efficiency		N/A		
Commissioning				

5 Hot water		
Cylinder/store - type: N/A		
Capacity	N/A	
Declared heat loss	N/A	
Primary pipework insulated	N/A	
Manufacturer		
Model		
Commissioning		
Waste water heat recovery system 1 - type: N/A		
Efficiency		
Manufacturer		
Model		
6 Controls		
Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services		
Function		
Ecodesign class		
Manufacturer		
Model		
Water heating - type: N/A		
Manufacturer		
Model		
7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	75 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: Balanced whole-house mechanical ventilation with heat recovery		
Maximum permitted specific fan power	1.5 W/(l/s)	
Specific fan power	1.3 W/(l/s)	OK
Minimum permitted heat recovery efficiency	73%	
Heat recovery efficiency	85%	OK
Manufacturer/Model	(targets)	
Commissioning		
9 Local generation		
N/A		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Full SAP Calculation Printout



Plot Reference	SE453111 - Ashwell Tennis 02				Issued on Date	22/01/2026	
Assessment Reference	02DSv0		Plot Type Ref		Plot 02 Type 01		
Plot Address	Plot 02 (Type 01), Rollys Lane, Baldock, SG7				SAP Version	10.2	
SAP Rating	81 B	DER	3.89	TER	11.05		
Environmental	96 A	% DER < TER				64.80	
CO ₂ Emissions (t/year)	0.53	DFEE	46.82	TFEE	46.84		
Compliance Check	See BREL	% DFEE < TFEE				0.05	
% DPER < TPER	29.89	DPER	40.81	TPER	58.20		
Assessor Details	Mr. Yik Shun Wilson Ho				Assessor ID	T635-0001	
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)
Main dwelling			
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	365.7480 (5)

2. Ventilation rate

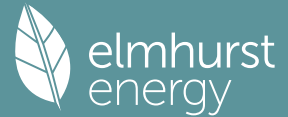
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	0 * 10 =	0.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	0.0000 / (5) =	
Pressure Test Method	Yes	
Measured/design AP50	Blower Door	
Infiltration rate	3.2000 (17)	
Number of sides sheltered	0.1600 (18)	
Shelter factor	1 (19)	
Infiltration rate adjusted to include shelter factor	(20) = 1 - [0.075 x (19)] =	
	(21) = (18) x (20) =	
	0.9250 (20)	
	0.1480 (21)	
Wind speed	Jan 5.1000	Feb 5.0000
Wind factor	Mar 4.9000	Apr 4.4000
Adj infilt rate	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)
	1.2750	1.1750 (22a)
	0.1887	0.1850
	0.1813	0.1628
	0.1591	0.1406
	0.1406	0.1369
	0.1480	0.1591
	0.1665	0.1739 (22b)
Balanced mechanical ventilation with heat recovery		
If mechanical ventilation	0.5000 (23a)	
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)	0.5000 (23b)	
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =	76.5000 (23c)	
Effective ac	0.3062	0.3025
	0.2988	0.2803
	0.2766	0.2581
	0.2581	0.2544
	0.2655	0.2766
	0.2840	0.2914 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
W			14.9200	0.9615	14.3462		(27)
D			9.8300	1.4000	13.7620		(26a)
Ground floor			74.6400	0.1200	8.9568	110.0000	8210.4000 (28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448	110.0000	16649.6000 (29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1400	0.5796	9.0000	37.2600 (29a)
Dwarf wall	9.6100		9.6100	0.2100	2.0181	9.0000	86.4900 (29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497	9.0000	470.4300 (30)
Raftered roof	28.8900		28.8900	0.1400	4.0446	9.0000	260.0100 (30)
Eaves void	3.6200		3.6200	0.1043	0.3774	9.0000	32.5800 (30)
Total net area of external elements Aum(A, m ²)			349.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		77.0792		(33)
Main dwelling							
Internal wall (masonry)			240.3700			55.0000	13220.3500 (32c)
Internal Floor 1			68.2800			18.0000	1229.0400 (32d)

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Water heating gains (Table 5)	112.2144	109.3597	103.8071	91.5646	84.0816	76.2527	71.4124	75.3632	80.0012	88.6879	100.4199	110.6436 (72)
Total internal gains	677.3162	697.5875	663.9768	640.5113	604.8684	582.5717	557.7486	558.4545	577.4549	597.3645	637.2563	661.9479 (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					2.8100	10.6334	0.6800	0.7000			0.7700	9.8564 (74)	
East					2.1400	19.6403	0.6800	0.7000			0.7700	13.8644 (76)	
South					4.1400	46.7521	0.6800	0.7000			0.7700	63.8471 (78)	
West					5.8300	19.6403	0.6800	0.7000			0.7700	37.7708 (80)	

Solar gains	125.3387	224.4106	331.5526	444.5624	523.4564	529.4770	506.4958	447.0741	371.0931	255.0614	152.2228	105.8488 (83)	
Total gains	802.6549	921.9982	995.5294	1085.0737	1128.3248	1112.0487	1064.2444	1005.5286	948.5480	852.4259	789.4791	767.7967 (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, n _{l,m} (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.4965	83.7720	84.0494	85.4643	85.7530	87.2263	87.2263	87.5270	86.6309	85.7530	85.1775	84.6097
alpha	6.5664	6.5848	6.6033	6.6976	6.7169	6.8151	6.8151	6.8351	6.7754	6.7169	6.6785	6.6406
util living area	0.9993	0.9980	0.9943	0.9752	0.9046	0.7189	0.5337	0.5856	0.8489	0.9843	0.9981	0.9995 (86)
Living	19.9786	20.1222	20.3260	20.6174	20.8539	20.9773	20.9973	20.9952	20.9315	20.6249	20.2573	19.9637
Non living	18.9206	19.1065	19.3685	19.7444	20.0209	20.1471	20.1588	20.1606	20.1082	19.7597	19.2900	18.9096
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	20.4775	20.1222	20.3260	20.6174	20.8539	20.9773	20.9973	20.9952	20.9315	20.6249	20.2573	20.1086 (87)
Th 2	20.1252	20.1279	20.1305	20.1437	20.1463	20.1596	20.1596	20.1622	20.1543	20.1463	20.1410	20.1358 (88)
util rest of house	0.9990	0.9972	0.9919	0.9646	0.8658	0.6373	0.4338	0.4828	0.7813	0.9756	0.9972	0.9993 (89)
MIT 2	19.6450	19.1065	19.3685	19.7444	20.0209	20.1471	20.1588	20.1606	20.1082	19.7597	19.2900	19.1306 (90)
Living area fraction	19.8888	19.4039	19.6489	20.0000	20.2648	20.3902	20.4043	20.4050	20.3493	20.0130	19.5733	19.4170 (92)
MIT	19.8888	19.4039	19.6489	20.0000	20.2648	20.3902	20.4043	20.4050	20.3493	20.0130	19.5733	19.4170 (93)
Temperature adjustment	19.8888	19.4039	19.6489	20.0000	20.2648	20.3902	20.4043	20.4050	20.3493	20.0130	19.5733	19.4170 (93)
adjusted MIT	19.8888	19.4039	19.6489	20.0000	20.2648	20.3902	20.4043	20.4050	20.3493	20.0130	19.5733	19.4170 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	801.7984	918.6100	985.7643	1044.2185	983.8049	734.6819	492.9938	515.9775	757.4814	830.0654	786.5767	767.0660 (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	2116.4832	1962.7167	1773.4798	1472.3474	1132.2404	752.5166	494.4222	518.7158	817.7685	1244.3774	1660.0705	2038.8216 (97)
Space heating kWh	978.1254	701.6397	586.0603	308.2528	110.4360	0.0000	0.0000	0.0000	0.0000	308.2482	628.9155	946.1862 (98a)
Space heating requirement - total per year (kWh/year)												4567.8642
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	978.1254	701.6397	586.0603	308.2528	110.4360	0.0000	0.0000	0.0000	0.0000	308.2482	628.9155	946.1862 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4567.8642
Space heating per m ²										(98c) / (4) =		31.9610 (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 %)											285.1140 (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	978.1254	701.6397	586.0603	308.2528	110.4360	0.0000	0.0000	0.0000	0.0000	308.2482	628.9155	946.1862 (98)
Space heating efficiency (main heating system 1)	285.1140	285.1140	285.1140	285.1140	285.1140	0.0000	0.0000	0.0000	0.0000	285.1140	285.1140	285.1140 (210)
Space heating fuel (main heating system)	343.0646	246.0909	205.5530	108.1156	38.7340	0.0000	0.0000	0.0000	0.0000	108.1140	220.5838	331.8624 (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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (64)
Efficiency of water heater (217)m	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578 (216)
Fuel for water heating, kWh/month	105.1990	92.9262	98.3771	85.5901	82.3711	73.5663	72.0909	75.2967	76.5098	86.1088	92.5437	103.9244 (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	68.9735	62.2986	68.9735	66.7485	68.9735	66.7485	68.9735	68.9735	66.7485	68.9735	66.7485	68.9735 (231)
Lighting	39.4482	31.6468	28.4944	20.8762	16.1254	13.1746	14.7101	19.1208	24.8360	32.5862	36.8060	40.5445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												

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(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												1602.1183	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												275.7578	
Water heating fuel used												1044.5041	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)													
mechanical ventilation fans (SFP = 1.8200)												812.1069	(230a)
Total electricity for the above, kWh/year												812.1069	(231)
Electricity for lighting (calculated in Appendix L)												318.3693	(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												3777.0986	(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	1602.1183	0.1557	249.4223	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1044.5041	0.1411	147.4017	(264)
Space and water heating			396.8241	(265)
Pumps, fans and electric keep-hot	812.1069	0.1387	112.6492	(267)
Energy for lighting	318.3693	0.1443	45.9505	(268)
Total CO2, kg/year			555.4238	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			3.8900	(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	1602.1183	1.5764	2525.5141	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1044.5041	1.5218	1589.5538	(278)
Space and water heating			4115.0679	(279)
Pumps, fans and electric keep-hot	812.1069	1.5128	1228.5553	(281)
Energy for lighting	318.3693	1.5338	488.3254	(282)
Total Primary energy kWh/year			5831.9486	(286)
Dwelling Primary energy Rate (DPER)			40.8100	(287)

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

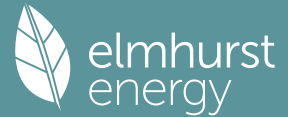
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)	
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	365.7480 (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)

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Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =											Air changes per hour
Pressure test												40.0000 / (5) = 0.1094 (8)
Pressure Test Method												Yes
Measured/design AP50												Blower Door
Infiltration rate												5.0000 (17)
Number of sides sheltered												0.3594 (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) = 0.3324 (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	0.4238	0.4155	0.4072	0.3657	0.3573	0.3158	0.3158	0.3075	0.3324	0.3573	0.3740	0.3906 (22b)
	0.5898	0.5863	0.5829	0.5669	0.5638	0.5499	0.5499	0.5473	0.5552	0.5638	0.5699	0.5763 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			9.8300	1.0000	9.8300		(26a)
TER Opening Type			14.9200	1.1450	17.0840		(27)
Ground floor			74.6400	0.1300	9.7032		(28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448		(29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1800	0.7452		(29a)
Dwarf wall	9.6100		9.6100	0.1800	1.7298		(29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497		(30)
Raftered roof	28.8900		28.8900	0.1100	3.1779		(30)
Eaves void	3.6200		3.6200	0.1100	0.3982		(30)
Total net area of external elements Aum(A, m2)			349.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	75.6628		(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							285.5491 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.8700	0.0500	0.7935
E2 Other lintels (including other steel lintels)	1.2000	0.0500	0.0600
E3 Sill	10.0300	0.0500	0.5015
E3 Sill	1.2000	0.0500	0.0600
E4 Jamb	30.2800	0.0500	1.5140
E4 Jamb	2.2800	0.0500	0.1140
E5 Ground floor (normal)	40.2300	0.1600	6.4368
E6 Intermediate floor within a dwelling	29.4000	0.0000	0.0000
E6 Intermediate floor within a dwelling	10.6600	0.0000	0.0000
E10 Eaves (insulation at ceiling level)	6.0500	0.0600	0.3630
E11 Eaves (insulation at rafter level)	16.0800	0.0400	0.6432
E11 Eaves (insulation at rafter level)	5.8000	0.0400	0.2320
E12 Gable (insulation at ceiling level)	15.3300	0.0600	0.9198
E12 Gable (insulation at ceiling level)	0.7800	0.0600	0.0468
E13 Gable (insulation at rafter level)	9.5700	0.0800	0.7656
E13 Gable (insulation at rafter level)	0.7200	0.0800	0.0576
E16 Corner (normal)	24.9100	0.0900	2.2419
E16 Corner (normal)	12.0700	0.0900	1.0863
E17 Corner (inverted - internal area greater than external area)	7.6100	-0.0900	-0.6849
E17 Corner (inverted - internal area greater than external area)	7.0500	-0.0900	-0.6345
R5 Ridge (inverted)	6.4800	0.0400	0.2592
R6 Flat ceiling	33.3200	0.0600	1.9992
R7 Flat ceiling (inverted)	6.5500	0.0400	0.2620
R8 Roof to wall (rafter)	4.2900	0.0600	0.2574

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

Point Thermal bridges	(36a) =	17.2944 (36)
Total fabric heat loss	(33) + (36) + (36a) =	92.9572 (37)

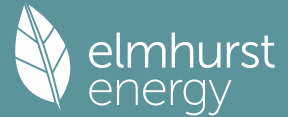
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	71.1887	70.7678	70.3552	68.4172	68.0546	66.3666	66.3666	66.0541	67.0168	68.0546	68.7881	69.5550 (38)
Average = Sum(39)m / 12 =	164.1459	163.7249	163.3123	161.3743	161.0117	159.3238	159.3238	159.0112	159.9740	161.0117	161.7453	162.5121 (39)
												161.3726
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1485	1.1456	1.1427	1.1291	1.1266	1.1148	1.1148	1.1126	1.1193	1.1266	1.1317	1.1371 (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												2.9224 (42)
Hot water usage for mixer showers												
	73.2197	72.1193	70.5159	67.4480	65.1840	62.6592	61.2241	62.8154	64.5598	67.2706	70.4044	72.9391 (42a)
Hot water usage for baths												
	31.6101	31.1406	30.4795	29.2606	28.3479	27.3358	26.7892	27.4456	28.1604	29.2433	30.4874	31.5032 (42b)
Hot water usage for other uses												
	44.5588	42.9385	41.3182	39.6978	38.0775	36.4572	36.4572	38.0775	39.6978	41.3182	42.9385	44.5588 (42c)
Average daily hot water use (litres/day)												137.3216 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	149.3886	146.1984	142.3136	136.4065	131.6094	126.4523	124.4705	128.3386	132.4180	137.8321	143.8302	149.0012 (44)
Energy content (annual)	236.5950	208.1846	218.7307	186.7337	177.1716	155.4878	150.5363	158.9100	163.2846	187.0369	204.9126	233.2998 (45)
Distribution loss (46)m = 0.15 x (45)m												Total = Sum(45)m = 2280.8835
	35.4892	31.2277	32.8096	28.0100	26.5757	23.3232	22.5804	23.8365	24.4927	28.0555	30.7369	34.9950 (46)
Water storage loss (or HIU loss):												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.3938 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												0.7527 (55)
Total storage loss												
	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798	23.3325 (56)

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If cylinder contains dedicated solar storage											
Primary loss	23.3325	21.0745	23.3325	22.5798	23.3325	22.5798	23.3325	23.3325	22.5798	23.3325	22.5798 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month											
WWHRS	283.1899	250.2703	265.3256	231.8255	223.7665	200.5796	197.1312	205.5049	208.3765	233.6318	250.0044 (62)
PV diverter	-33.4730	-29.6038	-30.9994	-25.6687	-23.9223	-20.4705	-19.1878	-20.4043	-21.1796	-24.9684	-28.2861 (63a)
Solar input	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
	249.7169	220.6666	234.3262	206.1568	199.8442	180.1091	177.9434	185.1005	187.1969	208.6634	221.7183 (64)
Total per year (kWh/year)											2518.4839 (64)
Electric shower(s)											2518 (64)
	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											
	115.9437	102.8900	110.0039	98.1624	96.1855	87.7732	87.3292	90.1135	90.3656	99.4657	104.2069 (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
(66)m	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5											
	180.4754	199.8121	180.4754	186.4913	180.4754	186.4913	180.4754	180.4754	186.4913	180.4754	186.4913 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5											
	312.7083	315.9532	307.7761	290.3679	268.3933	247.7402	233.9427	230.6978	238.8749	256.2830	278.2577 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5											
	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122 (69)
Pumps, fans											
	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)											
	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979 (71)
Water heating gains (Table 5)											
	155.8384	153.1101	147.8547	136.3367	129.2816	121.9072	117.3780	121.1203	125.5078	133.6904	144.7318 (72)
Total internal gains											
	718.8587	738.7120	705.9429	683.0326	647.9870	622.9754	598.6328	599.1302	617.7107	640.2856	679.3174 (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	2.8100	10.6334	0.6300	0.7000	0.7700	9.1317 (74)
East	2.1400	19.6403	0.6300	0.7000	0.7700	12.8450 (76)
South	4.1400	46.7521	0.6300	0.7000	0.7700	59.1525 (78)
West	5.8300	19.6403	0.6300	0.7000	0.7700	34.9935 (80)
Solar gains	116.1226	207.9098	307.1738	411.8740	484.9670	490.5448 (83)
Total gains	834.9814	946.6219	1013.1166	1094.9066	1132.9539	1113.5202 (84)

7. Mean internal temperature (heating season)

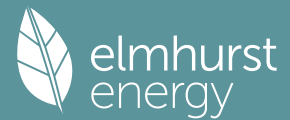
Temperature during heating periods in the living area from Table 9, Th1 (C)											
Utilisation factor for gains for living area, nil,m (see Table 9a)											21.0000 (85)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
tau	69.0623	69.2399	69.4148	70.2485	70.4067	71.1526	71.1526	71.2925	70.8634	70.4067	70.0874
alpha	5.6042	5.6160	5.6277	5.6832	5.6938	5.7435	5.7435	5.7528	5.7242	5.6938	5.6725
util living area	0.9991	0.9980	0.9952	0.9832	0.9412	0.8118	0.6351	0.6872	0.9032	0.9879	0.9979 (86)
MIT	19.7139	19.8588	20.0820	20.4073	20.7082	20.9215	20.9845	20.9762	20.8405	20.4527	20.0332 (87)
Th 2	19.9614	19.9638	19.9661	19.9771	19.9792	19.9888	19.9888	19.9906	19.9851	19.9792	19.9750 (88)
util rest of house	0.9988	0.9971	0.9931	0.9752	0.9104	0.7231	0.5006	0.5542	0.8422	0.9805	0.9969 (89)
MIT 2	18.4584	18.6457	18.9326	19.3522	19.7172	19.9423	19.9841	19.9824	19.8706	19.4141	18.8776 (90)
Living area fraction	18.8260	19.0009	19.2692	19.6611	20.0074	20.2290	20.2771	20.2734	20.1546	19.7182	19.2159 (91)
MIT	18.8260	19.0009	19.2692	19.6611	20.0074	20.2290	20.2771	20.2734	20.1546	19.7182	19.2159 (92)
Temperature adjustment	18.8260	19.0009	19.2692	19.6611	20.0074	20.2290	20.2771	20.2734	20.1546	19.7182	19.2159 (93)
adjusted MIT	18.8260	19.0009	19.2692	19.6611	20.0074	20.2290	20.2771	20.2734	20.1546	19.7182	19.2159 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9982	0.9960	0.9911	0.9718	0.9114	0.7465	0.5406	0.5937	0.8544	0.9779	0.9958	0.9986 (94)
Useful gains	833.4641	942.8741	1004.0798	1064.0795	1032.5792	831.2400	577.2845	601.6457	821.5005	857.2387	816.9238	800.5038 (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	2384.3845	2308.6695	2085.3698	1736.5704	1337.5864	896.8402	585.8431	615.9147	968.5759	1468.1418	1959.6972	2374.3030 (97)
Space heating kWh	1153.8848	917.8145	804.4798	484.1935	226.9254	0.0000	0.0000	0.0000	0.0000	454.5119	822.7969	1170.9066 (98a)
Space heating requirement - total per year (kWh/year)												6035.5132
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	1153.8848	917.8145	804.4798	484.1935	226.9254	0.0000	0.0000	0.0000	0.0000	454.5119	822.7969	1170.9066 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6035.5132
Space heating per m2												42.2300 (99)

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

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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	1153.8848	917.8145	804.4798	484.1935	226.9254	0.0000	0.0000	0.0000	0.0000	454.5119	822.7969	1170.9066 (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)	1250.1460	994.3819	871.5924	524.5866	245.8563	0.0000	0.0000	0.0000	0.0000	492.4289	891.4375	1268.5878 (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	249.7169	220.6666	234.3262	206.1568	199.8442	180.1091	177.9434	185.1005	187.1969	208.6634	221.7183	247.0416 (64)
Efficiency of water heater												79.8000 (216)
(217)m	87.0533	86.9004	86.5969	85.9067	84.3455	79.8000	79.8000	79.8000	79.8000	85.7568	86.7238	87.0888 (217)
Fuel for water heating, kWh/month	286.8553	253.9306	270.5942	239.9776	236.9352	225.7007	222.9867	231.9556	234.5826	243.3199	255.6602	283.6665 (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	37.4992	30.0833	27.0866	19.8448	15.3287	12.5237	13.9834	18.1761	23.6090	30.9763	34.9876	38.5414 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-64.8310	-88.9180	-124.3023	-135.6984	-142.8672	-132.0023	-130.2735	-124.6291	-114.2222	-99.6821	-70.3516	-56.3377 (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	-44.4567	-92.5352	-182.1987	-271.2411	-356.4255	-357.4370	-353.3107	-300.2054	-221.4029	-131.6031	-59.1007	-35.2366 (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												6539.0176 (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												2986.1648 (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)												302.6402 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3689.2690 (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												6224.5536 (238)

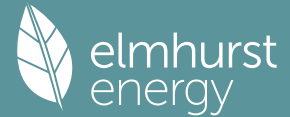
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6539.0176	0.2100	1373.1937 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2986.1648	0.2100	627.0946 (264)
Space and water heating			2000.2883 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	302.6402	0.1443	43.6803 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1284.1155	0.1352	-173.6330
PV Unit electricity exported	-2405.1535	0.1262	-303.4159
Total			-477.0490 (269)
Total CO2, kg/year			1578.8489 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			11.0500 (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	6539.0176	1.1300	7389.0898 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2986.1648	1.1300	3374.3663 (278)
Space and water heating			10763.4561 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	302.6402	1.5338	464.1997 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1284.1155	1.4998	-1925.8790
PV Unit electricity exported	-2405.1535	0.4631	-1113.7715
Total			-3039.6505 (283)
Total Primary energy kWh/year			8318.1061 (286)
Target Primary Energy Rate (TPER)			58.2000 (287)

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	365.7480 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	4 * 10 = 40.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	40.0000 / (5) = 0.1094 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.2000 (17)
Infiltration rate	0.2694 (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) = 0.2492 (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	0.3177	0.3115	0.3052	0.2741	0.2678	0.2367	0.2367	0.2305	0.2492	0.2678	0.2803	0.2928 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.5505	0.5485	0.5466	0.5376	0.5359	0.5280	0.5280	0.5266	0.5310	0.5359	0.5393	0.5429 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
W			14.9200	0.9615	14.3462		(27)
D			9.8300	1.4000	13.7620		(26a)
Ground floor			74.6400	0.1200	8.9568	110.0000	8210.4000 (28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448	110.0000	16649.6000 (29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1400	0.5796	9.0000	37.2600 (29a)
Dwarf wall	9.6100		9.6100	0.2100	2.0181	9.0000	86.4900 (29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497	9.0000	470.4300 (30)
Raftered roof	28.8900		28.8900	0.1400	4.0446	9.0000	260.0100 (30)
Eaves void	3.6200		3.6200	0.1043	0.3774	9.0000	32.5800 (30)
Total net area of external elements Aum(A, m ²)			349.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0792		(33)
Main dwelling							
Internal wall (masonry)			240.3700			55.0000	13220.3500 (32c)
Internal Floor 1			68.2800			18.0000	1229.0400 (32d)
Internal Ceiling 1			68.2800			9.0000	614.5200 (32e)

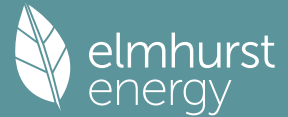
Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 40810.6800 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 285.5491 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	15.8700	0.0680	1.0792
E2 Other lintels (including other steel lintels)	1.2000	1.0000	1.2000
E3 Sill	10.0300	0.0270	0.2708
E3 Sill	1.2000	0.1000	0.1200
E4 Jamb	30.2800	0.0220	0.6662
E4 Jamb	2.2800	0.1000	0.2280
E5 Ground floor (normal)	40.2300	0.0980	3.9425
E6 Intermediate floor within a dwelling	29.4000	0.0010	0.0294
E6 Intermediate floor within a dwelling	10.6600	0.1400	1.4924
E10 Eaves (insulation at ceiling level)	6.0500	0.0690	0.4175
E11 Eaves (insulation at rafter level)	16.0800	0.0200	0.3216
E11 Eaves (insulation at rafter level)	5.8000	0.1500	0.8700
E12 Gable (insulation at ceiling level)	15.3300	0.0970	1.4870
E12 Gable (insulation at ceiling level)	0.7800	0.0970	0.0757
E13 Gable (insulation at rafter level)	9.5700	0.0600	0.5742
E13 Gable (insulation at rafter level)	0.7200	0.2500	0.1800
E16 Corner (normal)	24.9100	0.0460	1.1459
E16 Corner (normal)	12.0700	0.1800	2.1726
E17 Corner (inverted - internal area greater than external area)	7.6100	-0.0810	-0.6164
E17 Corner (inverted - internal area greater than external area)	7.0500	0.0000	0.0000
R5 Ridge (inverted)	6.4800	0.1200	0.7776
R6 Flat ceiling	33.3200	0.1200	3.9984

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R7 Flat ceiling (inverted)	6.5500	0.1200	0.7860
R8 Roof to wall (rafter)	4.2900	0.1200	0.5148
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.7332 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	98.8124 (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	66.4389	66.2024	65.9706	64.8817	64.6780	63.7297	63.7297	63.5541	64.0950	64.6780	65.0901	65.5210 (38)
Average = Sum(39)m / 12 =	165.2513	165.0148	164.7830	163.6942	163.4905	162.5421	162.5421	162.3665	162.9074	163.4905	163.9026	164.3334 (39)
												163.6932
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1563	1.1546	1.1530	1.1454	1.1439	1.1373	1.1373	1.1361	1.1399	1.1439	1.1468	1.1498 (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												2.9224 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
31.6101	31.1406	30.4795	29.2606	28.3479	27.3358	26.7892	27.4456	28.1604	29.2433	30.4874	31.5032	(42b)
Hot water usage for other uses												
44.5588	42.9385	41.3182	39.6978	38.0775	36.4572	36.4572	38.0775	39.6978	41.3182	42.9385	44.5588	(42c)
Average daily hot water use (litres/day)												69.8155 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
76.1689	74.0791	71.7977	68.9584	66.4254	63.7930	63.2463	65.5231	67.8582	70.5615	73.4258	76.0620	(44)
Energy conte	120.6329	105.4876	110.3504	94.4007	89.4214	78.4410	76.4910	81.1313	83.6760	95.7513	104.6086	119.0947 (45)
Energy content (annual)										Total = Sum(45)m =		1159.4867
Distribution loss (46)m = 0.15 x (45)m												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month												
102.5379	89.6645	93.7978	80.2406	76.0081	66.6748	65.0173	68.9616	71.1246	81.3886	88.9173	101.2305	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	102.5379	89.6645	93.7978	80.2406	76.0081	66.6748	65.0173	68.9616	71.1246	81.3886	88.9173	(64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				985.5637 (64)
Electric shower(s)	58.6368	52.2458	57.0505	54.4425	55.4641	52.9074	54.6710	55.4641	54.4425	57.0505	55.9777	58.6368 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				666.9898 (64a)
Heat gains from water heating, kWh/month	40.2937	35.4776	37.7121	33.6708	32.8681	29.8956	29.9221	31.1064	31.3918	34.6098	36.2237	39.9668 (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	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
185.5568	205.4379	185.5568	191.7421	185.5568	191.7421	185.5568	185.5568	191.7421	185.5568	191.7421	185.5568	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
312.7083	315.9532	307.7761	290.3679	268.3933	247.7402	233.9427	230.6978	238.8749	256.2830	278.2577	298.9107	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	(69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	(71)
Water heating gains (Table 5)												
54.1582	52.7940	50.6883	46.7650	44.1775	41.5216	40.2179	41.8097	43.5997	46.5185	50.3108	53.7188	(72)
Total internal gains	619.2600	641.0219	610.8579	595.7117	564.9643	547.8406	526.5541	524.9011	541.0534	555.1951	587.1472	605.0231 (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				2.8100	10.6334	0.6800	0.7000	0.7700	9.8564 (74)			
East				2.1400	19.6403	0.6800	0.7000	0.7700	13.8644 (76)			
South				4.1400	46.7521	0.6800	0.7000	0.7700	63.8471 (78)			
West				5.8300	19.6403	0.6800	0.7000	0.7700	37.7708 (80)			
Solar gains	125.3387	224.4106	331.5526	444.5624	523.4564	529.4770	506.4958	447.0741	371.0931	255.0614	152.2228	105.8488 (83)
Total gains	744.5987	865.4325	942.4105	1040.2741	1088.4208	1077.3176	1033.0499	971.9751	912.1464	810.2564	739.3700	710.8720 (84)

7. Mean internal temperature (heating season)

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

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tau	68.6004	68.6987	68.7953	69.2529	69.3392	69.7438	69.7438	69.8192	69.5874	69.3392	69.1649	68.9835
alpha	5.5734	5.5799	5.5864	5.6169	5.6226	5.6496	5.6496	5.6546	5.6392	5.6226	5.6110	5.5989
util living area	0.9995	0.9987	0.9966	0.9871	0.9513	0.8344	0.6631	0.7199	0.9226	0.9918	0.9988	0.9996 (86)
MIT	19.6425	19.7924	20.0227	20.3564	20.6726	20.9045	20.9796	20.9681	20.8092	20.3948	19.9613	19.6176 (87)
Th 2	19.9552	19.9565	19.9578	19.9640	19.9651	19.9705	19.9705	19.9715	19.9684	19.9651	19.9628	19.9603 (88)
util rest of house	0.9993	0.9982	0.9952	0.9806	0.9243	0.7481	0.5233	0.5832	0.8686	0.9867	0.9982	0.9995 (89)
MIT 2	18.7138	18.8646	19.0953	19.4302	19.7321	19.9252	19.9656	19.9627	19.8578	19.4713	19.0384	18.6931 (90)
Living area fraction	18.9857	19.1362	19.3669	19.7014	20.0075	20.2120	20.2625	20.2571	20.1364	19.7417	19.3086	18.9638 (92)
MIT	18.9857	19.1362	19.3669	19.7014	20.0075	20.2120	20.2625	20.2571	20.1364	19.7417	19.3086	18.9638 (93)
Temperature adjustment												0.0000
adjusted MIT	18.9857	19.1362	19.3669	19.7014	20.0075	20.2120	20.2625	20.2571	20.1364	19.7417	19.3086	18.9638 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9990	0.9976	0.9940	0.9784	0.9257	0.7710	0.5651	0.6242	0.8794	0.9851	0.9976	0.9993 (94)
Useful gains	743.8856	863.3510	936.7375	1017.8389	1007.4996	830.5735	583.8125	606.6607	802.1248	798.1805	737.6201	710.3515 (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	2426.8376	2349.1910	2120.2459	1768.1276	1358.1975	912.1807	595.3132	626.2633	983.3775	1494.5849	2001.0292	2426.1864 (97)
Space heating kWh	1252.1163	998.4844	880.5302	540.2079	260.9192	0.0000	0.0000	0.0000	0.0000	518.1249	909.6545	1276.5811 (98a)
Space heating requirement - total per year (kWh/year)												6636.6186
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	1252.1163	998.4844	880.5302	540.2079	260.9192	0.0000	0.0000	0.0000	0.0000	518.1249	909.6545	1276.5811 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6636.6186
Space heating per m2											(98c) / (4) =	46.4359 (99)

8c. Space cooling requirement

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

Ext. temp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1527.8959	1202.8117	1233.9854	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7134	0.8147	0.7713	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1090.0662	979.9361	951.8171	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1160.2939	1112.8433	1045.3981	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	50.5640	98.8829	69.6242	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									f _c = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	12.6410	24.7207	17.4061	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												54.7678 (107)
Energy for space heating												46.4359 (99)
Energy for space cooling												0.3832 (108)
Total												46.8191 (109)
Fabric Energy Efficiency (DFEE)												46.8 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

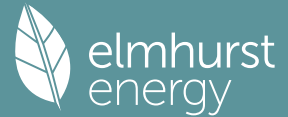
1. Overall dwelling characteristics

Main dwelling	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	365.7480 (5)

2. Ventilation rate

Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	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) = 0.1094 (8)
Pressure test		Yes
Pressure Test Method		Blower Door
Measured/design AP50		5.0000 (17)
Infiltration rate		0.3594 (18)

Full SAP Calculation Printout



Number of sides sheltered

1 (19)

Shelter factor

$$(20) = 1 - [0.075 \times (19)] = 0.9250 \quad (20)$$

Infiltration rate adjusted to include shelter factor

$$(21) = (18) \times (20) = 0.3324 \quad (21)$$

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.4238	0.4155	0.4072	0.3657	0.3573	0.3158	0.3158	0.3075	0.3324	0.3573	0.3740	0.3906	(22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													0.0000 (23c)
Effective ac	0.5898	0.5863	0.5829	0.5669	0.5638	0.5499	0.5499	0.5473	0.5552	0.5638	0.5699	0.5763	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			9.8300	1.0000	9.8300			(26a)
TER Opening Type			14.9200	1.1450	17.0840			(27)
Ground floor			74.6400	0.1300	9.7032			(28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448			(29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1800	0.7452			(29a)
Dwarf wall	9.6100		9.6100	0.1800	1.7298			(29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497			(30)
Raftered roof	28.8900		28.8900	0.1100	3.1779			(30)
Eaves void	3.6200		3.6200	0.1100	0.3982			(30)
Total net area of external elements Aum(A, m2)			349.2800					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	75.6628		(33)

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

285.5491 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)	15.8700	0.0500	0.7935	
E2 Other lintels (including other steel lintels)	1.2000	0.0500	0.0600	
E3 Sill	10.0300	0.0500	0.5015	
E3 Sill	1.2000	0.0500	0.0600	
E4 Jamb	30.2800	0.0500	1.5140	
E4 Jamb	2.2800	0.0500	0.1140	
E5 Ground floor (normal)	40.2300	0.1600	6.4368	
E6 Intermediate floor within a dwelling	29.4000	0.0000	0.0000	
E6 Intermediate floor within a dwelling	10.6600	0.0000	0.0000	
E10 Eaves (insulation at ceiling level)	6.0500	0.0600	0.3630	
E11 Eaves (insulation at rafter level)	16.0800	0.0400	0.6432	
E11 Eaves (insulation at rafter level)	5.8000	0.0400	0.2320	
E12 Gable (insulation at ceiling level)	15.3300	0.0600	0.9198	
E12 Gable (insulation at ceiling level)	0.7800	0.0600	0.0468	
E13 Gable (insulation at rafter level)	9.5700	0.0800	0.7656	
E13 Gable (insulation at rafter level)	0.7200	0.0800	0.0576	
E16 Corner (normal)	24.9100	0.0900	2.2419	
E16 Corner (normal)	12.0700	0.0900	1.0863	
E17 Corner (inverted - internal area greater than external area)	7.6100	-0.0900	-0.6849	
E17 Corner (inverted - internal area greater than external area)	7.0500	-0.0900	-0.6345	
R5 Ridge (inverted)	6.4800	0.0400	0.2592	
R6 Flat ceiling	33.3200	0.0600	1.9992	
R7 Flat ceiling (inverted)	6.5500	0.0400	0.2620	
R8 Roof to wall (rafter)	4.2900	0.0600	0.2574	

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

17.2944 (36)

Point Thermal bridges

$$(36a) = 0.0000$$

Total fabric heat loss

$$(33) + (36) + (36a) = 92.9572 \quad (37)$$

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

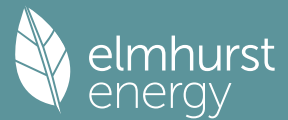
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	71.1887	70.7678	70.3552	68.4172	68.0546	66.3666	66.3666	66.0541	67.0168	68.0546	68.7881	69.5550	(38)
Average = Sum(39)m / 12 =	164.1459	163.7249	163.3123	161.3743	161.0117	159.3238	159.3238	159.0112	159.9740	161.0117	161.7453	162.5121	(39)
												161.3726	(39)

HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1485	1.1456	1.1427	1.1291	1.1266	1.1148	1.1148	1.1126	1.1193	1.1266	1.1317	1.1371	(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													2.9224 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	31.6101	31.1406	30.4795	29.2606	28.3479	27.3358	26.7892	27.4456	28.1604	29.2433	30.4874	31.5032	(42b)
Hot water usage for other uses	44.5588	42.9385	41.3182	39.6978	38.0775	36.4572	36.4572	38.0775	39.6978	41.3182	42.9385	44.5588	(42c)
Average daily hot water use (litres/day)													69.8155 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	76.1689	74.0791	71.7977	68.9584	66.4254	63.7930	63.2463	65.5231	67.8582	70.5615	73.4258	76.0620	(44)
Energy content (annual)	120.6329	105.4876	110.3504	94.4007	89.4214	78.4410	76.4910	81.1313	83.6760	95.7513	104.6086	119.0947	(45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(46)
Water storage loss (or HIU loss):													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month	102.5379	89.6645	93.7978	80.2406	76.0081	66.6748	65.0173	68.9616	71.1246	81.3886	88.9173	101.2305	(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)

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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	102.5379	89.6645	93.7978	80.2406	76.0081	66.6748	65.0173	68.9616	71.1246	81.3886	88.9173	101.2305 (64)
12Total per year (kWh/year)	Total per year (kWh/year) = Sum(64)m =											985.5637 (64)
Electric shower(s)	58.6368	52.2458	57.0505	54.4425	55.4641	52.9074	54.6710	55.4641	54.4425	57.0505	55.9777	58.6368 (64a)
Heat gains from water heating, kWh/month	40.2937	35.4776	37.7121	33.6708	32.8681	29.8956	29.9221	31.1064	31.3918	34.6098	36.2237	666.9898 (64a)
												986 (64)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	146.1224	666 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	180.4754	199.8121	180.4754	186.4913	180.4754	186.4913	180.4754	180.4754	186.4913	180.4754	186.4913	180.4754	677 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	312.7083	315.9532	307.7761	290.3679	268.3933	247.7402	233.9427	230.6978	238.8749	256.2830	278.2577	298.9107	688 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	37.6122	699 (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	700 (70)
Losses e.g. evaporation (negative values) (Table 5)	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	711 (71)
Water heating gains (Table 5)	54.1582	52.7940	50.6883	46.7650	44.1775	41.5216	40.2179	41.8097	43.5997	46.5185	50.3108	53.7188	722 (72)
Total internal gains	614.1786	635.3960	605.7765	590.4609	559.8829	542.5898	521.4727	519.8196	535.8026	550.1136	581.8964	599.9417	733 (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				2.8100	10.6334	0.6300	0.7000	0.7700	9.1317 (74)			
East				2.1400	19.6403	0.6300	0.7000	0.7700	12.8450 (76)			
South				4.1400	46.7521	0.6300	0.7000	0.7700	59.1525 (78)			
West				5.8300	19.6403	0.6300	0.7000	0.7700	34.9935 (80)			
Solar gains	116.1226	207.9098	307.1738	411.8740	484.9670	490.5448	469.2535	414.2010	343.8068	236.3069	141.0299	98.0658 (83)
Total gains	730.3012	843.3058	912.9502	1002.3349	1044.8499	1033.1346	990.7261	934.0206	879.6094	786.4205	722.9263	698.0076 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	69.0623	69.2399	69.4148	70.2485	70.4067	71.1526	71.1526	71.2925	70.8634	70.4067	70.0874	69.7566
alpha	5.6042	5.6160	5.6277	5.6832	5.6938	5.7435	5.7435	5.7528	5.7242	5.6938	5.6725	5.6504
util living area	0.9996	0.9989	0.9971	0.9889	0.9572	0.8461	0.6762	0.7316	0.9293	0.9928	0.9989	0.9997 (86)
MIT	19.6436	19.7898	20.0160	20.3495	20.6634	20.9013	20.9789	20.9674	20.8059	20.3950	19.9679	19.6267 (87)
Th 2	19.9614	19.9638	19.9661	19.9771	19.9792	19.9888	19.9888	19.9906	19.9851	19.9792	19.9750	19.9707 (88)
util rest of house	0.9994	0.9984	0.9958	0.9832	0.9328	0.7630	0.5372	0.5967	0.8786	0.9882	0.9984	0.9995 (89)
MIT 2	18.7199	18.8678	19.0953	19.4345	19.7366	19.9411	19.9836	19.9814	19.8708	19.4830	19.0548	18.7103 (90)
Living area fraction	18.9903	19.1377	19.3649	19.7024	20.0080	20.2223	20.2750	20.2701	20.1446	fLA = Living area / (4) =		0.2928 (91)
MIT	18.9903	19.1377	19.3649	19.7024	20.0080	20.2223	20.2750	20.2701	20.1446	19.7501	19.3222	18.9787 (92)
Temperature adjustment												0.0000
adjusted MIT	18.9903	19.1377	19.3649	19.7024	20.0080	20.2223	20.2750	20.2701	20.1446	19.7501	19.3222	18.9787 (93)

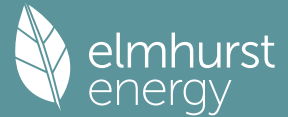
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	0.9991	0.9979	0.9948	0.9812	0.9337	0.7848	0.5789	0.6372	0.8884	0.9867	0.9979	0.9993	978 (97)
Useful gains	729.6706	841.5209	908.1913	983.5253	975.5708	810.8238	573.4962	595.1392	781.4839	775.9853	721.3998	697.5478	989 (98)
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	990 (99)
Heat loss rate W	2411.3597	2331.0745	2100.9912	1743.2360	1337.6862	895.7626	585.5212	615.3872	966.9820	1473.2711	1976.8786	2401.7148	1001 (100)
Space heating kWh	1251.1768	1000.9800	887.4431	546.9917	269.4139	0.0000	0.0000	0.0000	0.0000	518.7806	903.9447	1267.9002	1012 (101)
Space heating requirement - total per year (kWh/year)												6646.6309	1023 (102)
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	1034 (103)
Solar heating contribution - total per year (kWh/year)												0.0000	1045 (104)
Space heating kWh	1251.1768	1000.9800	887.4431	546.9917	269.4139	0.0000	0.0000	0.0000	0.0000	518.7806	903.9447	1267.9002	1056 (105)
Space heating requirement after solar contribution - total per year (kWh/year)												6646.6309	1067 (106)
Space heating per m2												46.5060	1078 (107)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	1089 (108)
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	1497.6438	1178.9962	1208.4853	0.0000	0.0000	0.0000	0.0000	1090 (109)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.7037	0.8069	0.7642	0.0000	0.0000	0.0000	0.0000	1101 (110)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	1053.9025	951.3528	923.5724	0.0000	0.0000	0.0000	0.0000	1112 (111)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1114.3442	1068.8328	1006.3505	0.0000	0.0000	0.0000	0.0000	1123 (112)
Space cooling kWh												0.0000	1134 (113)

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Cooled fraction	0.0000	0.0000	0.0000	0.0000	0.0000	43.5180	87.4052	61.5869	0.0000	0.0000	0.0000	0.0000 (104)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	1.0000 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	10.8795	21.8513	15.3967	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												48.1275 (107)
Energy for space heating												46.5060 (99)
Energy for space cooling												0.3367 (108)
Total												46.8427 (109)
Fabric Energy Efficiency (TFEE)												46.8 (109)

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

1. Overall dwelling characteristics

Main dwelling	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	365.7480 (5)

2. Ventilation rate

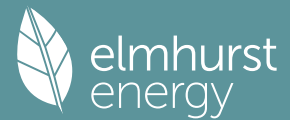
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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	3.2000 (17)
Infiltration rate	0.1600 (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) = 0.1480 (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	0.1887	0.1850	0.1813	0.1628	0.1591	0.1406	0.1406	0.1369	0.1480	0.1591	0.1665	0.1739 (22b)
Balanced mechanical ventilation with heat recovery												
If mechanical ventilation												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.3062	0.3025	0.2988	0.2803	0.2766	0.2581	0.2581	0.2544	0.2655	0.2766	0.2840	0.2914 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
W			14.9200	0.9615	14.3462		(27)
D			9.8300	1.4000	13.7620		(26a)
Ground floor			74.6400	0.1200	8.9568	110.0000	8210.4000 (28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448	110.0000	16649.6000 (29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1400	0.5796	9.0000	37.2600 (29a)
Dwarf wall	9.6100		9.6100	0.2100	2.0181	9.0000	86.4900 (29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497	9.0000	470.4300 (30)
Raftered roof	28.8900		28.8900	0.1400	4.0446	9.0000	260.0100 (30)
Eaves void	3.6200		3.6200	0.1043	0.3774	9.0000	32.5800 (30)
Total net area of external elements Aum(A, m ²)			349.2800				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0792		(33)
Main dwelling							
Internal wall (masonry)			240.3700			55.0000	13220.3500 (32c)
Internal Floor 1			68.2800			18.0000	1229.0400 (32d)
Internal Ceiling 1			68.2800			9.0000	614.5200 (32e)
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =	40810.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							285.5491 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				15.8700	0.0680	1.0792	
E2 Other lintels (including other steel lintels)				1.2000	1.0000	1.2000	
E3 Sill				10.0300	0.0270	0.2708	
E3 Sill				1.2000	0.1000	0.1200	
E4 Jamb				30.2800	0.0220	0.6662	
E4 Jamb				2.2800	0.1000	0.2280	

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E5 Ground floor (normal)	40.2300	0.0980	3.9425
E6 Intermediate floor within a dwelling	29.4000	0.0010	0.0294
E6 Intermediate floor within a dwelling	10.6600	0.1400	1.4924
E10 Eaves (insulation at ceiling level)	6.0500	0.0690	0.4175
E11 Eaves (insulation at rafter level)	16.0800	0.0200	0.3216
E11 Eaves (insulation at rafter level)	5.8000	0.1500	0.8700
E12 Gable (insulation at ceiling level)	15.3300	0.0970	1.4870
E12 Gable (insulation at ceiling level)	0.7800	0.0970	0.0757
E13 Gable (insulation at rafter level)	9.5700	0.0600	0.5742
E13 Gable (insulation at rafter level)	0.7200	0.2500	0.1800
E16 Corner (normal)	24.9100	0.0460	1.1459
E16 Corner (normal)	12.0700	0.1800	2.1726
E17 Corner (inverted - internal area greater than external area)	7.6100	-0.0810	-0.6164
E17 Corner (inverted - internal area greater than external area)	7.0500	0.0000	0.0000
R5 Ridge (inverted)	6.4800	0.1200	0.7776
R6 Flat ceiling	33.3200	0.1200	3.9984
R7 Flat ceiling (inverted)	6.5500	0.1200	0.7860
R8 Roof to wall (rafter)	4.2900	0.1200	0.5148
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			21.7332 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	98.8124 (37)

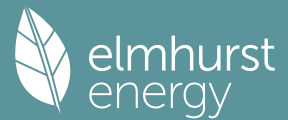
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	36.9574	36.5108	36.0642	33.8313	33.3847	31.1519	31.1519	30.7053	32.0450	33.3847	34.2779	35.1711
Average = Sum(39)m / 12 =	135.7698	135.3232	134.8767	132.6438	132.1972	129.9643	129.9643	129.5177	130.8574	132.1972	133.0903	133.9835
												132.5321
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9500	0.9468	0.9437	0.9281	0.9250	0.9093	0.9093	0.9062	0.9156	0.9250	0.9312	0.9375
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.9224 (42)
Hot water usage for mixer showers												
Hot water usage for baths	82.3721	81.1343	79.3304	75.8791	73.3320	70.4916	68.8772	70.6674	72.6298	75.6795	79.2050	82.0565
Hot water usage for other uses	31.6101	31.1406	30.4795	29.2606	28.3479	27.3358	26.7892	27.4456	28.1604	29.2433	30.4874	31.5032
Average daily hot water use (litres/day)	44.5588	42.9385	41.3182	39.6978	38.0775	36.4572	36.4572	38.0775	39.6978	41.3182	42.9385	44.5588
												145.7599 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	158.5410	155.2133	151.1281	144.8375	139.7574	134.2847	132.1235	136.1905	140.4880	146.2410	152.6308	158.1186
Energy content (annual)	251.0902	221.0217	232.2782	198.2753	188.1404	165.1187	159.7919	168.6323	173.2357	198.4476	217.4506	247.5754
Distribution loss (46)m = 0.15 x (45)m	37.6635	33.1533	34.8417	29.7413	28.2211	24.7678	23.9688	25.2948	25.9854	29.7671	32.6176	37.1363
Water storage loss (or HIU loss):												
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2582 (55)
Total storage loss	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042
If cylinder contains dedicated solar storage	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042
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
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total heat required for water heating calculated for each month	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796
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
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Output from w/h	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796
												2880.3010 (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
Heat gains from water heating, kWh/month	83.4875	73.4897	77.2325	65.9265	62.5567	54.9020	53.1308	56.0702	57.6009	65.9838	72.3023	82.3188

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	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0685	40.0294	32.5541	24.6456	18.4228	15.5533	16.8059	21.8450	29.3203	37.2288	43.4516	46.3211
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.7287	471.5719	459.3673	433.3850	400.5870	369.7615	349.1682	344.3250	356.5297	382.5120	415.3100	446.1354
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571
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
Losses e.g. evaporation (negative values) (Table 5)	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979
Water heating gains (Table 5)	112.2144	109.3597	103.8071	91.5646	84.0816	76.2527	71.4124	75.3632	80.0012	88.6879	100.4199	110.6436
Total internal gains	737.9177	734.8671	709.6346	663.5012	616.9975	575.4737	551.2926	555.4393	579.7573	622.3349	673.0875	717.0062

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

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	W/m2		or Table 6b		or Table 6c		Table 6d		
North		2.8100		10.6334		0.6800		0.7700	9.8564 (74)
East		2.1400		19.6403		0.6800		0.7700	13.8644 (76)
South		4.1400		46.7521		0.6800		0.7700	63.8471 (78)
West		5.8300		19.6403		0.6800		0.7700	37.7708 (80)

Solar gains	125.3387	224.4106	331.5526	444.5624	523.4564	529.4770	506.4958	447.0741	371.0931	255.0614	152.2228	105.8488 (83)
Total gains	863.2564	959.2778	1041.1872	1108.0637	1140.4539	1104.9506	1057.7884	1002.5134	950.8504	877.3962	825.3103	822.8550 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	83.4965	83.7720	84.0494	85.4643	85.7530	87.2263	87.2263	87.5270	86.6309	85.7530	85.1775	84.6097
alpha	6.5664	6.5848	6.6033	6.6976	6.7169	6.8151	6.8151	6.8351	6.7754	6.7169	6.6785	6.6406
util living area	0.9989	0.9975	0.9927	0.9725	0.9007	0.7226	0.5368	0.5873	0.8478	0.9817	0.9975	0.9992 (86)
Living	20.0206	20.1478	20.3565	20.6310	20.8584	20.9766	20.9972	20.9951	20.9321	20.6405	20.2820	20.0019
Non living	18.9744	19.1391	19.4070	19.7606	20.0254	20.1466	20.1587	20.1606	20.1087	19.7786	19.3215	18.9587
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	20.4990	20.1478	20.3565	20.6310	20.8584	20.9766	20.9972	20.9951	20.9321	20.6405	20.2820	20.1416 (87)
Th 2	20.1252	20.1279	20.1305	20.1437	20.1463	20.1596	20.1596	20.1622	20.1543	20.1463	20.1410	20.1358 (88)
util rest of house	0.9985	0.9965	0.9897	0.9609	0.8610	0.6409	0.4365	0.4842	0.7799	0.9718	0.9963	0.9989 (89)
MIT 2	19.6664	19.1391	19.4070	19.7606	20.0254	20.1466	20.1587	20.1606	20.1087	19.7786	19.3215	19.1708 (90)
Living area fraction									fLA = Living area / (4) =			0.2928 (91)
MIT	19.9102	19.4345	19.6850	20.0155	20.2693	20.3897	20.4042	20.4049	20.3498	20.0310	19.6027	19.4550 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9102	19.4345	19.6850	20.0155	20.2693	20.3897	20.4042	20.4049	20.3498	20.0310	19.6027	19.4550 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9984	0.9954	0.9877	0.9587	0.8675	0.6643	0.4660	0.5146	0.7973	0.9700	0.9953	0.9986 (94)
Useful gains	861.8501	954.9126	1028.3828	1062.3486	989.3209	734.0341	492.9347	515.9238	758.1213	851.1031	821.4445	821.6855 (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	2119.3943	1966.8565	1778.3542	1474.3987	1132.8401	752.4509	494.4158	518.7101	817.8353	1246.7495	1663.9912	2043.9229 (97)
Space heating kWh	935.6129	680.0263	557.9787	296.6760	106.7783	0.0000	0.0000	0.0000	0.0000	294.3609	606.6336	909.3447 (98a)
Space heating requirement - total per year (kWh/year)												4387.4114
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	935.6129	680.0263	557.9787	296.6760	106.7783	0.0000	0.0000	0.0000	0.0000	294.3609	606.6336	909.3447 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4387.4114
Space heating per m2										(98c) / (4) =		30.6984 (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 %)												285.1140 (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	935.6129	680.0263	557.9787	296.6760	106.7783	0.0000	0.0000	0.0000	0.0000	294.3609	606.6336	909.3447 (98)
Space heating efficiency (main heating system 1)	285.1140	285.1140	285.1140	285.1140	285.1140	0.0000	0.0000	0.0000	0.0000	285.1140	285.1140	285.1140 (210)
Space heating fuel (main heating system)	328.1539	238.5103	195.7037	104.0552	37.4511	0.0000	0.0000	0.0000	0.0000	103.2432	212.7688	318.9407 (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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (64)
Efficiency of water heater	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578 (216)
Fuel for water heating, kWh/month	105.1990	92.9262	98.3771	85.5901	82.3711	73.5663	72.0909	75.2967	76.5098	86.1088	92.5437	103.9244 (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	68.9735	62.2986	68.9735	66.7485	68.9735	66.7485	68.9735	68.9735	66.7485	68.9735	66.7485	68.9735 (231)
Lighting	39.4482	31.6468	28.4944	20.8762	16.1254	13.1746	14.7101	19.1208	24.8360	32.5862	36.8060	40.5445 (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)

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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	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												1538.8269	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												275.7578	
Water heating fuel used												1044.5041	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans: (BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200) mechanical ventilation fans (SFP = 1.8200)												812.1069	(230a)
Total electricity for the above, kWh/year												812.1069	(231)
Electricity for lighting (calculated in Appendix L)												318.3693	(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												3713.8071	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1538.8269	16.4900	253.7526	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1044.5041	16.4900	172.2387	(247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000	(247a)
Pumps, fans and electric keep-hot	812.1069	16.4900	133.9164	(249)
Energy for lighting	318.3693	16.4900	52.4991	(250)
Additional standing charges			0.0000	(251)
Total energy cost			612.4068	(255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600	(256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.1732	(257)
SAP value		80.9825	
SAP rating (Section 12)		81	(258)
SAP band		B	

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year	
Space heating - main system 1	1538.8269	0.1557	239.5733	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1044.5041	0.1411	147.4017	(264)
Space and water heating			386.9751	(265)
Pumps, fans and electric keep-hot	812.1069	0.1387	112.6492	(267)
Energy for lighting	318.3693	0.1443	45.9505	(268)
Total CO2, kg/year			545.5748	(272)
CO2 emissions per m2			3.8200	(273)
EI value			96.1097	
EI rating			96	(274)
EI band			A	

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

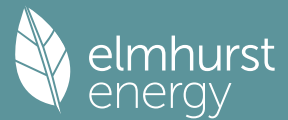
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)	
Main dwelling				
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)	
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)	
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	365.7480 (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)

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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 3.2000 (17)
Infiltration rate 0.1600 (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) = 0.1480 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.8000	4.6000	4.6000	4.1000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	4.1000	4.3000	(22)
Wind factor	1.2000	1.1500	1.1500	1.0250	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	1.0250	1.0750	(22a)
Adj infilt rate	0.1776	0.1702	0.1702	0.1517	0.1480	0.1295	0.1332	0.1332	0.1406	0.1480	0.1517	0.1591	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													76.5000 (23c)
Effective ac	0.2951	0.2877	0.2877	0.2692	0.2655	0.2470	0.2507	0.2507	0.2581	0.2655	0.2692	0.2766	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
W			14.9200	0.9615	14.3462			(27)
D			9.8300	1.4000	13.7620			(26a)
Ground floor			74.6400	0.1200	8.9568	110.0000	8210.4000	(28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448	110.0000	16649.6000	(29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1400	0.5796	9.0000	37.2600	(29a)
Dwarf wall	9.6100		9.6100	0.2100	2.0181	9.0000	86.4900	(29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497	9.0000	470.4300	(30)
Raftered roof	28.8900		28.8900	0.1400	4.0446	9.0000	260.0100	(30)
Eaves void	3.6200		3.6200	0.1043	0.3774	9.0000	32.5800	(30)
Total net area of external elements Aum(A, m2)			349.2800					(31)
Fabric heat loss, W/K = Sum (A x U)					77.0792			(33)
Main dwelling								
Internal wall (masonry)			240.3700			55.0000	13220.3500	(32c)
Internal Floor 1			68.2800			18.0000	1229.0400	(32d)
Internal Ceiling 1			68.2800			9.0000	614.5200	(32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 40810.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 285.5491 (35)

List of Thermal Bridges

	Length	Psi-value	Total	
K1 Element				
E2 Other lintels (including other steel lintels)	15.8700	0.0680	1.0792	
E2 Other lintels (including other steel lintels)	1.2000	1.0000	1.2000	
E3 Sill	10.0300	0.0270	0.2708	
E3 Sill	1.2000	0.1000	0.1200	
E4 Jamb	30.2800	0.0220	0.6662	
E4 Jamb	2.2800	0.1000	0.2280	
E5 Ground floor (normal)	40.2300	0.0980	3.9425	
E6 Intermediate floor within a dwelling	29.4000	0.0010	0.0294	
E6 Intermediate floor within a dwelling	10.6600	0.1400	1.4924	
E10 Eaves (insulation at ceiling level)	6.0500	0.0690	0.4175	
E11 Eaves (insulation at rafter level)	16.0800	0.0200	0.3216	
E11 Eaves (insulation at rafter level)	5.8000	0.1500	0.8700	
E12 Gable (insulation at ceiling level)	15.3300	0.0970	1.4870	
E12 Gable (insulation at ceiling level)	0.7800	0.0970	0.0757	
E13 Gable (insulation at rafter level)	9.5700	0.0600	0.5742	
E13 Gable (insulation at rafter level)	0.7200	0.2500	0.1800	
E16 Corner (normal)	24.9100	0.0460	1.1459	
E16 Corner (normal)	12.0700	0.1800	2.1726	
E17 Corner (inverted - internal area greater than external area)	7.6100	-0.0810	-0.6164	
E17 Corner (inverted - internal area greater than external area)	7.0500	0.0000	0.0000	
R5 Ridge (inverted)	6.4800	0.1200	0.7776	
R6 Flat ceiling	33.3200	0.1200	3.9984	
R7 Flat ceiling (inverted)	6.5500	0.1200	0.7860	
R8 Roof to wall (rafter)	4.2900	0.1200	0.5148	

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.7332 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 98.8124 (37)

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

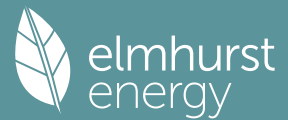
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	35.6176	34.7245	34.7245	32.4916	32.0450	29.8121	30.2587	30.2587	31.1519	32.0450	32.4916	33.3847	(38)
Heat transfer coeff	134.4301	133.5369	133.5369	131.3040	130.8574	128.6246	129.0711	129.0711	129.9643	130.8574	131.3040	132.1972	(39)
Average = Sum(39)m / 12 =												131.2296	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.9406	0.9343	0.9343	0.9187	0.9156	0.9000	0.9031	0.9031	0.9093	0.9156	0.9187	0.9250	(40)
HLP (average)												0.9182	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.9224 (42)
Hot water usage for mixer showers												
82.3721	81.1343	79.3304	75.8791	73.3320	70.4916	68.8772	70.6674	72.6298	75.6795	79.2050	82.0565 (42a)	
Hot water usage for baths												
31.6101	31.1406	30.4795	29.2606	28.3479	27.3358	26.7892	27.4456	28.1604	29.2433	30.4874	31.5032 (42b)	
Hot water usage for other uses												
44.5588	42.9385	41.3182	39.6978	38.0775	36.4572	36.4572	38.0775	39.6978	41.3182	42.9385	44.5588 (42c)	
Average daily hot water use (litres/day)												145.7599 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use												

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Energy conte	158.5410	155.2133	151.1281	144.8375	139.7574	134.2847	132.1235	136.1905	140.4880	146.2410	152.6308	158.1186 (44)
Energy content (annual)	251.0902	221.0217	232.2782	198.2753	188.1404	165.1187	159.7919	168.6323	173.2357	198.4476	217.4506	247.5754 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		2421.0580
Water storage loss (or HIU loss):	37.6635	33.1533	34.8417	29.7413	28.2211	24.7678	23.9688	25.2948	25.9854	29.7671	32.6176	37.1363 (46)
Store volume												300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												2.3300 (48)
Temperature factor from Table 2b												0.5400 (49)
Enter (49) or (54) in (55)												1.2582 (55)
Total storage loss												
If cylinder contains dedicated solar storage	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042 (56)
Primary loss	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042 (57)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Total heat required for water heating calculated for each month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
WWHRS	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (62)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63a)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63b)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63c)
Output from w/h	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (63d)
Electric shower(s)	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (64)
Total per year (kWh/year) = Sum(64)m =												2880.3010 (64)
Heat gains from water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	83.4875	73.4897	77.2325	65.9265	62.5567	54.9020	53.1308	56.0702	57.6009	65.9838	72.3023	82.3188 (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	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0685	40.0294	32.5541	24.6456	18.4228	15.5533	16.8059	21.8450	29.3203	37.2288	43.4516	46.3211 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.7287	471.5719	459.3673	433.3850	400.5870	369.7615	349.1682	344.3250	356.5297	382.5120	415.3100	446.1354 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571 (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)	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979 (71)
Water heating gains (Table 5)	112.2144	109.3597	103.8071	91.5646	84.0816	76.2527	71.4124	75.3632	80.0012	88.6879	100.4199	110.6436 (72)
Total internal gains	737.9177	734.8671	709.6346	663.5012	616.9975	575.4737	551.2926	555.4393	579.7573	622.3349	673.0875	717.0062 (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					2.8100	12.0392	0.6800	0.7000	0.7700		11.1595 (74)	
East					2.1400	22.4002	0.6800	0.7000	0.7700		15.8127 (76)	
South					4.1400	51.5965	0.6800	0.7000	0.7700		70.4630 (78)	
West					5.8300	22.4002	0.6800	0.7000	0.7700		43.0785 (80)	
Solar gains	140.5137	234.6114	337.6827	463.7225	533.9190	572.0811	538.7466	480.2596	398.5296	274.9885	170.3757	117.4992 (83)
Total gains	878.4313	969.4785	1047.3173	1127.2238	1150.9165	1147.5547	1090.0392	1035.6990	978.2869	897.3234	843.4632	834.5054 (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	84.3286	84.8926	84.8926	86.3363	86.6309	88.1348	87.8299	87.8299	87.2263	86.6309	86.3363	85.7530
alpha	6.6219	6.6595	6.6595	6.7558	6.7754	6.8757	6.8553	6.8553	6.8151	6.7754	6.7558	6.7169
util living area	0.9987	0.9973	0.9916	0.9653	0.8765	0.6477	0.4489	0.4721	0.7829	0.9742	0.9968	0.9991 (86)
Living	20.0639	20.1731	20.3912	20.6767	20.8907	20.9891	20.9992	20.9989	20.9629	20.6954	20.3286	20.0382
Non living	19.0359	19.1796	19.4572	19.8223	20.0655	20.1623	20.1647	20.1646	20.1381	19.8518	19.3891	19.0132
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	20.5211	20.1731	20.3912	20.6767	20.8907	20.9891	20.9992	20.9989	20.9629	20.6954	20.3286	20.1727 (87)
Th 2	20.1331	20.1384	20.1384	20.1516	20.1543	20.1675	20.1649	20.1649	20.1596	20.1543	20.1516	20.1463 (88)
util rest of house	0.9982	0.9962	0.9883	0.9508	0.8300	0.5629	0.3509	0.3692	0.7010	0.9604	0.9954	0.9988 (89)
MIT 2	19.6957	19.1796	19.4572	19.8223	20.0655	20.1623	20.1647	20.1646	20.1381	19.8518	19.3891	19.2174 (90)
Living area fraction	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	0.2928 (91)
MIT	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	19.4972 (92)
Temperature adjustment												0.0000
adjusted MIT	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	19.4972 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9981	0.9951	0.9862	0.9492	0.8393	0.5877	0.3797	0.3995	0.7240	0.9592	0.9942	0.9984 (94)
Ext temp.	876.7217	964.7541	1032.8393	1069.9839	965.9901	674.3909	413.8585	413.7152	708.2677	860.7385	838.5740	833.1690 (95)
Heat loss rate W	4.5000	4.9000	6.7000	9.2000	12.1000	15.1000	17.2000	17.2000	14.7000	11.0000	7.3000	4.3000 (96)
	2075.2500	1945.7011	1740.0843	1427.6055	1073.9614	682.2715	414.1965	414.1797	738.1527	1190.6532	1623.4713	2009.0210 (97)

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Space heating kWh	891.7051	659.1964	526.1903	257.4876	80.3306	0.0000	0.0000	0.0000	0.0000	245.4565	565.1261	874.8339 (98a)
Space heating requirement - total per year (kWh/year)												4100.3264
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	891.7051	659.1964	526.1903	257.4876	80.3306	0.0000	0.0000	0.0000	0.0000	245.4565	565.1261	874.8339 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4100.3264
Space heating per m2										(98c) / (4) =		28.6897 (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 %)												285.4646 (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	891.7051	659.1964	526.1903	257.4876	80.3306	0.0000	0.0000	0.0000	0.0000	245.4565	565.1261	874.8339 (98)
Space heating efficiency (main heating system 1)	285.4646	285.4646	285.4646	285.4646	285.4646	0.0000	0.0000	0.0000	0.0000	285.4646	285.4646	285.4646 (210)
Space heating fuel (main heating system)	312.3697	230.9205	184.3277	90.1995	28.1403	0.0000	0.0000	0.0000	0.0000	85.9849	197.9671	306.4597 (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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (64)
Efficiency of water heater	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830 (216)
Fuel for water heating, kWh/month	105.1894	92.9177	98.3681	85.5822	82.3635	73.5595	72.0843	75.2898	76.5028	86.1010	92.5353	103.9149 (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	68.9735	62.2986	68.9735	66.7485	68.9735	66.7485	68.9735	68.9735	66.7485	68.9735	66.7485	68.9735 (231)
Lighting	39.4482	31.6468	28.4944	20.8762	16.1254	13.1746	14.7101	19.1208	24.8360	32.5862	36.8060	40.5445 (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												1436.3694 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												275.7830
Water heating fuel used												1044.4084 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)												
mechanical ventilation fans (SFP = 1.8200)												812.1069 (230a)
Total electricity for the above, kWh/year												812.1069 (231)
Electricity for lighting (calculated in Appendix L)												318.3693 (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												3611.2540 (238)

10a. Fuel costs - using BEDF prices (589)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1436.3694	28.4300	408.3598 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1044.4084	28.4300	296.9253 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	812.1069	28.4300	230.8820 (249)
Energy for lighting	318.3693	28.4300	90.5124 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1026.6795 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1436.3694	0.1561	224.2186 (261)

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Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1044.4084	0.1411	147.3882 (264)
Space and water heating			371.6069 (265)
Pumps, fans and electric keep-hot	812.1069	0.1387	112.6492 (267)
Energy for lighting	318.3693	0.1443	45.9505 (268)
Total CO2, kg/year			530.2066 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1436.3694	1.5779	2266.4638 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1044.4084	1.5218	1589.4082 (278)
Space and water heating			3855.8719 (279)
Pumps, fans and electric keep-hot	812.1069	1.5128	1228.5553 (281)
Energy for lighting	318.3693	1.5338	488.3254 (282)
Total Primary energy kWh/year			5572.7526 (286)

SAP 10 EPC IMPROVEMENTS

02DSv0

Current energy efficiency rating: B 81
Current environmental impact rating: A 96

N Solar water heating			SAP increase too small
U Solar photovoltaic panels			Recommended
V2 Wind turbine			Not applicable
Recommended measures:	SAP change	Cost change	CO2 change
U Solar photovoltaic panels	+ 5.0	-£ 288	-136 kg (25.6%)
Measures omitted - SAP change or cost saving too small:			
N Solar water heating	+ 0.8	-£ 49	-21 kg (4.0%)

	Typical annual savings	Energy efficiency	Environmental impact
Recommended measures			
Solar photovoltaic panels	£288	0.95 kg/m²	B 86 A 97
Total Savings	£288	0.95 kg/m²	
Potential energy efficiency rating:		B 86	
Potential environmental impact rating:			A 97

Fuel prices for cost data on this page from database revision number 589 TEST (12 Dec 2025)
Recommendation texts revision number 6.1 (11 Jun 2019)

Typical heating and lighting costs of this home (per year, Thames Valley):

	Current £1027	Potential £1027	Saving £0
Electricity	£1027	£1027	£0
Space heating	£639	£639	£0
Water heating	£297	£297	£0
Lighting	£91	£91	£0
Generated (PV)	-£0	-£288	£288
Total cost of fuels	£1027	£739	£288
Total cost of uses	£1027	£739	£288
Delivered energy	25 kWh/m²	18 kWh/m²	7 kWh/m²
Carbon dioxide emissions	0.5 tonnes	0.4 tonnes	0.1 tonnes
CO2 emissions per m²	4 kg/m²	3 kg/m²	1 kg/m²
Primary energy	39 kWh/m²	28 kWh/m²	11 kWh/m²

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

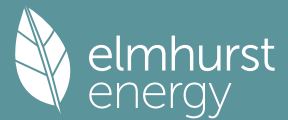
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)
Dwelling volume		(3a) + (3b) + (3c) + (3d) + (3e) ... (3n) =	365.7480 (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)

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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			3.2000 (17)
Infiltration rate			0.1600 (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) =		0.1480 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000	(22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750	(22a)
	0.1887	0.1850	0.1813	0.1628	0.1591	0.1406	0.1406	0.1369	0.1480	0.1591	0.1665	0.1739	(22b)
Balanced mechanical ventilation with heat recovery													
If mechanical ventilation													0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)													0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =													76.5000 (23c)
Effective ac	0.3062	0.3025	0.2988	0.2803	0.2766	0.2581	0.2581	0.2544	0.2655	0.2766	0.2840	0.2914	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
W			14.9200	0.9615	14.3462			(27)
D			9.8300	1.4000	13.7620			(26a)
Ground floor			74.6400	0.1200	8.9568	110.0000	8210.4000	(28a)
External wall	174.7400	23.3800	151.3600	0.1800	27.2448	110.0000	16649.6000	(29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1400	0.5796	9.0000	37.2600	(29a)
Dwarf wall	9.6100		9.6100	0.2100	2.0181	9.0000	86.4900	(29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497	9.0000	470.4300	(30)
Raftered roof	28.8900		28.8900	0.1400	4.0446	9.0000	260.0100	(30)
Eaves void	3.6200		3.6200	0.1043	0.3774	9.0000	32.5800	(30)
Total net area of external elements Aum(A, m2)			349.2800					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	77.0792			(33)
Main dwelling								
Internal wall (masonry)			240.3700			55.0000	13220.3500	(32c)
Internal Floor 1			68.2800			18.0000	1229.0400	(32d)
Internal Ceiling 1			68.2800			9.0000	614.5200	(32e)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	40810.6800 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		285.5491 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	15.8700	0.0680	1.0792
E2 Other lintels (including other steel lintels)	1.2000	1.0000	1.2000
E2 Other lintels (including other steel lintels)	10.0300	0.0270	0.2708
E3 Sill	1.2000	0.1000	0.1200
E4 Jamb	30.2800	0.0220	0.6662
E4 Jamb	2.2800	0.1000	0.2280
E5 Ground floor (normal)	40.2300	0.0980	3.9425
E6 Intermediate floor within a dwelling	29.4000	0.0010	0.0294
E6 Intermediate floor within a dwelling	10.6600	0.1400	1.4924
E10 Eaves (insulation at ceiling level)	6.0500	0.0690	0.4175
E11 Eaves (insulation at rafter level)	16.0800	0.0200	0.3216
E11 Eaves (insulation at rafter level)	5.8000	0.1500	0.8700
E12 Gable (insulation at ceiling level)	15.3300	0.0970	1.4870
E12 Gable (insulation at ceiling level)	0.7800	0.0970	0.0757
E13 Gable (insulation at rafter level)	9.5700	0.0600	0.5742
E13 Gable (insulation at rafter level)	0.7200	0.2500	0.1800
E16 Corner (normal)	24.9100	0.0460	1.1459
E16 Corner (normal)	12.0700	0.1800	2.1726
E17 Corner (inverted - internal area greater than external area)	7.6100	-0.0810	-0.6164
E17 Corner (inverted - internal area greater than external area)	7.0500	0.0000	0.0000
R5 Ridge (inverted)	6.4800	0.1200	0.7776
R6 Flat ceiling	33.3200	0.1200	3.9984
R7 Flat ceiling (inverted)	6.5500	0.1200	0.7860
R8 Roof to wall (rafter)	4.2900	0.1200	0.5148

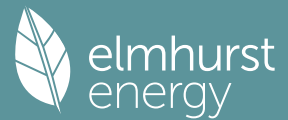
Thermal bridges (Sum(L x Psi) calculated using Appendix K)		21.7332 (36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	98.8124 (37)

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	36.9574	36.5108	36.0642	33.8313	33.3847	31.1519	31.1519	30.7053	32.0450	33.3847	34.2779	35.1711	(38)
Average = Sum(39)m / 12 =	135.7698	135.3232	134.8767	132.6438	132.1972	129.9643	129.9643	129.5177	130.8574	132.1972	133.0903	133.9835	(39)
												132.5321	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9500	0.9468	0.9437	0.9281	0.9250	0.9093	0.9093	0.9062	0.9156	0.9250	0.9312	0.9375	(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													2.9224 (42)
Hot water usage for mixer showers													
	82.3721	81.1343	79.3304	75.8791	73.3320	70.4916	68.8772	70.6674	72.6298	75.6795	79.2050	82.0565	(42a)
Hot water usage for baths													
	31.6101	31.1406	30.4795	29.2606	28.3479	27.3358	26.7892	27.4456	28.1604	29.2433	30.4874	31.5032	(42b)
Hot water usage for other uses													
	44.5588	42.9385	41.3182	39.6978	38.0775	36.4572	36.4572	38.0775	39.6978	41.3182	42.9385	44.5588	(42c)
Average daily hot water use (litres/day)													145.7599 (43)

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	158.5410	155.2133	151.1281	144.8375	139.7574	134.2847	132.1235	136.1905	140.4880	146.2410	152.6308	158.1186	(44)
Energy conte	251.0902	221.0217	232.2782	198.2753	188.1404	165.1187	159.7919	168.6323	173.2357	198.4476	217.4506	247.5754	(45)
Energy content (annual)	Total = Sum(45)m = 2421.0580												
Distribution loss	(46)m = 0.15 x (45)m												
	37.6635	33.1533	34.8417	29.7413	28.2211	24.7678	23.9688	25.2948	25.9854	29.7671	32.6176	37.1363	(46)
Water storage loss (or HIU loss):													
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.3300 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.2582 (55)
Total storage loss													
	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(56)
If cylinder contains dedicated solar storage													
	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(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													
	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796	(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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796	(64)
	Total per year (kWh/year) = Sum(64)m = 2880.3010 (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	83.4875	73.4897	77.2325	65.9265	62.5567	54.9020	53.1308	56.0702	57.6009	65.9838	72.3023	82.3188	(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	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0685	40.0294	32.5541	24.6456	18.4228	15.5533	16.8059	21.8450	29.3203	37.2288	43.4516	46.3211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.7287	471.5719	459.3673	433.3850	400.5870	369.7615	349.1682	344.3250	356.5297	382.5120	415.3100	446.1354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	(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)	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	(71)
Water heating gains (Table 5)	112.2144	109.3597	103.8071	91.5646	84.0816	76.2527	71.4124	75.3632	80.0012	88.6879	100.4199	110.6436	(72)
Total internal gains	737.9177	734.8671	709.6346	663.5012	616.9975	575.4737	551.2926	555.4393	579.7573	622.3349	673.0875	717.0062	(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				2.8100	10.6334	0.6800	0.7000	0.7700	9.8564 (74)			
East				2.1400	19.6403	0.6800	0.7000	0.7700	13.8644 (76)			
South				4.1400	46.7521	0.6800	0.7000	0.7700	63.8471 (78)			
West				5.8300	19.6403	0.6800	0.7000	0.7700	37.7708 (80)			

Solar gains	125.3387	224.4106	331.5526	444.5624	523.4564	529.4770	506.4958	447.0741	371.0931	255.0614	152.2228	105.8488 (83)
Total gains	863.2564	959.2778	1041.1872	1108.0637	1140.4539	1104.9506	1057.7884	1002.5134	950.8504	877.3962	825.3103	822.8550 (84)

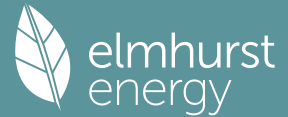
7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)													21.0000 (85)
Utilisation factor for gains for living area, n _{li} m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	83.4965	83.7720	84.0494	85.4643	85.7530	87.2263	87.2263	87.5270	86.6309	85.7530	85.1775	84.6097	
alpha	6.5664	6.5848	6.6033	6.6976	6.7169	6.8151	6.8151	6.8351	6.7754	6.7169	6.6785	6.6406	
util living area	0.9989	0.9975	0.9927	0.9725	0.9007	0.7226	0.5368	0.5873	0.8478	0.9817	0.9975	0.9992	(86)
Living	20.0206	20.1478	20.3565	20.6310	20.8584	20.9766	20.9972	20.9951	20.9321	20.6405	20.2820	20.0019	
Non living	18.9744	19.1391	19.4070	19.7606	20.0254	20.1466	20.1587	20.1606	20.1087	19.7786	19.3215	18.9587	
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	20.4990	20.1478	20.3565	20.6310	20.8584	20.9766	20.9972	20.9951	20.9321	20.6405	20.2820	20.1416	(87)
Th 2	20.1252	20.1279	20.1305	20.1437	20.1463	20.1596	20.1596	20.1622	20.1543	20.1463	20.1410	20.1358	(88)
util rest of house	0.9985	0.9965	0.9897	0.9609	0.8610	0.6409	0.4365	0.4842	0.7799	0.9718	0.9963	0.9989	(89)
MIT 2	19.6664	19.1391	19.4070	19.7606	20.0254	20.1466	20.1587	20.1606	20.1087	19.7786	19.3215	19.1708	(90)
Living area fraction	19.9102	19.4345	19.6850	20.0155	20.2693	20.3897	20.4042	20.4049	20.3498	20.0310	19.6027	19.4550	(92)
MIT	19.9102	19.4345	19.6850	20.0155	20.2693	20.3897	20.4042	20.4049	20.3498	20.0310	19.6027	19.4550	(93)
Temperature adjustment													0.0000
adjusted MIT	19.9102	19.4345	19.6850	20.0155	20.2693	20.3897	20.4042	20.4049	20.3498	20.0310	19.6027	19.4550	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9984	0.9954	0.9877	0.9587	0.8675	0.6643	0.4660	0.5146	0.7973	0.9700	0.9953	0.9986	(94)
Useful gains	861.8501	954.9126	1028.3828	1062.3486	989.3209	734.0341	492.9347	515.9238	758.1213	851.1031	821.4445	821.6855	(95)

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Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000 (96)
Heat loss rate W	2119.3943	1966.8565	1778.3542	1474.3987	1132.8401	752.4509	494.4158	518.7101	817.8353	1246.7495	1663.9912	2043.9229 (97)
Space heating kWh	935.6129	680.0263	557.9787	296.6760	106.7783	0.0000	0.0000	0.0000	0.0000	294.3609	606.6336	909.3447 (98a)
Space heating requirement - total per year (kWh/year)												4387.4114
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	935.6129	680.0263	557.9787	296.6760	106.7783	0.0000	0.0000	0.0000	0.0000	294.3609	606.6336	909.3447 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4387.4114
Space heating per m2												30.6984 (99)
										(98c) / (4) =		

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												285.1140 (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	935.6129	680.0263	557.9787	296.6760	106.7783	0.0000	0.0000	0.0000	0.0000	294.3609	606.6336	909.3447 (98)
Space heating efficiency (main heating system 1)	285.1140	285.1140	285.1140	285.1140	285.1140	0.0000	0.0000	0.0000	0.0000	285.1140	285.1140	285.1140 (210)
Space heating fuel (main heating system)	328.1539	238.5103	195.7037	104.0552	37.4511	0.0000	0.0000	0.0000	0.0000	103.2432	212.7688	318.9407 (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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (64)
Efficiency of water heater	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578	275.7578 (216)
Fuel for water heating, kWh/month	105.1990	92.9262	98.3771	85.5901	82.3711	73.5663	72.0909	75.2967	76.5098	86.1088	92.5437	103.9244 (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	68.9735	62.2986	68.9735	66.7485	68.9735	66.7485	68.9735	68.9735	66.7485	68.9735	66.7485	68.9735 (231)
Lighting	39.4482	31.6468	28.4944	20.8762	16.1254	13.1746	14.7101	19.1208	24.8360	32.5862	36.8060	40.5445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-39.6476	-59.9281	-91.7865	-108.0605	-118.8717	-110.3235	-109.0776	-100.4468	-85.5602	-69.6824	-44.6383	-33.7574 (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												1538.8269 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												275.7578
Water heating fuel used												1044.5041 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)												
mechanical ventilation fans (SFP = 1.8200)												812.1069 (230a)
Total electricity for the above, kWh/year												812.1069 (231)
Electricity for lighting (calculated in Appendix L)												318.3693 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-971.7806 (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												2742.0265 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1538.8269	16.4900	253.7526 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1044.5041	16.4900	172.2387 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	812.1069	16.4900	133.9164 (249)
Energy for lighting	318.3693	16.4900	52.4991 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-971.7806	16.4900	-160.2466
PV Unit electricity exported	0.0000	5.5900	0.0000
Total			-160.2466 (252)
Total energy cost			452.1602 (255)

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11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] = 0.8662 (257)$
SAP value	85.9588
SAP rating (Section 12)	86 (258)
SAP band	B

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1538.8269	0.1557	239.5733 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1044.5041	0.1411	147.4017 (264)
Space and water heating			386.9751 (265)
Pumps, fans and electric keep-hot	812.1069	0.1387	112.6492 (267)
Energy for lighting	318.3693	0.1443	45.9505 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-971.7806	0.1338	-129.9926
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-129.9926 (269)
Total CO2, kg/year			415.5823 (272)
CO2 emissions per m2			2.9100 (273)
EI value			97.0366
EI rating			97 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	74.6400 (1b)	x 2.5400 (2b)	= 189.5856 (1b) - (3b)
First floor	68.2800 (1c)	x 2.5800 (2c)	= 176.1624 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	142.9200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	365.7480 (5)

2. Ventilation rate

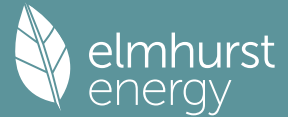
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	0 * 10 = 0.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	0.0000 / (5) = 0.0000 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	3.2000 (17)
Infiltration rate	0.1600 (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) = 0.1480 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.8000	4.6000	4.6000	4.1000	4.0000	3.5000	3.6000	3.6000	3.8000	4.0000	4.1000	4.3000 (22)
Wind factor	1.2000	1.1500	1.1500	1.0250	1.0000	0.8750	0.9000	0.9000	0.9500	1.0000	1.0250	1.0750 (22a)
Adj infilt rate	0.1776	0.1702	0.1702	0.1517	0.1480	0.1295	0.1332	0.1332	0.1406	0.1480	0.1517	0.1591 (22b)
Balanced mechanical ventilation with heat recovery												0.5000 (23a)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.5000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												76.5000 (23c)
Effective ac	0.2951	0.2877	0.2877	0.2692	0.2655	0.2470	0.2507	0.2507	0.2581	0.2655	0.2692	0.2766 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
W			14.9200	0.9615	14.3462		(27)
D			9.8300	1.4000	13.7620		(26a)
Ground floor			74.6400	0.1200	8.9568	110.0000	8210.4000 (28a)

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External wall	174.7400	23.3800	151.3600	0.1800	27.2448	110.0000	16649.6000 (29a)
Dormer cheeks	5.5100	1.3700	4.1400	0.1400	0.5796	9.0000	37.2600 (29a)
Dwarf wall	9.6100		9.6100	0.2100	2.0181	9.0000	86.4900 (29a)
Joisted roof	52.2700		52.2700	0.1100	5.7497	9.0000	470.4300 (30)
Raftered roof	28.8900		28.8900	0.1400	4.0446	9.0000	260.0100 (30)
Eaves void	3.6200		3.6200	0.1043	0.3774	9.0000	32.5800 (30)
Total net area of external elements Aum(A, m2)			349.2800				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		77.0792		(33)
Main dwelling							
Internal wall (masonry)			240.3700			55.0000	13220.3500 (32c)
Internal Floor 1			68.2800			18.0000	1229.0400 (32d)
Internal Ceiling 1			68.2800			9.0000	614.5200 (32e)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 40810.6800 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 285.5491 (35)

List of Thermal Bridges													
K1 Element													
E2 Other lintels (including other steel lintels)													
E2 Other lintels (including other steel lintels)													
E3 Sill													
E3 Sill													
E4 Jamb													
E4 Jamb													
E5 Ground floor (normal)													
E6 Intermediate floor within a dwelling													
E6 Intermediate floor within a dwelling													
E10 Eaves (insulation at ceiling level)													
E11 Eaves (insulation at rafter level)													
E11 Eaves (insulation at rafter level)													
E12 Gable (insulation at ceiling level)													
E12 Gable (insulation at ceiling level)													
E13 Gable (insulation at rafter level)													
E13 Gable (insulation at rafter level)													
E16 Corner (normal)													
E16 Corner (normal)													
E17 Corner (inverted - internal area greater than external area)													
E17 Corner (inverted - internal area greater than external area)													
R5 Ridge (inverted)													
R6 Flat ceiling													
R7 Flat ceiling (inverted)													
R8 Roof to wall (rafter)													

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 21.7332 (36)

Point Thermal bridges (36a) = 0.0000

Total fabric heat loss (33) + (36) + (36a) = 98.8124 (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	35.6176	34.7245	34.7245	32.4916	32.0450	29.8121	30.2587	30.2587	31.1519	32.0450	32.4916	33.3847	(38)
Average = Sum(39)m / 12 =	134.4301	133.5369	133.5369	131.3040	130.8574	128.6246	129.0711	129.0711	129.9643	130.8574	131.3040	132.1972	(39)
												131.2296	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	0.9406	0.9343	0.9343	0.9187	0.9156	0.9000	0.9031	0.9031	0.9093	0.9156	0.9187	0.9250	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

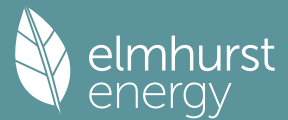
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.9224 (42)
Hot water usage for mixer showers													
Hot water usage for baths													
Hot water usage for other uses													
Average daily hot water use (litres/day)													145.7599 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	158.5410	155.2133	151.1281	144.8375	139.7574	134.2847	132.1235	136.1905	140.4880	146.2410	152.6308	158.1186	(44)
Energy content (annual)	251.0902	251.0217	232.2782	198.2753	188.1404	165.1187	159.7919	168.6323	173.2357	198.4476	217.4506	247.5754	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss (or HIU loss):	37.6635	33.1533	34.8417	29.7413	28.2211	24.7678	23.9688	25.2948	25.9854	29.7671	32.6176	37.1363	(46)
Store volume													300.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													2.3300 (48)
Temperature factor from Table 2b													0.5400 (49)
Enter (49) or (54) in (55)													1.2582 (55)
Total storage loss	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(56)
If cylinder contains dedicated solar storage	39.0042	35.2296	39.0042	37.7460	39.0042	37.7460	39.0042	39.0042	37.7460	39.0042	37.7460	39.0042	(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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796	(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	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796	(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	83.4875	73.4897	77.2325	65.9265	62.5567	54.9020	53.1308	56.0702	57.6009	65.9838	72.3023	82.3188	(65)

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

Metabolic gains (Table 5), Watts													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	

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(66)m	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	175.3469	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	45.0685	40.0294	32.5541	24.6456	18.4228	15.5533	16.8059	21.8450	29.3203	37.2288	43.4516	46.3211	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	466.7287	471.5719	459.3673	433.3850	400.5870	369.7615	349.1682	344.3250	356.5297	382.5120	415.3100	446.1354	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	55.4571	(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)	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	-116.8979	(71)
Water heating gains (Table 5)	112.2144	109.3597	103.8071	91.5646	84.0816	76.2527	71.4124	75.3632	80.0012	88.6879	100.4199	110.6436	(72)
Total internal gains	737.9177	734.8671	709.6346	663.5012	616.9975	575.4737	551.2926	555.4393	579.7573	622.3349	673.0875	717.0062	(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				2.8100	12.0392		0.6800		0.7000		0.7700		11.1595 (74)
East				2.1400	22.4002		0.6800		0.7000		0.7700		15.8127 (76)
South				4.1400	51.5965		0.6800		0.7000		0.7700		70.4630 (78)
West				5.8300	22.4002		0.6800		0.7000		0.7700		43.0785 (80)
Solar gains	140.5137	234.6114	337.6827	463.7225	533.9190	572.0811	538.7466	480.2596	398.5296	274.9885	170.3757	117.4992	(83)
Total gains	878.4313	969.4785	1047.3173	1127.2238	1150.9165	1147.5547	1090.0392	1035.6990	978.2869	897.3234	843.4632	834.5054	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	84.3286	84.8926	84.8926	86.3363	86.6309	88.1348	87.8299	87.8299	87.2263	86.6309	86.3363	85.7530
alpha	6.6219	6.6595	6.6595	6.7558	6.7754	6.8757	6.8553	6.8553	6.8151	6.7754	6.7558	6.7169
util living area	0.9987	0.9973	0.9916	0.9653	0.8765	0.6477	0.4489	0.4721	0.7829	0.9742	0.9968	0.9991 (86)
Living	20.0639	20.1731	20.3912	20.6767	20.8907	20.9891	20.9992	20.9989	20.9629	20.6954	20.3286	20.0382
Non living	19.0359	19.1796	19.4572	19.8223	20.0655	20.1623	20.1647	20.1646	20.1381	19.8518	19.3891	19.0132
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	20.5211	20.1731	20.3912	20.6767	20.8907	20.9891	20.9992	20.9989	20.9629	20.6954	20.3286	20.1727 (87)
Th 2	20.1331	20.1384	20.1384	20.1516	20.1543	20.1675	20.1649	20.1649	20.1596	20.1543	20.1516	20.1463 (88)
util rest of house	0.9982	0.9962	0.9883	0.9508	0.8300	0.5629	0.3509	0.3692	0.7010	0.9604	0.9954	0.9988 (89)
MIT 2	19.6957	19.1796	19.4572	19.8223	20.0655	20.1623	20.1647	20.1646	20.1381	19.8518	19.3891	19.2174 (90)
Living area fraction	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	0.2928 (91)
MIT	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	19.4972 (92)
Temperature adjustment	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	0.0000
adjusted MIT	19.9374	19.4705	19.7307	20.0725	20.3071	20.4044	20.4091	20.4089	20.3797	20.0989	19.6642	19.4972 (93)

8. Space heating requirement

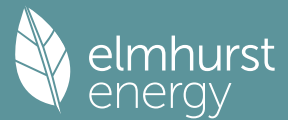
Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9981	0.9951	0.9862	0.9492	0.8393	0.5877	0.3797	0.3995	0.7240	0.9592	0.9942	0.9984 (94)
Ext temp.	876.7217	964.7541	1032.8393	1069.9839	965.9901	674.3909	413.8585	413.7152	708.2677	860.7385	838.5740	833.1690 (95)
Heat loss rate W	4.5000	4.9000	6.7000	9.2000	12.1000	15.1000	17.2000	14.7000	14.7000	11.0000	7.3000	4.3000 (96)
Space heating kWh	2075.2500	1945.7011	1740.0843	1427.6055	1073.9614	682.2715	414.1965	414.1797	738.1527	1190.6532	1623.4713	2009.0210 (97)
Space heating requirement - total per year (kWh/year)	891.7051	659.1964	526.1903	257.4876	80.3306	0.0000	0.0000	0.0000	0.0000	245.4565	565.1261	874.8339 (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)	891.7051	659.1964	526.1903	257.4876	80.3306	0.0000	0.0000	0.0000	0.0000	245.4565	565.1261	874.8339 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (98d)
Space heating per m2	(98c) / (4) =											28.6897 (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 %)	285.4646 (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)	891.7051	659.1964	526.1903	257.4876	80.3306	0.0000	0.0000	0.0000	0.0000	245.4565	565.1261	874.8339 (98)
Space heating fuel (main heating system)	285.4646	285.4646	285.4646	285.4646	285.4646	0.0000	0.0000	0.0000	0.0000	285.4646	285.4646	285.4646 (210)
Space heating efficiency (main heating system 2)	312.3697	230.9205	184.3277	90.1995	28.1403	0.0000	0.0000	0.0000	0.0000	85.9849	197.9671	306.4597 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)

Water heating
Water heating requirement

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Efficiency of water heater	290.0944	256.2513	271.2824	236.0213	227.1446	202.8647	198.7961	207.6365	210.9817	237.4518	255.1966	286.5796 (64)
(217)m	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830	275.7830 (216)
Fuel for water heating, kWh/month	105.1894	92.9177	98.3681	85.5822	82.3635	73.5595	72.0843	75.2898	76.5028	86.1010	92.5353	103.9149 (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)
(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	68.9735	62.2986	68.9735	66.7485	68.9735	66.7485	68.9735	68.9735	66.7485	68.9735	66.7485	68.9735 (231)
Lighting	39.4482	31.6468	28.4944	20.8762	16.1254	13.1746	14.7101	19.1208	24.8360	32.5862	36.8060	40.5445 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-43.9583	-62.3660	-93.1275	-110.8093	-119.7717	-115.7643	-113.3984	-105.3406	-90.1097	-73.6983	-49.2127	-37.1638 (233a)
(233a)m	-43.9583	-62.3660	-93.1275	-110.8093	-119.7717	-115.7643	-113.3984	-105.3406	-90.1097	-73.6983	-49.2127	-37.1638 (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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	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)
(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)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1												1436.3694 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												275.7830
Water heating fuel used												1044.4084 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
(BalancedWithHeatRecovery, DataSheet: in-use factor = 1.4000, SFP = 1.8200)												
mechanical ventilation fans (SFP = 1.8200)												812.1069 (230a)
Total electricity for the above, kWh/year												812.1069 (231)
Electricity for lighting (calculated in Appendix L)												318.3693 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-1014.7207 (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												2596.5333 (238)

10a. Fuel costs - using BEDF prices (589)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	1436.3694	28.4300	408.3598 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1044.4084	28.4300	296.9253 (247)
Energy for instantaneous electric shower(s)	0.0000	28.4300	0.0000 (247a)
Pumps, fans and electric keep-hot	812.1069	28.4300	230.8820 (249)
Energy for lighting	318.3693	28.4300	90.5124 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1014.7207	28.4300	-288.4851
PV Unit electricity exported	0.0000	5.8100	0.0000
Total			-288.4851 (252)
Total energy cost			738.1944 (255)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	1436.3694	0.1561	224.2186 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1044.4084	0.1411	147.3882 (264)
Space and water heating			371.6069 (265)
Pumps, fans and electric keep-hot	812.1069	0.1387	112.6492 (267)
Energy for lighting	318.3693	0.1443	45.9505 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1014.7207	0.1339	-135.8301
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-135.8301 (269)
Total CO2, kg/year			394.3765 (272)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	1436.3694	1.5779	2266.4638 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1044.4084	1.5218	1589.4082 (278)
Space and water heating			3855.8719 (279)
Pumps, fans and electric keep-hot	812.1069	1.5128	1228.5553 (281)
Energy for lighting	318.3693	1.5338	488.3254 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1014.7207	1.4947	-1516.6827
PV Unit electricity exported	0.0000	0.0000	0.0000
Total			-1516.6827 (283)
Total Primary energy kWh/year			4056.0699 (286)

Predicted Energy Assessment

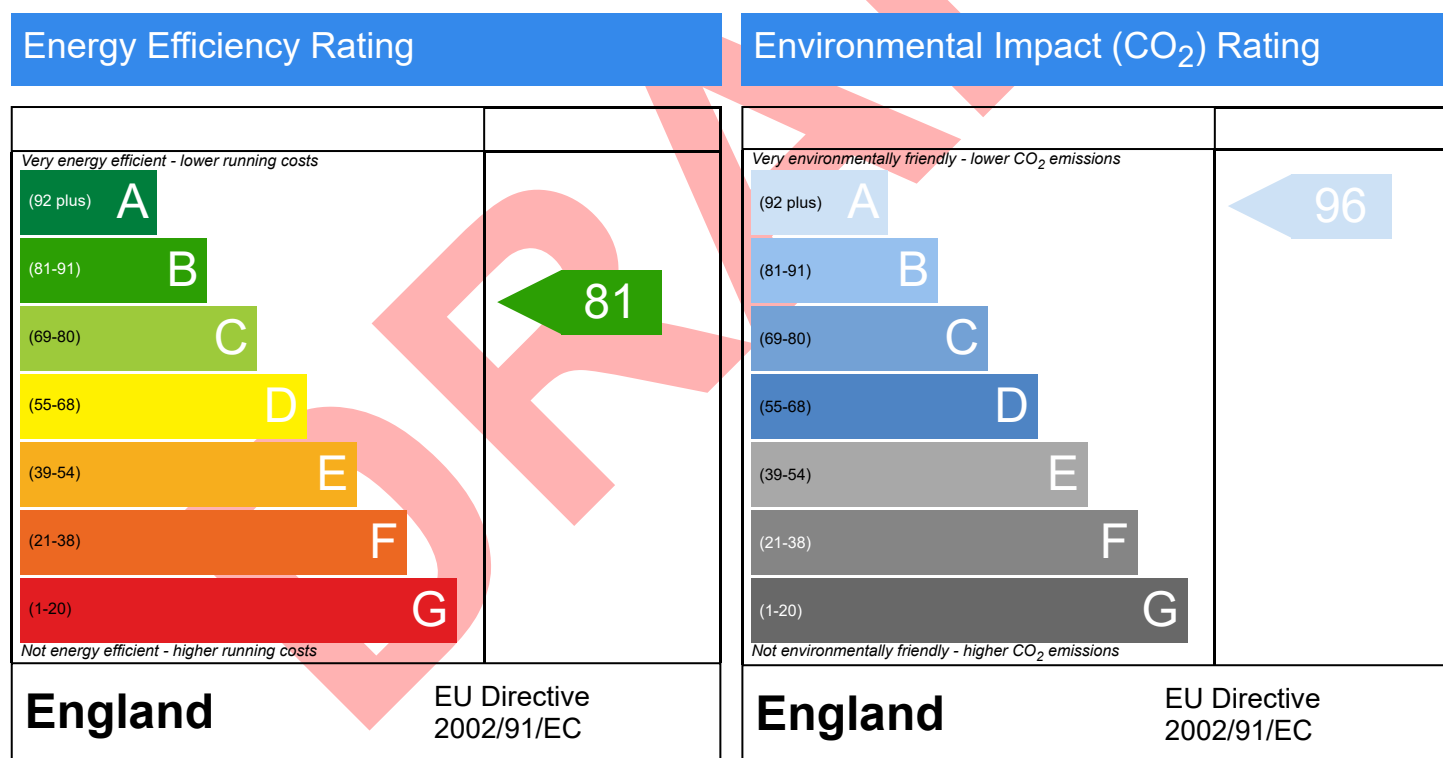


Plot 02 (Type 01), Rollys Lane, Baldock, SG7

Dwelling type: House, Detached
Date of assessment: 22/01/2026
SAP Version: 10.2
Produced by: Yik Shun Wilson Ho
Total floor area: 142.92 m²
DRRN:

This document is a Predicted Energy Assessment for properties marketed when they are incomplete. It includes a predicted energy rating which might not represent the final energy rating of the property on completion. Once the property is completed, this rating will be updated and an official Energy Performance Certificate will be created for the property. This will include more detailed information about the energy performance of the completed property.

The energy performance has been assessed using the Government approved SAP 10 methodology and is rated in terms of the energy use per square meter of floor area; the energy efficiency is based on fuel costs and the environmental impact is based on carbon dioxide (CO₂) emissions.



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills are likely to be.

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO₂) emissions. The higher the rating the less impact it has on the environment.