



EPS Group
Energy Consultancy and Compliance Services

Project No: 18416

London Borough of Haringey Energy Statement

Extension and Reconfiguration of 26 Ravenstone Road, London, N8 0JP to form 2No. Flats

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



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Executive Summary

This report has been commissioned in response to the Sustainable and Low Carbon Planning Policy requirements of the London Borough of Haringey in respect to the proposed extension and reconfiguration of 26 Ravenstone Road, London, N8 0JP to form 2No. self-contained flats.

In accordance with the Energy Hierarchy detailed within The London Plan 2021, this statement outlines an overall commitment to reducing energy consumption under occupancy through the adoption of enhanced insulation standards and improved heating and lighting efficiencies in comparison to the standard requirements of Approved Document L1 2021 of the Building Regulations.

Further improvements are then proposed through the installation of photovoltaic panels with a total minimum output capacity of 1.60 kWp. It is initially proposed that this will comprise of 4 x 400 W panels being installed on the south facing pitched roof to the front.

Predictive SAP calculations firmly demonstrate that the proposed development would be expected to deliver an overall minimum on site reduction in annual regulated carbon emissions of **42.70%** in comparison to the minimum requirements of Approved Document L1 2021 of the Building Regulations. This is thought to be the maximum amount of on-site savings that are technically feasible and economically viable for a small-scale development such as that proposed.

As the proposed development has not achieved zero carbon on-site, the shortfall in carbon dioxide emissions for the assumed lifetime of the development's services (30 years) will be met through a total cash-in-lieu contribution of **£6,934.05**.

In the circumstances, the proposed development is therefore deemed to comply with the mandatory requirements of Policy *SI 2: Minimising Carbon Dioxide Emissions* of The London Plan 2021 and the London Borough of Haringey's Strategic Policy *SP4: Working Towards a Low Carbon Haringey*.

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1.0 Introduction

- 1.1 EPS Group have been appointed to provide an Energy Statement to support the planning application for the proposed extension and reconfiguration of 26 Ravenstone Road, London, N8 0JP to form 2No. self-contained flats.
- 1.2 It is anticipated that the development would fall under the requirements of Approved Document L1 (2021) of the Building Regulations, if planning is approved.
- 1.3 The energy consumption of the proposed dwellings has therefore been assessed using the National Calculations Method (NCM) - SAP 10 (Standard Assessment Procedure), in order to determine the predicted annual carbon dioxide (CO₂) emissions of the development and the associated reduction targets.
- 1.4 The following fuel emissions factors have been used within the underlying calculations as defined by the updated National Calculations Method (NCM):

Fuel	CO ₂ emission factor (kgCO ₂ /kWh)
Natural gas	0.210
Grid supplied electricity	0.136
Grid displaced electricity	0.136

- 1.5 This document should be used for planning purposes only and should be reassessed and where necessary, resubmitted at the Building Control stage if alternative building specifications or proposed HVAC systems are adopted as oppose to those outlined within the report.
- 1.6 It is also highlighted that the SAP calculations underlying this report rely on a number of standard operational parameters which may not ultimately match the actual measures adopted within the finalised dwellings. Whilst they provide a 'like for like' comparison for the purpose of this report they are not valid for Building Control purposes or for the actual operation of the development post completion.
- 1.7 The dimensions that are referenced within this report are based upon SAP measurement conventions which may result in slight differences with other dimensions quoted elsewhere.

2.0 Planning Policy Context

2.1 National

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

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

152. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

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

154. New development should be planned for in ways that:

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

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

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

a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);

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

c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

156. *Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.*
157. *In determining planning applications, local planning authorities should expect new development to:*
- a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and*
 - b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.*
158. *When determining planning applications for renewable and low carbon development, local planning authorities should:*
- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and*
 - b) approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."*

2.2 The London Plan

The London Plan is the overall strategic plan for London detailing a fully integrated economic, environmental, transport and social framework for the development of the city over the next 20 – 25 years.

Policy SI 2 of The London Plan March 2021 relates to 'Minimising Carbon Dioxide Emissions' and states:

- "A *Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:*
- 1) be lean: use less energy and manage demand during operation*
 - 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly*
 - 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site*
 - 4) be seen: monitor, verify and report on energy performance.*
- B *Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.*
- C *A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy*

efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

- 1) through a cash in lieu contribution to the borough's carbon offset fund, or
 - 2) off-site provided that an alternative proposal is identified and delivery is certain.
- D Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.
- E Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.
- F Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions."

2.3 The London Borough of Haringey

The relevant policy from the London Borough of Haringey's *Local Plan Strategic Policies 2013 – 2026 (formerly the Core Strategy)*, March 2013 is detailed below:

Strategic Policy 4: Working Towards a Low Carbon Haringey (SP4)

"Over the life time of the Local Plan, reducing energy use in buildings and working towards a low carbon borough will be one of the key challenges facing Haringey. The Council will promote the measures outlined below to reduce carbon emissions from new and existing buildings.

1. In line with London Plan policy, the Council will promote and require all new developments to take measures to reduce energy use and carbon emissions during design, construction and occupation, by incorporating the following measures:
 - a. From 2011 onwards, all new residential development will achieve a minimum 25% reduction in total (regulated) CO₂ emissions in line with Code for Sustainable Homes Level 4 energy standards, and should aim to achieve Level 6. All new residential development shall be zero carbon from 2016 onwards; and
 - b. From 2011 onwards all new non-residential development shall be built to at least BREEAM "very good" standard and should aim to achieve BREEAM "excellent" or the current nationally agreed standard. All new non-residential development shall be zero carbon from 2019.
2. The Council will promote low- and zero-carbon energy generation through the following measures:
 - a. Requiring all developments to assess, identify and implement, where viable, site-wide and area-wide decentralised energy facilities including the potential to link into a wider network;
 - b. Establishing local networks of decentralised heat and energy facilities by requiring developers to prioritise connection to existing or planned networks where feasible;

- c. *Working with neighbouring boroughs and other partners to explore ways of implementing sub-regional decentralised energy networks including the potential in the Upper Lee Valley Opportunity Area; and*
- d. *All new developments are required, where viable, to achieve a reduction in predicted carbon dioxide emissions of 20% from onsite renewable energy regeneration, which can include connections to local sources of decentralised renewable energy."*

2.4 Conclusions

On review of the above policies, it is evident that the development will need to achieve a zero carbon standard as defined within *Policy SI 2* of The London Plan.

This will require a minimum 35% reduction in CO₂ emissions (using SAP 10 emission factors) to be achieved on site by following the Energy Hierarchy which promotes the use of Lean, Clean and Green measures, with 10% from energy efficiency measures. Any remaining carbon emissions may then be offset with a cash-in-lieu contribution to the local council which will be used to secure carbon dioxide savings elsewhere.

3.0 Energy Calculation Methodology

- 3.1 As detailed within Paragraph 1.3, SAP 10 has been utilised as an appropriate method for calculating the predicted energy consumption and the associated carbon dioxide emissions for the proposed development across a number of different scenarios.
- 3.2 Where specific information was unavailable due to the lack of detail ordinarily associated with Building Control specifications, details from previous comparable projects have been utilised. Alternatively, industry standard defaults and assumptions have been adopted and consistently applied across all variant calculations.
- 3.3 In the first instance a set of 'Notional' Baseline SAP Calculations were produced as outlined within Section 4.0 in order to determine the amount of annual regulated carbon dioxide (CO₂) emissions that would be permitted for the proposed development under the standard requirements of Approved Document L1 2021.
- 3.4 In response to the Energy Hierarchy of the London Plan 2021, a range of conventional energy efficiency improvements are proposed for the development which have then been modelled within SAP 10 to produce a set of 'Lean' Energy Calculations as detailed within Section 5.0.
- 3.5 In accordance with the 'Clean' step of the Energy Hierarchy, the feasibility of utilising decentralised energy networks or Combined Heat and Power (CHP) was then reviewed as detailed within Section 6.0.
- 3.6 The suitability of a wide range of renewable technologies has been reviewed for potential inclusion within the development, although it has been concluded that it would not be viable to install any of these technologies as detailed with Section 7.0.
- 3.7 Since it is not feasible or economically viable for the proposed dwelling to achieve zero carbon entirely through on-site measures, a cash in lieu payment for the cumulative shortfall was calculated at a rate of £95 / tonne for a period of 30 years. This is in accordance with the London Plan 2021.

4.0 Notional Benchmark Energy Calculations

- 4.1 Notional SAP calculations (Baseline) have been produced for the development as a means of determining the maximum energy consumption and associated carbon dioxide (CO₂) emissions that would ordinarily be permitted under the standard requirements of Approved Document L1 2021 of the Building Regulations.
- 4.2 The Baseline SAP calculations are based upon the maximum permitted U-values allowable under Approved Document L1 2021, in conjunction with the minimum allowable lighting, heating and hot water system efficiencies as outlined within Table 1 below:

Table 1: Baseline SAP Specifications	
Fabric Insulation and Lighting Standards	
Element / Feature	Approved Document L1 2021 Minimal Acceptable Standard
Existing External Wall (thermally upgraded)	0.30 W/m ² K
Semi Exposed Wall to unheated communal stairs	0.28 W/m ² K (prior to sheltering factor)
New External Walls (incl. dormer)	0.18 W/m ² K
Party Wall	0.00 W/m ² K
Existing Ground Floor (No thermal upgrade required)	0.66 W/m ² K
New Ground Floor	0.18 W/m ² K
Semi Exposed Floor / Ceiling to unheated communal stairs	0.25 W/m ² K (prior to sheltering factor)
Pitched Roof (New & thermally upgraded existing)	0.15 W/m ² K
New Flat Roof (incl. dormer)	0.15 W/m ² K
Existing Double Glazed Windows	2.00 W/m ² K
New Double Glazed Windows / Rooflights	1.40 W/m ² K
Entrance Doors (Unglazed)	3.00 W/m ² K (prior to sheltering factor)
Lighting	All fixed lighting to have an efficacy of 75 lm/W
HVAC Details	
Heating & Hot Water	Gas combi boilers (Worcester Greenstar 8000 Style 50)
Heating Controls	Programmer, Room Thermostat and TRV's
Ventilation	Natural ventilation with intermittent extract fans

- 4.3 The key results of the Baseline SAP Calculations are summarised within Table 2 below with the full calculation worksheets available for detailed review within Appendix 1 of this report:

Table 2: Benchmark Annual Energy Consumption and CO ₂ Emissions (SAP 10)			
Dwelling	Floor Area (m ²)	Annual Regulated Energy Consumption (kWhr / Year)	Annual Regulated CO ₂ Emissions (Kg / Year)
Flat 1	85.42	11,591.17	2,371.17
Flat 2	89.95	9,234.66	1,874.88

- 4.4 On review of the above, it is evident that the proposed development would be permitted to emit up to **4,246.05 KgCO₂/year** under occupancy if it was constructed to the minimum energy performance standards required by Approved Document L1 2021 of the Building Regulations.
- 4.5 In order to comply with the planning policies detailed in Section 2, a minimum on-site saving of **1,486.12 KgCO₂/year** will need to be achieved by adopting the principles of the Energy Hierarchy of the London Plan, with a minimum of **424.61 KgCO₂/year** from energy efficiency measures. Any remaining emissions may then be offset through a Section 106 payment to the council.
- 4.6 The CO₂ emissions arising from unregulated energy consumption within the development such as that used for cooking, appliances and powering equipment have also been estimated in accordance with the benchmarks produced by the Good Homes Alliance in 2020 and are summarised within Table 3 below:

Table 3: Non-Regulated Annual Energy Consumption and CO ₂ Emissions			
Dwelling	Floor Area (m ²)	Good Homes Alliance Benchmark Annual Energy Consumption from Cooking & Appliance Use (kWh/m ² /year)	Total Unregulated CO ₂ Emissions (Kg / Year)
Flat 1	85.42	19.30	224.21
Flat 2	89.95	19.30	236.10

- 4.7 As detailed above, the future occupants of the completed dwelling are predicted to consume energy from unregulated activities which will result in additional non-regulated carbon dioxide emissions of **460.31 KgCO₂/year**.
- 4.8 Whilst it is noted that targeting a reduction in non-regulated CO₂ emissions is outside of the guidance of the GLA, efforts will be made to reduce the impact of this type of energy consumption by only installing highly efficient energy rated appliances & equipment within the proposed dwellings.

5.0 Proposed Energy Strategy and Performance – Lean Measures

- 5.1 In accordance with the 'Lean' principles of the Energy Hierarchy, it is provisionally proposed to adopt the following minimum fabric, heating and lighting standards within the proposed development as a means of reducing its overall energy demand by conventional (lean) means:

Table 4: Proposed 'Lean' Fabric & Lighting Standards		
Element / Feature	Approved Document L1 2021 Minimal Acceptable Standard	Proposed Development Target
Existing External Wall (thermally upgraded)	0.30 W/m ² K	0.30 W/m²K
Semi Exposed Wall to unheated communal stairs	0.28 W/m ² K (prior to sheltering factor)	0.16 W/m²K (Ru = 2.50)
New External Walls (incl. dormer)	0.18 W/m ² K	0.18 W/m²K
Party Wall	0.00 W/m ² K	0.00 W/m²K
Existing Ground Floor (No thermal upgrade required)	0.66 W/m ² K	0.66 W/m²K
New Ground Floor	0.18 W/m ² K	0.18 W/m²K
Semi Exposed Floor / Ceiling to unheated communal stairs	0.25 W/m ² K (prior to sheltering factor)	0.15 W/m²K (Ru = 2.50)
Pitched Roof (New & thermally upgraded existing)	0.15 W/m ² K	0.18 W/m²K
New Flat Roof (incl. dormer)	0.15 W/m ² K	0.15 W/m²K
Existing Double Glazed Windows	2.00 W/m ² K	2.00 W/m²K
New Double Glazed Windows / Rooflights	1.40 W/m ² K	1.20 W/m²K
Entrance Doors (Unglazed)	3.00 W/m ² K (prior to sheltering factor)	0.35 W/m²K (Ru = 2.50)
Lighting	All fixed lighting to have an efficacy of 75 lm/W	All fixed lighting to have an efficacy of 80 lm/W
Proposed 'Lean' HVAC Standards		
Heating	100% Efficient Direct Acting Electric Boilers with Delayed Start Time and Temperature Zone Control	
Hot Water Storage	150 litre cylinders with a declared heat loss of 1.89 kWh/day or less	
Ventilation	Natural ventilation with intermittent extract fans	

- 5.2 The above build standards will ensure that the proposed dwellings have a reduced regulated energy demand in comparison to the minimum requirements of Approved Document L1 2021 of the Building Regulations. This will help to reduce the associated CO₂ emissions arising from occupancy.
- 5.3 It should also be noted that as a result of the rapid decarbonisation of the national grid, the carbon emissions factor for electricity was drastically lowered in the update to Part L of the Building Regulations that took effect from 15 June 2022. This means that electric heating systems are now deemed to be far less carbon intensive than mains gas systems.
- 5.4 The impact of the above 'Lean' measures on the proposed development's overall annual carbon dioxide emissions was determined by updating the Baseline SAP Calculations referenced in Section 4.0.
- 5.5 The results of the Lean SAP Calculations are summarised in Table 5 below with the full 'Lean' SAP Worksheets provided in Appendix 2 for detailed review:

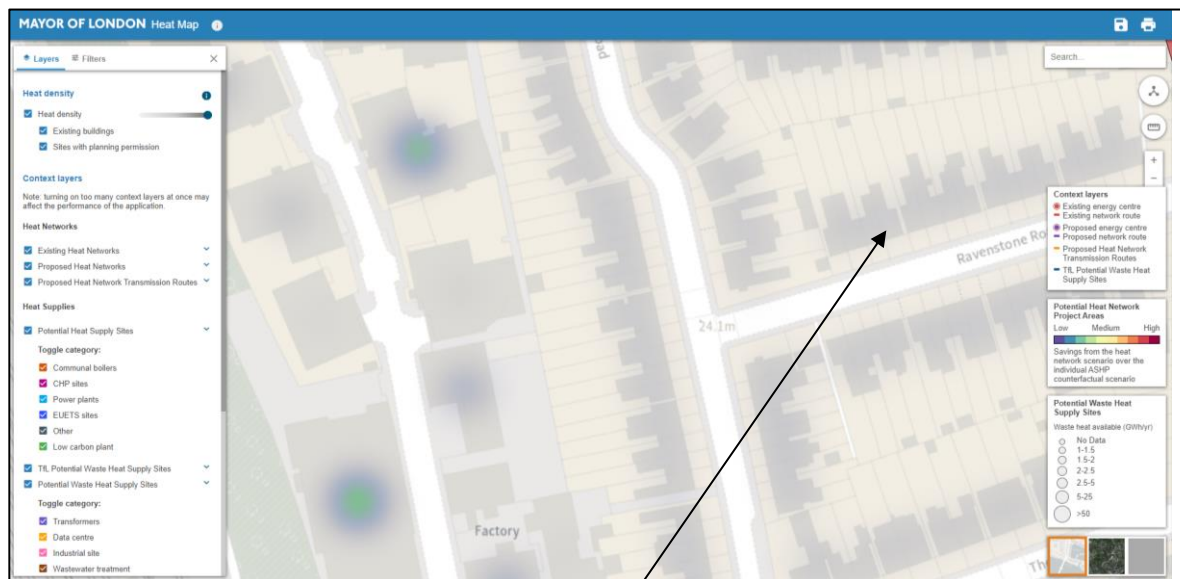
Table 5: 'Lean' Annual Energy Consumption and CO ₂ Emissions (SAP 10)			
Dwelling	Floor Area (m ²)	Annual Regulated Energy Consumption (kWhr / Year)	Annual Regulated CO ₂ Emissions (Kg / Year)
Flat 1	85.42	9,627.35	1,448.00
Flat 2	89.95	7,764.20	1,163.71

- 5.6 As a result of adopting the recommended 'Lean' energy efficient measures outlined within paragraph 5.1, the proposed development will have a reduced annual level of regulated CO₂ emissions of **2,611.71 KgCO₂/year**. This represents a total reduction of **38.49%** in comparison to the Baseline Carbon Dioxide Emissions detailed within Section 4.0.

6.0 Proposed Energy Strategy and Performance – Clean Measures

- 6.1 Where feasible, the Energy Hierarchy advocates the use of zero or low emission decentralised energy, prioritising connection to district heating and cooling networks and utilising secondary heat sources. In accordance with the ‘Clean’ step of the aforementioned Energy Hierarchy, developments should look to exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly.
- 6.2 On consulting the London Heat Map (see below), it is apparent that there is no existing or potential Energy Network within the immediate vicinity of the proposed development and as such any possible connection to an existing or planned network is unviable in this instance.

Figure 1: Results of the London Heat Map Search within Vicinity of the Development



Approximate Location of Proposed Development Site

- 6.3 Combined Heat and Power (CHP) units conventionally produce electricity at a localised level from mains gas. In generating electricity in this manner, the technology reduces the losses associated with the inefficient transportation of electricity across the national grid, whilst also producing large quantities of heat as a by-product. This heat can then be harvested and used for the provision of localised heating and hot water.
- 6.4 It should be noted that CHP units are not suitable for all developments as they require sustained heat load demands in order to achieve maximum operating efficiencies. Since there are no economic or sustainability benefits associated with oversizing a CHP installation, a large proportion of smaller developments are often unsuitable for this technology.
- 6.5 On review of the above circumstances, coupled with a growing concern on the detrimental impact that CHP equipment can have on urban air quality, the use of this technology within the development is deemed to be unviable.

7.0 Review of Low Carbon and Renewable Technologies

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

7.2 Wind Turbine (Column or Roof Mounted)

Benefits	When installed in optimum positions, wind turbines can generate a large amount of renewable electricity, the surplus of which can be exported at financial gain to the national grid via the Smart Export Guarantee scheme.
Site Limitations / Restrictions	- Not aesthetically pleasing and will not be in keeping with the local area. - The site is too sheltered as a result of its urban location which would result in unreliable and insufficient outputs. - Require on-going maintenance which future occupants may neglect. - Can produce unacceptable levels of noise to occupants and neighbours.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

7.3 Solar Photovoltaic

Benefits	- When installed in optimum positions photovoltaic (PV) arrays can generate a large amount of renewable electricity which can be used locally or exported at financial gain to the national grid via the Smart Export Guarantee scheme. - Minimal on-going costs & maintenance issues following installation. - Easy to integrate into a conventional build specification or retro-fit applications. - The development benefits from a south facing pitched roof space which would provide an optimal location for the installation of PV panels in order to maximise their efficiency and generation capacity.
Site Limitations / Restrictions	- PV panels are not aesthetically pleasing and may detract from the visual appearance of the development. - As a result of the rapid decarbonisation of the national grid, the amount of CO₂ savings with this technology is limited as the CO₂ emission factor for grid displaced electricity is relatively low.
Conclusion	It is proposed to utilise this technology within the proposed development.

7.4 Solar Thermal

Benefits	- Solar hot water systems can provide an efficient way of contributing to a dwelling's overall hot water requirements. - Minimal on-going costs & maintenance issues following installation. - As with PV, the proposed development benefits from a south facing pitched roof space which would provide an optimal location for the siting of Solar Thermal collectors.
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Site Limitations / Restrictions	- The amount of CO₂ savings with this technology is restricted as there is no benefit to producing more hot water than is used within a dwelling. - Solar collectors are not aesthetically pleasing and may detract from the visual appearance of the development.
Conclusion	It is not proposed to use this technology within the proposed development.

7.5 Ground Source Heat Pump

Benefits	- High operating efficiencies (CoPs). - Reliable and proven technology. - Generally low maintenance costs. - No visual impact on the property.
Site Limitations / Restrictions	- Detailed ground surveys required. - Minimal space to facilitate an installation. - High capital installation costs rendering the technology financially unviable.
Conclusion	The technology is not deemed as being suitable for use within the proposed development.

7.6 Air Source Heat Pump

Benefits	- High operating efficiencies (CoPs). - Reduced visual impact on the property. - Reliable and proven technology. - Generally low maintenance costs.
Site Limitations / Restrictions	- Could potentially require a supplementary immersion heating system for hot water production. - The external units can result in some noise related problems although this can be limited through the careful selection of particular models with low operating acoustic levels and the potential use of acoustic housing units.
Conclusion	It is not proposed to use this technology within the proposed development.

7.7 Biomass Boilers

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

7.8 On review of the above renewable and low carbon technologies, the use of PV panels is recommended as being the most viable and cost effective technology for use within the development. This will provide a local source of renewable electricity for occupant use as well as a significant and affordable reduction in the calculated carbon dioxide emissions.

7.9 It is therefore proposed to fit PV panels with a total minimum output capacity of 1.60 kWp. It is initially proposed that this will comprise of 4 x 400 W panels being installed on the south facing pitched roof to the front.

8.0 Proposed Energy Strategy and Performance – Green Measures

- 8.1 Having identified the use of photovoltaic (PV) panels as being the most suitable renewable technology for use within the development, the 'lean' SAP calculations detailed in Section 5.0 were updated to incorporate the PV proposals outlined in paragraph 5.9.
- 8.2 The key results of the Proposed (Green) Calculations are summarised in Table 6 below with the full SAP Worksheets provided in Appendix 3 for detailed review:

Table 6: Proposed 'Green' Annual Energy Consumption and CO ₂ Emissions (SAP 10)			
Dwelling	Floor Area (m ²)	Annual Regulated Energy Consumption (kWhr / Year)	Annual Regulated CO ₂ Emissions (Kg / Year)
Flat 1	85.42	8,953.72	1,360.91
Flat 2	89.95	7,056.03	1,072.09

- 8.3 As a result of installing the low carbon and renewable technology specified within Section 7.0 the proposed development will have a total annual level of regulated CO₂ emissions of **2,433 KgCO₂/year**.

9.0 Energy Calculation Summary

- 9.1 The results of the various Energy Calculations detailed within this report are summarised within the tables below:

Table 7: Carbon Dioxide Emissions after each stage of the Energy Hierarchy		
	Carbon dioxide emissions (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Approved Document L1 2021 of the Building Regulations Compliant Development	4.246	0.460
After energy demand reduction	2.612	0.460
After CHP	2.612	0.460
After renewable energy	2.433	0.460

Table 8: Regulated carbon dioxide savings from each stage of the Energy Hierarchy		
	Regulated Carbon Dioxide savings	
	(Tonnes CO ₂ per annum)	%
Savings from energy demand reduction	1.634	38.483
Savings from CHP	0.000	0.000
Savings from renewable energy	0.179	4.216
Cumulative On Site Savings	1.813	42.699
Carbon shortfall	2.433	57.301
(Tonnes CO ₂ per annum)		
Cumulative savings for off-set payment	72.99	
Cash-in-lieu contribution	£6,934.05	

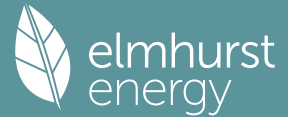
- 9.2 It is evident that the proposed development achieves on-site savings of **42.70%**, which is believed to be the maximum amount of on-site savings that are technically feasible and economically viable.
- 9.3 Therefore the remaining **2.433** tonnes of CO₂ per annum for the assumed lifetime of the residential development's services (30 years) will be met by multiplying the cumulative shortfall by the CO₂ off-set price of £95 per tonne. This will result in a cash-in-lieu contribution of **£6,934.05** for the proposed development.
- 9.4 In the circumstances, the proposed development is deemed to comply with the mandatory requirements of Policy *SI 2: Minimising Carbon Dioxide Emissions* of The London Plan 2021 and the London Borough of Haringey's Strategic Policy *SP4: Working Towards a Low Carbon Haringey*.



Appendix 1:

Baseline Full SAP 10 Calculation Worksheets

Full SAP Calculation Printout



Property Reference	Flat 1 - Baseline			Issued on Date	07/11/2023
Assessment Reference	00001	Prop Type Ref	18416		
Property	Flat 1 - Baseline, 26, Ravenstone Road, London, N8 0JP				
SAP Rating	72 C	DER		TER	
Environmental	76 C	% DER < TER			N/A
CO ₂ Emissions (t/year)	2.08	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Andrew Bamford			Assessor ID	F391-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	85.4200 (1b)	2.9200 (2b)	249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		249.4264 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	249.4264 (5)

2. Ventilation rate

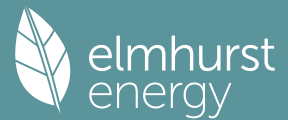
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0802 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8302 (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) = 0.7679 (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	0.9791	0.9599	0.9407	0.8447	0.8255	0.7295	0.7295	0.7103	0.7679	0.8255	0.8639	0.9023 (22b)
Effective ac	0.9793	0.9607	0.9425	0.8568	0.8407	0.7661	0.7661	0.7523	0.7949	0.8407	0.8732	0.9071 (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
New Glazing (Uw = 1.40)			7.3700	1.3258	9.7708		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.3258	2.5985		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum (A, m ²)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	96.5527		(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							49.4100 (36)

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Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
145.9627 (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	80.6083	79.0762	77.5746	70.5213	69.2016	63.0585	63.0585	61.9208	65.4247	69.2016	71.8713	74.6623	(38)
Heat transfer coeff	226.5710	225.0390	223.5373	216.4840	215.1644	209.0212	209.0212	207.8836	211.3875	215.1644	217.8340	220.6250	(39)
Average = Sum(39)m / 12 =												216.4777	
HLP	2.6524	2.6345	2.6169	2.5343	2.5189	2.4470	2.4470	2.4337	2.4747	2.5189	2.5502	2.5828	(40)
HLP (average)												2.5343	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5577 (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													
28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822	28.8822	(42b)
Hot water usage for other uses													
40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235	40.8235	(42c)
Average daily hot water use (litres/day)												63.9814	(43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	(44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Energy content (annual)													
Distribution loss (46)m = 0.15 x (45)m													
16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713	16.3713	(46)
Water storage loss:													
Total storage loss													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	29.7910	26.9039	29.7804	28.8100	29.7637	28.7973	29.7544	29.7585	28.8030	29.7706	28.8198	29.7899	(61)
Total heat required for water heating calculated for each month													
140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	138.9321	(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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	(64)
												1413.1367	(64)
Electric shower(s)													
53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	53.7391	(64a)
												611.2796	(64a)
Heat gains from water heating, kWh/month													
57.6410	50.8401	54.1419	48.4417	47.3969	43.2237	43.2727	44.8694	45.1718	49.6907	51.9062	57.1720	57.1720	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
29.1504	25.8911	21.0561	15.9408	11.9159	10.0599	10.8701	14.1294	18.9645	24.0797	28.1046	29.9606	29.9606	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)													
-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)													
77.4745	75.6550	72.7714	67.2801	63.7056	60.0329	58.1623	60.3083	62.7386	66.7886	72.0919	76.8441	76.8441	(72)
Total internal gains	557.5563	556.0458	539.3351	509.5855	477.8214	446.5813	430.3483	432.1853	448.4427	479.7510	513.2439	542.5635	(73)

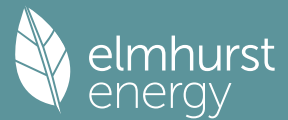
6. Solar gains

[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				6.3800	10.6334		0.6300		0.7000		0.7700		20.7331 (74)
East				0.9900	19.6403		0.6300		0.7000		0.7700		5.9423 (76)
East				1.9600	26.0000		0.6300		0.7000		1.0000		20.2260 (82)
Southeast				1.0800	36.7938		0.7200		0.7000		0.7700		13.8791 (77)
South				2.5200	46.7521		0.7200		0.7000		0.7700		41.1496 (78)
Southwest				1.0800	36.7938		0.7200		0.7000		0.7700		13.8791 (79)
Solar gains	115.8093	207.9293	311.6920	429.9375	520.1504	533.0044	506.9848	437.3776	352.4019	237.2475	140.6821		97.8195 (83)
Total gains	673.3655	763.9751	851.0271	939.5230	997.9718	979.5857	937.3331	869.5629	800.8446	716.9985	653.9259		640.3830 (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	10.4726	10.5439	10.6147	10.9605	11.0277	11.3519	11.3519	11.4140	11.2248	11.0277	10.8926	10.7548	
alpha	1.6982	1.7029	1.7076	1.7307	1.7352	1.7568	1.7568	1.7609	1.7483	1.7352	1.7262	1.7170	

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util living area	0.9557	0.9434	0.9228	0.8842	0.8238	0.7313	0.6312	0.6677	0.8042	0.9013	0.9435	0.9591 (86)
MIT	16.1596	16.5053	17.1792	18.1563	19.1182	19.9891	20.4662	20.3866	19.6845	18.4596	17.1831	16.1461 (87)
Th 2	18.9338	18.9439	18.9538	19.0009	19.0098	19.0520	19.0520	19.0599	19.0357	19.0098	18.9918	18.9731 (88)
util rest of house												
MIT 2	0.9461	0.9310	0.9044	0.8532	0.7668	0.6208	0.4409	0.4897	0.7167	0.8684	0.9289	0.9502 (89)
Living area fraction	14.8051	15.1510	15.8202	16.7989	17.7208	18.5274	18.8906	18.8523	18.2776	17.1153	15.8523	14.8123 (90)
MIT	15.3880	15.7338	16.4050	17.3831	18.3221	19.1564	19.5687	19.5126	18.8830	17.6938	16.4250	15.3863 (91)
Temperature adjustment												0.0000 (92)
adjusted MIT	15.3880	15.7338	16.4050	17.3831	18.3221	19.1564	19.5687	19.5126	18.8830	17.6938	16.4250	15.3863 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9194	0.9005	0.8699	0.8176	0.7405	0.6283	0.5024	0.5413	0.7076	0.8364	0.8996	0.9250	(94)
Useful gains	619.1228	687.9618	740.3509	768.1873	739.0205	615.4311	470.9193	470.6684	566.6552	599.6638	588.2616	592.3816	(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	2512.2171	2438.0320	2214.1384	1836.4515	1424.8483	952.3872	620.5112	647.0547	1011.0740	1526.3328	2031.3071	2467.9739	(97)
Space heating kWh	1408.4621	1176.0472	1096.4979	769.1502	510.2559	0.0000	0.0000	0.0000	0.0000	689.4417	1038.9928	1395.4407	(98a)
Space heating requirement - total per year (kWh/year)												8084.2884	
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	1408.4621	1176.0472	1096.4979	769.1502	510.2559	0.0000	0.0000	0.0000	0.0000	689.4417	1038.9928	1395.4407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8084.2884	
Space heating per m2										(98c) / (4) =		94.6416	(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 %)	88.9000	(206)
Efficiency of main space heating system 2 (in %)	0.0000	(207)
Efficiency of secondary/supplementary heating system, %	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1408.4621	1176.0472	1096.4979	769.1502	510.2559	0.0000	0.0000	0.0000	0.0000	689.4417	1038.9928	1395.4407	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	1584.3218	1322.8877	1233.4060	865.1859	573.9661	0.0000	0.0000	0.0000	0.0000	775.5250	1168.7208	1569.6745	(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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	(64)
Efficiency of water heater (217)m	88.8361	88.8330	88.8248	88.8081	88.7735	88.2000	88.2000	88.2000	88.2000	88.7974	88.8245	88.8362	(216)
Fuel for water heating, kWh/month	157.9795	139.1111	147.3796	129.8556	125.8405	114.1540	113.2128	118.0386	119.5990	132.3463	140.3740	156.3913	(219)

Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	(231)
Lighting	25.5152	20.4692	18.4303	13.5028	10.4300	8.5214	9.5146	12.3674	16.0640	21.0768	23.8062	26.2243	(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												9093.6878	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												1594.2824	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												205.9222	(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												11591.1719	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	9093.6878	3.6400	331.0102 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1594.2824	3.6400	58.0319 (247)
Energy for instantaneous electric shower(s)	611.2796	16.4900	100.8000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	205.9222	16.4900	33.9566 (250)
Additional standing charges			92.0000 (251)
Total energy cost			629.9801 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	1.7389 (257)
SAP value	71.8117
SAP rating (Section 12)	72 (258)
SAP band	C

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	9093.6878	0.2100	1909.6744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1594.2824	0.2100	334.7993 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			2244.4737 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	205.9222	0.1443	29.7209 (268)
Total CO2, kg/year			2371.1664 (272)
CO2 emissions per m2			27.7600 (273)
EI value			75.6375
EI rating			76 (274)
EI band			C

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.4264 (5)

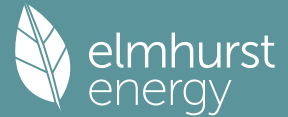
2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0802 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8302	(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) =	0.7679	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.8831	0.8255	0.8447	0.7679	0.7679	0.6719	0.6911	0.7295	0.7103	0.7487	0.7487	0.8255 (22b)
Effective ac	0.8899	0.8407	0.8568	0.7949	0.7949	0.7257	0.7388	0.7661	0.7523	0.7803	0.7803	0.8407 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K						
New Glazing (Uw = 1.40)			7.3700	1.3258	9.7708			(27)					
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667			(27)					
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615			(26)					
RL1-RL2			1.9600	1.3258	2.5985			(27a)					
Extension Ground			27.5600	0.1800	4.9608			(28a)					
Existing Ground			57.8600	0.6600	38.1876			(28a)					
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390			(29a)					
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880			(29a)					
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952			(29a)					
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140			(30)					
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755			(30)					
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062			(30)					
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890			(30)					
Total net area of external elements Aum(A, m2)			247.0500					(31)					
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	96.5527			(33)					
Party Wall 1			25.3500	0.0000	0.0000			(32)					
Party Ceiling 1			52.0100					(32b)					
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000	(35)					
Thermal bridges (Default value 0.200 * total exposed area)							49.4100	(36)					
Point Thermal bridges						(36a) =	0.0000						
Total fabric heat loss						(33) + (36) + (36a) =	145.9627	(37)					
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan 73.2516	Feb 69.2016	Mar 70.5213	Apr 65.4247	May 65.4247	Jun 59.7366	Jul 60.8135	Aug 63.0585	Sep 61.9208	Oct 64.2264	Nov 64.2264	Dec 69.2016	(38)
Heat transfer coeff	219.2143	215.1644	216.4840	211.3875	211.3875	205.6993	206.7763	209.0212	207.8836	210.1892	210.1892	215.1644	(39)
Average = Sum(39)m / 12 =												211.5467	
HLP	Jan 2.5663	Feb 2.5189	Mar 2.5343	Apr 2.4747	May 2.4747	Jun 2.4081	Jul 2.4207	Aug 2.4470	Sep 2.4337	Oct 2.4607	Nov 2.4607	Dec 2.5189	(40)
HLP (average)												2.4765	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5577 (42)
Hot water usage for mixer showers													(42a)
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	
Hot water usage for baths													(42b)
28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822		
Hot water usage for other uses													(42c)
40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235		
Average daily hot water use (litres/day)												63.9814	(43)
Daily hot water use	Jan 69.8036	Feb 67.8887	Mar 65.7981	Apr 63.1961	May 60.8749	Jun 58.4625	Jul 57.9613	Aug 60.0477	Sep 62.1875	Oct 64.6648	Nov 67.2898	Dec 69.7056	(44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Energy content (annual)										Total = Sum(45)m =		1062.5943	
Distribution loss (46)m = 0.15 x (45)m													(46)
16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713		
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	29.7910	26.9039	29.7804	28.8100	29.7637	28.7973	29.7544	29.7585	28.8030	29.7706	28.8198	29.7899	(61)
Total heat required for water heating calculated for each month													
140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321		(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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	(64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												611.2796	(64a)
Heat gains from water heating, kWh/month	57.6410	50.8401	54.1419	48.4417	47.3969	43.2237	43.2727	44.8694	45.1718	49.6907	51.9062	57.1720	(65)

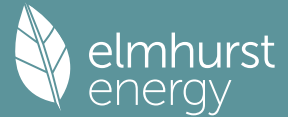
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan 153.4623	Feb 153.4623	Mar 153.4623	Apr 153.4623	May 153.4623	Jun 153.4623	Jul 153.4623	Aug 153.4623	Sep 153.4623	Oct 153.4623	Nov 153.4623	Dec 153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.1504	25.8911	21.0561	15.9408	11.9159	10.0599	10.8701	14.1294	18.9645	24.0797	28.1046	29.9606	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	77.4745	75.6550	72.7714	67.2801	63.7056	60.0329	58.1623	60.3083	62.7386	66.7886	72.0919	76.8441	(72)
Total internal gains	557.5563	556.0458	539.3351	509.5855	477.8214	446.5813	430.3483	432.1853	448.4427	479.7510	513.2439	542.5635	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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	m2	Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	factor Table 6d	W
North	6.3800	11.5821	0.6300	0.7000	0.7700	22.5828 (74)
East	0.9900	21.5869	0.6300	0.7000	0.7700	6.5313 (76)
East	1.9600	29.0000	0.6300	0.7000	1.0000	22.5598 (82)
Southeast	1.0800	39.1209	0.7200	0.7000	0.7700	14.7569 (77)
South	2.5200	49.2853	0.7200	0.7000	0.7700	43.3792 (78)
Southwest	1.0800	39.1209	0.7200	0.7000	0.7700	14.7569 (79)

Solar gains	124.5670	201.2699	304.1309	437.7978	513.3256	564.5506	538.3344	473.6515	381.2557	251.1938	156.3622	107.7298 (83)
Total gains	682.1233	757.3157	843.4660	947.3833	991.1469	1011.1319	968.6827	905.8368	829.6983	730.9447	669.6060	650.2932 (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	10.8240	11.0277	10.9605	11.2248	11.2248	11.5352	11.4751	11.3519	11.4140	11.2888	11.2888	11.0277
alpha	1.7216	1.7352	1.7307	1.7483	1.7483	1.7690	1.7650	1.7568	1.7609	1.7526	1.7526	1.7352
util living area	0.9495	0.9382	0.9115	0.8603	0.7759	0.6175	0.4339	0.4827	0.7293	0.8731	0.9321	0.9527 (86)
MIT	16.6299	16.9135	17.6794	18.6633	19.6474	20.4709	20.8417	20.7931	20.1551	19.0020	17.6844	16.6310 (87)
Th 2	18.9825	19.0098	19.0009	19.0357	19.0357	19.0751	19.0676	19.0520	19.0599	19.0439	19.0439	19.0098 (88)
util rest of house	0.9379	0.9240	0.8889	0.8196	0.6930	0.4404	0.1186	0.1669	0.5916	0.8254	0.9134	0.9419 (89)
MIT 2	15.2972	15.5898	16.3380	17.3072	18.2210	18.9026	19.0635	19.0422	18.6869	17.6559	16.3745	15.3131 (90)
Living area fraction	fLA = Living area / (4) = 0.4303 (91)											
MIT	15.8707	16.1595	16.9152	17.8908	18.8348	19.5775	19.8288	19.7957	19.3187	18.2352	16.9382	15.8803 (92)
Temperature adjustment	0.0000											
adjusted MIT	15.8707	16.1595	16.9152	17.8908	18.8348	19.5775	19.8288	19.7957	19.3187	18.2352	16.9382	15.8803 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9097	0.8930	0.8542	0.7869	0.6821	0.4958	0.2610	0.3083	0.6151	0.7974	0.8826	0.9149 (94)
Useful gains	620.5014	676.2653	720.4609	745.4909	676.0593	501.2987	252.7929	279.2653	510.3229	582.8341	590.9810	594.9551 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	2295.3313	2228.9905	1973.3019	1604.6008	1148.8570	653.6085	274.7590	312.6293	773.0613	1289.5459	1815.6597	2254.9795 (97)
Space heating kWh	1246.0734	1043.4314	932.1138	618.5591	351.7615	0.0000	0.0000	0.0000	0.0000	525.7936	881.7687	1235.0581 (98a)
Space heating requirement - total per year (kWh/year)	6834.5596											
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	1246.0734	1043.4314	932.1138	618.5591	351.7615	0.0000	0.0000	0.0000	0.0000	525.7936	881.7687	1235.0581 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6834.5596											
Space heating per m2	(98c) / (4) = 80.0112 (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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1246.0734	1043.4314	932.1138	618.5591	351.7615	0.0000	0.0000	0.0000	0.0000	525.7936	881.7687	1235.0581 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	1401.6574	1173.7136	1048.4969	695.7921	395.6822	0.0000	0.0000	0.0000	0.0000	591.4439	991.8658	1389.2668 (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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321 (64)
Efficiency of water heater (217)m	88.8286	88.8254	88.8132	88.7893	88.7303	88.2000	88.2000	88.2000	88.2000	88.7713	88.8127	88.8287 (216)
Fuel for water heating, kWh/month	157.9928	139.1231	147.3989	129.8832	125.9018	114.1540	113.2128	118.0386	119.5990	132.3852	140.3927	156.4044 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	25.5152	20.4692	18.4303	13.5028	10.4300	8.5214	9.5146	12.3674	16.0640	21.0768	23.8062	26.2243 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	7687.9186	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	88.2000	
Water heating fuel used	1594.4863	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	205.9222	(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	10185.6067	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7687.9186	4.8000	369.0201 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1594.4863	4.8000	76.5353 (247)
Energy for instantaneous electric shower(s)	611.2796	21.5100	131.4862 (247a)
Pumps, fans and electric keep-hot	86.0000	21.5100	18.4986 (249)
Energy for lighting	205.9222	21.5100	44.2939 (250)
Additional standing charges			98.0000 (251)
Total energy cost			737.8341 (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	7687.9186	0.2100	1614.4629 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1594.4863	0.2100	334.8421 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			1949.3050 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	205.9222	0.1443	29.7209 (268)
Total CO2, kg/year			2075.9977 (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	7687.9186	1.1300	8687.3480 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1594.4863	1.1300	1801.7695 (278)
Energy for instantaneous electric shower(s)	611.2796	1.5143	925.6816 (278a)
Space and water heating			10489.1175 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	205.9222	1.5338	315.8503 (282)
Total Primary energy kWh/year			11860.7502 (286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: C 72
Current environmental impact rating: C 76

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

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

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

Potential energy efficiency rating: C 72
Potential environmental impact rating: C 76

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
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	£194	£194	£0
Mains gas	£544	£544	£0

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Space heating	£486	£486	£0
Water heating	£208	£208	£0
Lighting	£44	£44	£0
Total cost of fuels	£738	£738	£0
Total cost of uses	£738	£738	£0
Delivered energy	119 kWh/m²	119 kWh/m²	0 kWh/m²
Carbon dioxide emissions	2.1 tonnes	2.1 tonnes	0.0 tonnes
CO2 emissions per m²	24 kg/m²	24 kg/m²	0 kg/m²
Primary energy	139 kWh/m²	139 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.4264 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.0802 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8302 (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) = 0.7679 (21)

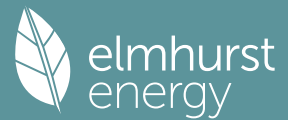
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9791	0.9599	0.9407	0.8447	0.8255	0.7295	0.7295	0.7103	0.7679	0.8255	0.8639	0.9023 (22b)
Effective ac	0.9793	0.9607	0.9425	0.8568	0.8407	0.7661	0.7661	0.7523	0.7949	0.8407	0.8732	0.9071 (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
New Glazing (Uw = 1.40)			7.3700	1.3258	9.7708		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.3258	2.5985		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum(A, m²)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	96.5527		(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							49.4100 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	145.9627 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	80.6083	79.0762	77.5746	70.5213	69.2016	63.0585	63.0585	61.9208	65.4247	69.2016	71.8713	74.6623 (38)
Heat transfer coeff	226.5710	225.0390	223.5373	216.4840	215.1644	209.0212	209.0212	207.8836	211.3875	215.1644	217.8340	220.6250 (39)
Average = Sum(39)m / 12 =												216.4777
HLP	2.6524	2.6345	2.6169	2.5343	2.5189	2.4470	2.4470	2.4337	2.4747	2.5189	2.5502	2.5828 (40)

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(average)												2.5343
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)												

Assumed occupancy												2.5577 (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	28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822 (42b)
Hot water usage for other uses	40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235 (42c)
Average daily hot water use (litres/day)												63.9814 (43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056 (44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422 (45)
Energy content (annual)												Total = Sum(45)m = 1062.5943
Distribution loss (46)m = 0.15 x (45)m	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	29.7910	26.9039	29.7804	28.8100	29.7637	28.7973	29.7544	29.7585	28.8030	29.7706	28.8198	29.7899 (61)
Total heat required for water heating calculated for each month	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321 (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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321 (64)
Total per year (kWh/year) = Sum(64)m = 1413.1367 (64)												
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 611.2796 (64a)												
Heat gains from water heating, kWh/month	57.6410	50.8401	54.1419	48.4417	47.3969	43.2237	43.2727	44.8694	45.1718	49.6907	51.9062	57.1720 (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	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	29.1504	25.8911	21.0561	15.9408	11.9159	10.0599	10.8701	14.1294	18.9645	24.0797	28.1046	29.9606 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	77.4745	75.6550	72.7714	67.2801	63.7056	60.0329	58.1623	60.3083	62.7386	66.7886	72.0919	76.8441 (72)
Total internal gains	557.5563	556.0458	539.3351	509.5855	477.8214	446.5813	430.3483	432.1853	448.4427	479.7510	513.2439	542.5635 (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	6.3800	10.6334		0.6300		0.7000		0.7700		20.7331 (74)		
East	0.9900	19.6403		0.6300		0.7000		0.7700		5.9423 (76)		
East	1.9600	26.0000		0.6300		0.7000		1.0000		20.2260 (82)		
Southeast	1.0800	36.7938		0.7200		0.7000		0.7700		13.8791 (77)		
South	2.5200	46.7521		0.7200		0.7000		0.7700		41.1496 (78)		
Southwest	1.0800	36.7938		0.7200		0.7000		0.7700		13.8791 (79)		

Solar gains	115.8093	207.9293	311.6920	429.9375	520.1504	533.0044	506.9848	437.3776	352.4019	237.2475	140.6821	97.8195 (83)
Total gains	673.3655	763.9751	851.0271	939.5230	997.9718	979.5857	937.3331	869.5629	800.8446	716.9985	653.9259	640.3830 (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	10.4726	10.5439	10.6147	10.9605	11.0277	11.3519	11.3519	11.4140	11.2248	11.0277	10.8926	10.7548
alpha	1.6982	1.7029	1.7076	1.7307	1.7352	1.7568	1.7568	1.7609	1.7483	1.7352	1.7262	1.7170
util living area	0.9557	0.9434	0.9228	0.8842	0.8238	0.7313	0.6312	0.6677	0.8042	0.9013	0.9435	0.9591 (86)
MIT	16.1596	16.5053	17.1792	18.1563	19.1182	19.9891	20.4662	20.3866	19.6845	18.4596	17.1831	16.1461 (87)
Th 2	18.9338	18.9439	18.9538	19.0009	19.0098	19.0520	19.0520	19.0599	19.0357	19.0098	18.9918	18.9731 (88)
util rest of house	0.9461	0.9310	0.9044	0.8532	0.7668	0.6208	0.4409	0.4897	0.7167	0.8684	0.9289	0.9502 (89)
MIT 2	14.8051	15.1510	15.8202	16.7989	17.7208	18.5274	18.8906	18.8523	18.2776	17.1153	15.8523	14.8123 (90)
Living area fraction												fLA = Living area / (4) = 0.4303 (91)
MIT	15.3880	15.7338	16.4050	17.3831	18.3221	19.1564	19.5687	19.5126	18.8830	17.6938	16.4250	15.3863 (92)
Temperature adjustment												0.0000
adjusted MIT	15.3880	15.7338	16.4050	17.3831	18.3221	19.1564	19.5687	19.5126	18.8830	17.6938	16.4250	15.3863 (93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9194	0.9005	0.8699	0.8176	0.7405	0.6283	0.5024	0.5413	0.7076	0.8364	0.8996	0.9250	(94)
Useful gains	619.1228	687.9618	740.3509	768.1873	739.0205	615.4311	470.9193	470.6684	566.6552	599.6638	588.2616	592.3816	(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	2512.2171	2438.0320	2214.1384	1836.4515	1424.8483	952.3872	620.5112	647.0547	1011.0740	1526.3328	2031.3071	2467.9739	(97)
Space heating kWh	1408.4621	1176.0472	1096.4979	769.1502	510.2559	0.0000	0.0000	0.0000	0.0000	689.4417	1038.9928	1395.4407	(98a)
Space heating requirement - total per year (kWh/year)												8084.2884	
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	1408.4621	1176.0472	1096.4979	769.1502	510.2559	0.0000	0.0000	0.0000	0.0000	689.4417	1038.9928	1395.4407	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												8084.2884	
Space heating per m2											(98c) / (4) =	94.6416	(99)

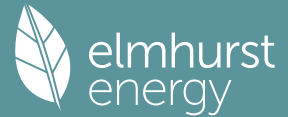
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													88.9000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1408.4621	1176.0472	1096.4979	769.1502	510.2559	0.0000	0.0000	0.0000	0.0000	689.4417	1038.9928	1395.4407	(98)	
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)	
Space heating fuel (main heating system)	1584.3218	1322.8877	1233.4060	865.1859	573.9661	0.0000	0.0000	0.0000	0.0000	775.5250	1168.7208	1569.6745	(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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	(64)	
Efficiency of water heater (217)m	88.8361	88.8330	88.8248	88.8081	88.7735	88.2000	88.2000	88.2000	88.2000	88.7974	88.8245	88.8362	(216)	
Fuel for water heating, kWh/month	157.9795	139.1111	147.3796	129.8556	125.8405	114.1540	113.2128	118.0386	119.5990	132.3463	140.3740	156.3913	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	25.5152	20.4692	18.4303	13.5028	10.4300	8.5214	9.5146	12.3674	16.0640	21.0768	23.8062	26.2243	(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												9093.6878	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												88.2000		
Water heating fuel used												1594.2824	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump												41.0000	(230c)	
main heating flue fan												45.0000	(230e)	
Total electricity for the above, kWh/year												86.0000	(231)	
Electricity for lighting (calculated in Appendix L)												205.9222	(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												11591.1719	(238)	

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	9093.6878	3.6400	331.0102	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1594.2824	3.6400	58.0319	(247)
Energy for instantaneous electric shower(s)	611.2796	16.4900	100.8000	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)

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Energy for lighting	205.9222	16.4900	33.9566 (250)
Additional standing charges			92.0000 (251)
Total energy cost			629.9801 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.7389 (257)
SAP value		71.8117
SAP rating (Section 12)		72 (258)
SAP band		C

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	9093.6878	0.2100	1909.6744 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1594.2824	0.2100	334.7993 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			2244.4737 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	205.9222	0.1443	29.7209 (268)
Total CO2, kg/year			2371.1664 (272)
CO2 emissions per m2			27.7600 (273)
EI value			75.6375
EI rating			76 (274)
EI band			C

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	249.4264 (5)

2. Ventilation rate

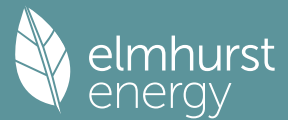
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour 20.0000 / (5) = 0.0802 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8302 (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) = 0.7679 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.8831	0.8255	0.8447	0.7679	0.7679	0.6719	0.6911	0.7295	0.7103	0.7487	0.7487	0.8255 (22b)
Effective ac	0.8899	0.8407	0.8568	0.7949	0.7949	0.7257	0.7388	0.7661	0.7523	0.7803	0.7803	0.8407 (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
New Glazing (Uw = 1.40)			7.3700	1.3258	9.7708		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.3258	2.5985		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)

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Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952	(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140	(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755	(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062	(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890	(30)
Total net area of external elements Aum(A, m2)			247.0500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	96.5527		(33)
Party Wall 1			25.3500	0.0000	0.0000	(32)
Party Ceiling 1			52.0100			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)						49.4100 (36)
Point Thermal Bridges					(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =	145.9627 (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	73.2516	69.2016	70.5213	65.4247	65.4247	59.7366	60.8135	63.0585	61.9208	64.2264	64.2264	69.2016	(38)
Average = Sum(39)m / 12 =	219.2143	215.1644	216.4840	211.3875	211.3875	205.6993	206.7763	209.0212	207.8836	210.1892	210.1892	215.1644	(39)
												211.5467	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	2.5663	2.5189	2.5343	2.4747	2.4747	2.4081	2.4207	2.4470	2.4337	2.4607	2.4607	2.5189	(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													2.5577 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	(44)
Energy content (annual)	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713	(46)
Total storage loss													
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	29.7910	26.9039	29.7804	28.8100	29.7637	28.7973	29.7544	29.7585	28.8030	29.7706	28.8198	29.7899	(61)
Total heat required for water heating calculated for each month	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	(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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321	(64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	(64a)
Heat gains from water heating, kWh/month	57.6410	50.8401	54.1419	48.4417	47.3969	43.2237	43.2727	44.8694	45.1718	49.6907	51.9062	57.1720	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												611.2796	(64a)

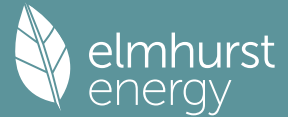
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	29.1504	25.8911	21.0561	15.9408	11.9159	10.0599	10.8701	14.1294	18.9645	24.0797	28.1046	29.9606	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Pumps, fans	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Total internal gains	77.4745	75.6550	72.7714	67.2801	63.7056	60.0329	58.1623	60.3083	62.7386	66.7886	72.0919	76.8441	(72)
	557.5563	556.0458	539.3351	509.5855	477.8214	446.5813	430.3483	432.1853	448.4427	479.7510	513.2439	542.5635	(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				6.3800	11.5821		0.6300		0.7000		0.7700		22.5828 (74)
East				0.9900	21.5869		0.6300		0.7000		0.7700		6.5313 (76)
East				1.9600	29.0000		0.6300		0.7000		1.0000		22.5598 (82)
Southeast				1.0800	39.1209		0.7200		0.7000		0.7700		14.7569 (77)
South				2.5200	49.2853		0.7200		0.7000		0.7700		43.3792 (78)
Southwest				1.0800	39.1209		0.7200		0.7000		0.7700		14.7569 (79)
Solar gains	124.5670	201.2699	304.1309	437.7978	513.3256	564.5506	538.3344	473.6515	381.2557	251.1938	156.3622	107.7298	(83)

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Total gains 682.1233 757.3157 843.4660 947.3833 991.1469 1011.1319 968.6827 905.8368 829.6983 730.9447 669.6060 650.2932 (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	10.8240	11.0277	10.9605	11.2248	11.2248	11.5352	11.4751	11.3519	11.4140	11.2888	11.2888	11.0277
alpha	1.7216	1.7352	1.7307	1.7483	1.7483	1.7690	1.7650	1.7568	1.7609	1.7526	1.7526	1.7352
util living area	0.9495	0.9382	0.9115	0.8603	0.7759	0.6175	0.4339	0.4827	0.7293	0.8731	0.9321	0.9527 (86)
MIT	16.6299	16.9135	17.6794	18.6633	19.6474	20.4709	20.8417	20.7931	20.1551	19.0020	17.6844	16.6310 (87)
Th 2	18.9825	19.0098	19.0009	19.0357	19.0357	19.0751	19.0676	19.0520	19.0599	19.0439	19.0439	19.0098 (88)
util rest of house	0.9379	0.9240	0.8889	0.8196	0.6930	0.4404	0.1186	0.1669	0.5916	0.8254	0.9134	0.9419 (89)
MIT 2	15.2972	15.5898	16.3380	17.3072	18.2210	18.9026	19.0635	19.0422	18.6869	17.6559	16.3745	15.3131 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	15.8707	16.1595	16.9152	17.8908	18.8348	19.5775	19.8288	19.7957	19.3187	18.2352	16.9382	15.8803 (92)
Temperature adjustment	0.0000											
adjusted MIT	15.8707	16.1595	16.9152	17.8908	18.8348	19.5775	19.8288	19.7957	19.3187	18.2352	16.9382	15.8803 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9097	0.8930	0.8542	0.7869	0.6821	0.4958	0.2610	0.3083	0.6151	0.7974	0.8826	0.9149 (94)
Useful gains	620.5014	676.2653	720.4609	745.4909	676.0593	501.2987	252.7929	279.2653	510.3229	582.8341	590.9810	594.9551 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	2295.3313	2228.9905	1973.3019	1604.6008	1148.8570	653.6085	274.7590	312.6293	773.0613	1289.5459	1815.6597	2254.9795 (97)
Space heating kWh	1246.0734	1043.4314	932.1138	618.5591	351.7615	0.0000	0.0000	0.0000	0.0000	525.7936	881.7687	1235.0581 (98a)
Space heating requirement - total per year (kWh/year)	6834.5596											
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	1246.0734	1043.4314	932.1138	618.5591	351.7615	0.0000	0.0000	0.0000	0.0000	525.7936	881.7687	1235.0581 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6834.5596											
Space heating per m2	(98c) / (4) = 80.0112 (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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1246.0734	1043.4314	932.1138	618.5591	351.7615	0.0000	0.0000	0.0000	0.0000	525.7936	881.7687	1235.0581 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	1401.6574	1173.7136	1048.4969	695.7921	395.6822	0.0000	0.0000	0.0000	0.0000	591.4439	991.8658	1389.2668 (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	140.3428	123.5765	130.9096	115.3223	111.7130	100.6838	99.8536	104.1100	105.4863	117.5201	124.6865	138.9321 (64)
Efficiency of water heater	88.8286	88.8254	88.8132	88.7893	88.7303	88.2000	88.2000	88.2000	88.2000	88.7713	88.8127	88.2000 (216)
Fuel for water heating, kWh/month	157.9928	139.1231	147.3989	129.8832	125.9018	114.1540	113.2128	118.0386	119.5990	132.3852	140.3927	156.4044 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Pumps and Fa	25.5152	20.4692	18.4303	13.5028	10.4300	8.5214	9.5146	12.3674	16.0640	21.0768	23.8062	26.2243 (232)
Lighting	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												
Space heating fuel - main system 1	7687.9186 (211)											
Space heating fuel - main system 2	0.0000 (213)											
Space heating fuel - secondary	0.0000 (215)											
Efficiency of water heater	88.2000											
Water heating fuel used	1594.4863 (219)											
Space cooling fuel	0.0000 (221)											
Electricity for pumps and fans:												
central heating pump	41.0000 (230c)											
main heating flue fan	45.0000 (230e)											
Total electricity for the above, kWh/year	86.0000 (231)											

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Electricity for lighting (calculated in Appendix L)	205.9222 (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	10185.6067 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7687.9186	4.8000	369.0201 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1594.4863	4.8000	76.5353 (247)
Energy for instantaneous electric shower(s)	611.2796	21.5100	131.4862 (247a)
Pumps, fans and electric keep-hot	86.0000	21.5100	18.4986 (249)
Energy for lighting	205.9222	21.5100	44.2939 (250)
Additional standing charges			98.0000 (251)
Total energy cost			737.8341 (255)

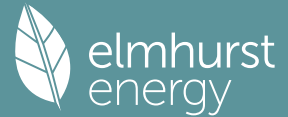
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	7687.9186	0.2100	1614.4629 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1594.4863	0.2100	334.8421 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			1949.3050 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	205.9222	0.1443	29.7209 (268)
Total CO2, kg/year			2075.9977 (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	7687.9186	1.1300	8687.3480 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1594.4863	1.1300	1801.7695 (278)
Energy for instantaneous electric shower(s)	611.2796	1.5143	925.6816 (278a)
Space and water heating			10489.1175 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	205.9222	1.5338	315.8503 (282)
Total Primary energy kWh/year			11860.7502 (286)

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Property Reference	Flat 2 - Baseline			Issued on Date	07/11/2023
Assessment Reference	00001	Prop Type Ref	18416		
Property	Flat 2 - Baseline, 26, Ravenstone Road, London, N8 0JP				
SAP Rating	76 C	DER		TER	
Environmental	81 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.63	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Andrew Bamford			Assessor ID	F391-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

2. Ventilation rate

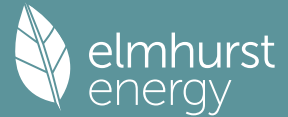
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (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	1.0445	1.0240	1.0035	0.9011	0.8806	0.7782	0.7782	0.7578	0.8192	0.8806	0.9216	0.9626 (22b)
Effective ac	1.0445	1.0240	1.0035	0.9060	0.8878	0.8028	0.8028	0.7871	0.8355	0.8878	0.9247	0.9633 (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
New Glazing (Uw = 1.40)			1.7600	1.3258	2.3333		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.3258	2.7841		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1500	6.0060		(30)
Loft voids	12.1600		12.1600	0.1395	1.6967		(30)
Total net area of external elements A _{um} (A, m ²)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	61.2975	(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)

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Thermal bridges (Default value 0.200 * total exposed area)
 Point Thermal bridges (36a) = 38.7040 (36)
 Total fabric heat loss (33) + (36) + (36a) = 100.0015 (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	76.2431	74.7482	73.2532	66.1352	64.8034	58.6035	58.6035	57.4553	60.9916	64.8034	67.4977	70.3144	(38)
Heat transfer coeff	176.2447	174.7497	173.2547	166.1367	164.8049	158.6050	158.6050	157.4568	160.9931	164.8049	167.4992	170.3160	(39)
Average = Sum(39)m / 12 =												166.1226	
HLP	1.9594	1.9427	1.9261	1.8470	1.8322	1.7633	1.7633	1.7505	1.7898	1.8322	1.8621	1.8935	(40)
HLP (average)												1.8468	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6250 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths													29.4656 (42b)
Hot water usage for other uses													41.5130 (42c)
Average daily hot water use (litres/day)													65.0584 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy content (annual)	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)
Distribution loss (46)m = 0.15 x (45)m													16.8619 (46)
Water storage loss:													
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage													
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Combi loss	29.7936	26.9061	29.7826	28.8118	29.7654	28.7988	29.7558	29.7600	28.8046	29.7725	28.8220	29.7925	(61)
Total heat required for water heating calculated for each month													
WWHRS	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(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	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
Heat gains from water heating, kWh/month	58.4865	51.5831	54.9284	49.1362	48.0698	43.8303	43.8762	45.4997	45.8112	50.4022	52.6591	58.0096	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636	(64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(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)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	78.6108	76.7606	73.8284	68.2447	64.6099	60.8754	58.9733	61.1555	63.6267	67.7449	73.1376	77.9699	(72)
Total internal gains	574.8199	573.2455	555.9042	525.0872	492.1565	459.9131	443.1242	445.0306	461.9110	494.2623	528.9509	559.2921	(73)

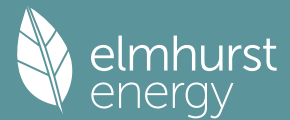
6. Solar gains

[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				1.7600	10.6334	0.6300	0.7000		0.7700		5.7195 (74)	
South				2.1000	26.0000	0.6300	0.7000		1.0000		21.6707 (82)	
North				3.5300	10.6334	0.7200	0.7000		0.7700		13.1102 (74)	
East				1.6000	19.6403	0.7200	0.7000		0.7700		10.9757 (76)	
South				5.0300	46.7521	0.7200	0.7000		0.7700		82.1358 (78)	
Solar gains	133.6119	236.9810	347.8720	468.4739	557.3474	567.2481	541.1209	472.9628	389.4901	268.4116	161.7784	113.1994 (83)
Total gains	708.4318	810.2265	903.7761	993.5611	1049.5040	1027.1611	984.2451	917.9934	851.4010	762.6739	690.7293	672.4916 (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	14.1769	14.2982	14.4216	15.0395	15.1610	15.7537	15.7537	15.8685	15.5200	15.1610	14.9172	14.6704	
alpha	1.9451	1.9532	1.9614	2.0026	2.0107	2.0502	2.0502	2.0579	2.0347	2.0107	1.9945	1.9780	

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util living area	0.9517	0.9358	0.9094	0.8598	0.7836	0.6682	0.5521	0.5907	0.7546	0.8806	0.9360	0.9558 (86)
MIT	16.9899	17.3505	17.9843	18.8901	19.6980	20.3853	20.7112	20.6584	20.1309	19.0895	17.9440	17.0045 (87)
Th 2	19.3606	19.3718	19.3830	19.4373	19.4476	19.4958	19.4958	19.5049	19.4771	19.4476	19.4268	19.4053 (88)
util rest of house	0.9427	0.9238	0.8915	0.8299	0.7308	0.5749	0.4088	0.4529	0.6760	0.8490	0.9221	0.9476 (89)
MIT 2	15.8498	16.2102	16.8383	17.7470	18.5130	19.1480	19.3894	19.3676	18.9389	17.9617	16.8323	15.8891 (90)
Living area fraction	16.2203	16.5808	17.2107	18.1185	18.8981	19.5501	19.8190	19.7871	19.3262	18.3282	17.1935	16.2516 (91)
MIT	16.2203	16.5808	17.2107	18.1185	18.8981	19.5501	19.8190	19.7871	19.3262	18.3282	17.1935	16.2516 (92)
Temperature adjustment												0.0000
adjusted MIT	16.2203	16.5808	17.2107	18.1185	18.8981	19.5501	19.8190	19.7871	19.3262	18.3282	17.1935	16.2516 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9166	0.8939	0.8580	0.7970	0.7078	0.5788	0.4436	0.4827	0.6665	0.8181	0.8935	0.9233	(94)
Useful gains	649.3551	724.2238	775.4757	791.8323	742.8581	594.4886	436.5881	443.0761	567.4587	623.9337	617.1584	620.8907	(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	2100.8891	2041.2082	1855.6762	1531.5259	1186.2762	785.1091	510.5447	533.3152	841.3867	1273.6415	1690.6561	2052.5771	(97)
Space heating kWh	1079.9413	885.0135	803.6691	532.5794	329.9030	0.0000	0.0000	0.0000	0.0000	483.3826	772.9184	1065.1747	(98a)
Space heating requirement - total per year (kWh/year)												5952.5821	
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	1079.9413	885.0135	803.6691	532.5794	329.9030	0.0000	0.0000	0.0000	0.0000	483.3826	772.9184	1065.1747	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5952.5821	
Space heating per m2										(98c) / (4) =		66.1766	(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 %)													88.9000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1079.9413	885.0135	803.6691	532.5794	329.9030	0.0000	0.0000	0.0000	0.0000	483.3826	772.9184	1065.1747	(98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)
Space heating fuel (main heating system)	1214.7821	995.5157	904.0148	599.0769	371.0945	0.0000	0.0000	0.0000	0.0000	543.7375	869.4245	1198.1718	(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	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(64)
Efficiency of water heater (217)m	88.8180	88.8126	88.8002	88.7733	88.7202	88.2000	88.2000	88.2000	88.2000	88.7608	88.8010	88.8177	(216)
Fuel for water heating, kWh/month	160.1099	140.9777	149.3399	131.5490	127.4726	115.5274	114.5521	119.4593	121.0644	134.0671	142.2308	158.4953	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626	(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												6695.8179	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												88.2000	
Water heating fuel used												1614.8454	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.4307	(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												9234.6577	(238)

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10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6695.8179	3.6400	243.7278 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1614.8454	3.6400	58.7804 (247)
Energy for instantaneous electric shower(s)	621.5636	16.4900	102.4958 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	216.4307	16.4900	35.6894 (250)
Additional standing charges			92.0000 (251)
Total energy cost			546.8748 (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] = 1.4589 (257)
SAP value	76.3517
SAP rating (Section 12)	76 (258)
SAP band	C

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	6695.8179	0.2100	1406.1217 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1614.8454	0.2100	339.1175 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1745.2393 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1874.8794 (272)
CO2 emissions per m2			20.8400 (273)
EI value			81.3832
EI rating			81 (274)
EI band			B

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

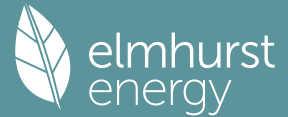
2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1356 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8856	(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) =		0.8192 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.9421	0.8806	0.9011	0.8192	0.8192	0.7168	0.7373	0.7782	0.7578	0.7987	0.7987	0.8806 (22b)
Effective ac	0.9438	0.8878	0.9060	0.8355	0.8355	0.7569	0.7718	0.8028	0.7871	0.8190	0.8190	0.8878 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
New Glazing (Uw = 1.40)			1.7600	1.3258	2.3333			(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148			(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615			(26)
RL1-RL3			2.1000	1.3258	2.7841			(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892			(28b)
Exposed Floor			1.0600	0.1800	0.1908			(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960			(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046			(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952			(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977			(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275			(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1500	6.0060			(30)
Loft voids	12.1600		12.1600	0.1395	1.6967			(30)
Total net area of external elements Aum(A, m2)			193.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.2975			(33)
Party Wall 1			44.9900	0.0000	0.0000			(32)
Party Floor 1			52.0200					(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)							38.7040	(36)
Point Thermal bridges						(36a) =	0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	100.0015	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	68.8908	64.8034	66.1352	60.9916	60.9916	55.2509	56.3378	58.6035	57.4553	59.7822	59.7822	64.8034	(38)
Heat transfer coeff	168.8923	164.8049	166.1367	160.9931	160.9931	155.2524	156.3393	158.6050	157.4568	159.7837	159.7837	164.8049	(39)
Average = Sum(39)m / 12 =												161.1538	
HLP	1.8776	1.8322	1.8470	1.7898	1.7898	1.7260	1.7381	1.7633	1.7505	1.7764	1.7764	1.8322	(40)
HLP (average)												1.7916	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

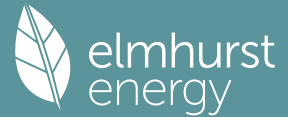
Assumed occupancy													2.6250	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	29.3660	(42b)
Hot water usage for other uses	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	41.5130	(42c)
Average daily hot water use (litres/day)													65.0584	(43)
Daily hot water use	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	70.8790	(44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	110.9794	(45)
Energy content (annual)										Total = Sum(45)m =		1080.4805		
Distribution loss (46)m = 0.15 x (45)m	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	16.6469	(46)
Water storage loss:														
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	29.7936	26.9061	29.7826	28.8118	29.7654	28.7988	29.7558	29.7600	28.8046	29.7725	28.8220	29.7925	29.7925	(61)
Total heat required for water heating calculated for each month	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	140.7719	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	140.7719	(64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	54.6432	(64a)
Heat gains from water heating, kWh/month	58.4865	51.5831	54.9284	49.1362	48.0698	43.8303	43.8762	45.4997	45.8112	50.4022	52.6591	58.0096	58.0096	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636	621.5636	(64a)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(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)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	78.6108	76.7606	73.8284	68.2447	64.6099	60.8754	58.9733	61.1555	63.6267	67.7449	73.1376	77.9699	(72)
Total internal gains	574.8199	573.2455	555.9042	525.0872	492.1565	459.9131	443.1242	445.0306	461.9110	494.2623	528.9509	559.2921	(73)

6. Solar gains

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[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	1.7600		11.5821		0.6300		0.7000		0.7700		6.2297 (74)	
South	2.1000		29.0000		0.6300		0.7000		1.0000		24.1712 (82)	
North	3.5300		11.5821		0.7200		0.7000		0.7700		14.2799 (74)	
East	1.6000		21.5869		0.7200		0.7000		0.7700		12.0635 (76)	
South	5.0300		49.2853		0.7200		0.7000		0.7700		86.5863 (78)	

Solar gains	143.3307	228.6278	338.1055	475.2445	548.3224	599.1950	572.9205	510.3825	419.7132	283.1643	179.2926	124.3581 (83)
Total gains	718.1506	801.8733	894.0097	1000.3317	1040.4790	1059.1081	1016.0447	955.4131	881.6241	777.4266	708.2435	683.6502 (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	14.7941	15.1610	15.0395	15.5200	15.5200	16.0939	15.9820	15.7537	15.8685	15.6375	15.6375	15.1610
alpha	1.9863	2.0107	2.0026	2.0347	2.0347	2.0729	2.0655	2.0502	2.0579	2.0425	2.0425	2.0107
util living area	0.9438	0.9289	0.8947	0.8282	0.7231	0.5361	0.3499	0.3960	0.6607	0.8429	0.9210	0.9479 (86)
MIT	17.4597	17.7737	18.4573	19.3410	20.1257	20.7234	20.9335	20.9067	20.4975	19.5718	18.4351	17.4754 (87)
Th 2	19.4162	19.4476	19.4373	19.4771	19.4771	19.5223	19.5137	19.4958	19.5049	19.4866	19.4866	19.4476 (88)
util rest of house	0.9329	0.9153	0.8727	0.7895	0.6496	0.4037	0.1531	0.1927	0.5469	0.7977	0.9031	0.9378 (89)
MIT 2	16.3456	16.6703	17.3326	18.2011	18.9160	19.4142	19.5082	19.4854	19.2558	18.4434	17.3486	16.3792 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.7077	17.0288	17.6981	18.5716	19.3091	19.8396	19.9714	19.9473	19.6593	18.8101	17.7017	16.7354 (92)
Temperature adjustment	0.0000											
adjusted MIT	16.7077	17.0288	17.6981	18.5716	19.3091	19.8396	19.9714	19.9473	19.6593	18.8101	17.7017	16.7354 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9055	0.8853	0.8396	0.7604	0.6400	0.4354	0.2182	0.2593	0.5607	0.7715	0.8734	0.9117 (94)
Useful gains	650.2726	709.8997	750.6165	760.6948	665.9273	461.0869	221.6695	247.7071	494.2953	599.7787	618.5513	623.2965 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	1909.7751	1850.5668	1644.4374	1331.6634	951.3209	534.0077	230.0338	261.2664	639.1687	1072.1580	1502.2316	1868.1336 (97)
Space heating kWh	937.0699	766.5282	665.0027	411.0974	212.3328	0.0000	0.0000	0.0000	0.0000	351.4502	636.2498	926.1588 (98a)
Space heating requirement - total per year (kWh/year)	4905.8898											
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	937.0699	766.5282	665.0027	411.0974	212.3328	0.0000	0.0000	0.0000	0.0000	351.4502	636.2498	926.1588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4905.8898											
Space heating per m2	(98c) / (4) = 54.5402 (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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	937.0699	766.5282	665.0027	411.0974	212.3328	0.0000	0.0000	0.0000	0.0000	351.4502	636.2498	926.1588 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	1054.0719	862.2365	748.0346	462.4267	238.8445	0.0000	0.0000	0.0000	0.0000	395.3321	715.6916	1041.7984 (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	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719 (64)
Efficiency of water heater (217)m	88.8071	88.8010	88.7828	88.7442	88.6555	88.2000	88.2000	88.2000	88.2000	88.7219	88.7833	88.8070 (216)
Fuel for water heating, kWh/month	160.1295	140.9961	149.3691	131.5921	127.5657	115.5274	114.5521	119.4593	121.0644	134.1260	142.2592	158.5144 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	5518.4363	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	88.2000	
Water heating fuel used	1615.1552	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
main heating flue fan	45.0000	(230e)
Total electricity for the above, kWh/year	86.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.4307	(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	8057.5858	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5518.4363	4.8000	264.8849 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1615.1552	4.8000	77.5274 (247)
Energy for instantaneous electric shower(s)	621.5636	21.5100	133.6983 (247a)
Pumps, fans and electric keep-hot	86.0000	21.5100	18.4986 (249)
Energy for lighting	216.4307	21.5100	46.5543 (250)
Additional standing charges			98.0000 (251)
Total energy cost			639.1636 (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	5518.4363	0.2100	1158.8716 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1615.1552	0.2100	339.1826 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1498.0542 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1627.6944 (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	5518.4363	1.1300	6235.8330 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1615.1552	1.1300	1825.1253 (278)
Energy for instantaneous electric shower(s)	621.5636	1.5143	941.2551 (278a)
Space and water heating			8060.9583 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	216.4307	1.5338	331.9687 (282)
Total Primary energy kWh/year			9464.2829 (286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: C 76
Current environmental impact rating: B 81

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

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

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

Potential energy efficiency rating: C 76
Potential environmental impact rating: B 81

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
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 £199 £199 £0
Mains gas £440 £440 £0

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Space heating	£381	£381	£0
Water heating	£211	£211	£0
Lighting	£47	£47	£0
Total cost of fuels	£639	£639	£0
Total cost of uses	£639	£639	£0
Delivered energy	90 kWh/m²	90 kWh/m²	0 kWh/m²
Carbon dioxide emissions	1.6 tonnes	1.6 tonnes	0.0 tonnes
CO2 emissions per m²	18 kg/m²	18 kg/m²	0 kg/m²
Primary energy	105 kWh/m²	105 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.2003 (5)

2. Ventilation rate

	m³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (21)

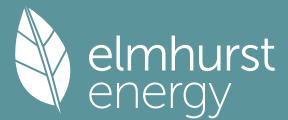
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	1.0445	1.0240	1.0035	0.9011	0.8806	0.7782	0.7782	0.7578	0.8192	0.8806	0.9216	0.9626 (22b)
Effective ac	1.0445	1.0240	1.0035	0.9060	0.8878	0.8028	0.8028	0.7871	0.8355	0.8878	0.9247	0.9633 (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
New Glazing (Uw = 1.40)			1.7600	1.3258	2.3333		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.3258	2.7841		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1500	6.0060		(30)
Loft voids	12.1600		12.1600	0.1395	1.6967		(30)
Total net area of external elements Aum(A, m²)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	61.2975		(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							38.7040 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	100.0015 (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	76.2431	74.7482	73.2532	66.1352	64.8034	58.6035	58.6035	57.4553	60.9916	64.8034	67.4977	70.3144 (38)
Heat transfer coeff	176.2447	174.7497	173.2547	166.1367	164.8049	158.6050	158.6050	157.4568	160.9931	164.8049	167.4992	170.3160 (39)
Average = Sum(39)m / 12 =												166.1226
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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HLP	1.9594	1.9427	1.9261	1.8470	1.8322	1.7633	1.7633	1.7505	1.7898	1.8322	1.8621	1.8935 (40)
HLP (average)												1.8468
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6250 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Hot water usage for other uses												
41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
Average daily hot water use (litres/day)												65.0584 (43)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use												
70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	89.2266	97.4804	110.9794	(45)
Energy content (annual)									Total =	Sum(45)m =	1080.4805	
Distribution loss (46)m = 0.15 x (45)m												
16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	(46)
Water storage loss:												
Total storage loss												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	29.7936	26.9061	29.7826	28.8118	29.7654	28.7988	29.7558	29.7600	28.8046	29.7725	28.8220	(61)
Total heat required for water heating calculated for each month												
142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(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												
142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(64)
Electric shower(s)												
54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636 (64a)
Heat gains from water heating, kWh/month												
58.4865	51.5831	54.9284	49.1362	48.0698	43.8303	43.8762	45.4997	45.8112	50.4022	52.6591	58.0096	(65)

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

Metabolic gains (Table 5), Watts												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(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)												
-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)												
78.6108	76.7606	73.8284	68.2447	64.6099	60.8754	58.9733	61.1555	63.6267	67.7449	73.1376	77.9699	(72)
Total internal gains												
574.8199	573.2455	555.9042	525.0872	492.1565	459.9131	443.1242	445.0306	461.9110	494.2623	528.9509	559.2921	(73)

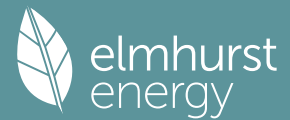
6. Solar gains

[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				1.7600		10.6334		0.6300		0.7700		5.7195 (74)
South				2.1000		26.0000		0.6300		1.0000		21.6707 (82)
North				3.5300		10.6334		0.7200		0.7700		13.1102 (74)
East				1.6000		19.6403		0.7200		0.7700		10.9757 (76)
South				5.0300		46.7521		0.7200		0.7700		82.1358 (78)
Solar gains	133.6119	236.9810	347.8720	468.4739	557.3474	567.2481	541.1209	472.9628	389.4901	268.4116	161.7784	113.1994 (83)
Total gains	708.4318	810.2265	903.7761	993.5611	1049.5040	1027.1611	984.2451	917.9934	851.4010	762.6739	690.7293	672.4916 (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	14.1769	14.2982	14.4216	15.0395	15.1610	15.7537	15.7537	15.8685	15.5200	15.1610	14.9172	14.6704	
alpha	1.9451	1.9532	1.9614	2.0026	2.0107	2.0502	2.0502	2.0579	2.0347	2.0107	1.9945	1.9780	
util living area	0.9517	0.9358	0.9094	0.8598	0.7836	0.6682	0.5521	0.5907	0.7546	0.8806	0.9360	0.9558 (86)	
MIT	16.9899	17.3505	17.9843	18.8901	19.6980	20.3853	20.7112	20.6584	20.1309	19.0895	17.9440	17.0045 (87)	
Th 2	19.3606	19.3718	19.3830	19.4373	19.4476	19.4958	19.4958	19.5049	19.4771	19.4476	19.4268	19.4053 (88)	
util rest of house	0.9427	0.9238	0.8915	0.8299	0.7308	0.5749	0.4088	0.4529	0.6760	0.8490	0.9221	0.9476 (89)	
MIT 2	15.8498	16.2102	16.8383	17.7470	18.5130	19.1480	19.3894	19.3676	18.9389	17.9617	16.8323	15.8891 (90)	
Living area fraction									fLA = Living area / (4) =				0.3250 (91)
MIT	16.2203	16.5808	17.2107	18.1185	18.8981	19.5501	19.8190	19.7871	19.3262	18.3282	17.1935	16.2516 (92)	
Temperature adjustment												0.0000	
adjusted MIT	16.2203	16.5808	17.2107	18.1185	18.8981	19.5501	19.8190	19.7871	19.3262	18.3282	17.1935	16.2516 (93)	

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9166	0.8939	0.8580	0.7970	0.7078	0.5788	0.4436	0.4827	0.6665	0.8181	0.8935	0.9233	(94)
Useful gains	649.3551	724.2238	775.4757	791.8323	742.8581	594.4886	436.5881	443.0761	567.4587	623.9337	617.1584	620.8907	(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	2100.8891	2041.2082	1855.6762	1531.5259	1186.2762	785.1091	510.5447	533.3152	841.3867	1273.6415	1690.6561	2052.5771	(97)
Space heating kWh	1079.9413	885.0135	803.6691	532.5794	329.9030	0.0000	0.0000	0.0000	0.0000	483.3826	772.9184	1065.1747	(98a)
Space heating requirement - total per year (kWh/year)												5952.5821	
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	1079.9413	885.0135	803.6691	532.5794	329.9030	0.0000	0.0000	0.0000	0.0000	483.3826	772.9184	1065.1747	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5952.5821	
Space heating per m2											(98c) / (4) =	66.1766	(99)

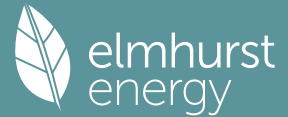
9a. Energy requirements - Individual heating systems, including micro-CHP

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 %)													88.9000	(206)
Efficiency of main space heating system 2 (in %)													0.0000	(207)
Efficiency of secondary/supplementary heating system, %													0.0000	(208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	1079.9413	885.0135	803.6691	532.5794	329.9030	0.0000	0.0000	0.0000	0.0000	483.3826	772.9184	1065.1747	(98)	
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000	(210)	
Space heating fuel (main heating system)	1214.7821	995.5157	904.0148	599.0769	371.0945	0.0000	0.0000	0.0000	0.0000	543.7375	869.4245	1198.1718	(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	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(64)	
Efficiency of water heater (217)m	88.8180	88.8126	88.8002	88.7733	88.7202	88.2000	88.2000	88.2000	88.2000	88.7608	88.8010	88.8177	(216)	
Fuel for water heating, kWh/month	160.1099	140.9777	149.3399	131.5490	127.4726	115.5274	114.5521	119.4593	121.0644	134.0671	142.2308	158.4953	(219)	
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)	
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)	
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626	(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												6695.8179	(211)	
Space heating fuel - main system 2												0.0000	(213)	
Space heating fuel - secondary												0.0000	(215)	
Efficiency of water heater												88.2000		
Water heating fuel used												1614.8454	(219)	
Space cooling fuel												0.0000	(221)	
Electricity for pumps and fans:														
central heating pump													41.0000	(230c)
main heating flue fan													45.0000	(230e)
Total electricity for the above, kWh/year													86.0000	(231)
Electricity for lighting (calculated in Appendix L)													216.4307	(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													9234.6577	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6695.8179	3.6400	243.7278	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1614.8454	3.6400	58.7804	(247)
Energy for instantaneous electric shower(s)	621.5636	16.4900	102.4958	(247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814	(249)

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Energy for lighting	216.4307	16.4900	35.6894 (250)
Additional standing charges			92.0000 (251)
Total energy cost			546.8748 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	1.4589 (257)
SAP value		76.3517
SAP rating (Section 12)		76 (258)
SAP band		C

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	6695.8179	0.2100	1406.1217 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1614.8454	0.2100	339.1175 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1745.2393 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1874.8794 (272)
CO2 emissions per m2			20.8400 (273)
EI value			81.3832
EI rating			81 (274)
EI band			B

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

2. Ventilation rate

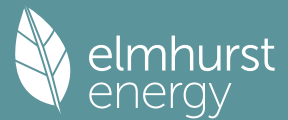
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure Test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.9421	0.8806	0.9011	0.8192	0.8192	0.7168	0.7373	0.7782	0.7578	0.7987	0.7987	0.8806 (22b)
Effective ac	0.9438	0.8878	0.9060	0.8355	0.8355	0.7569	0.7718	0.8028	0.7871	0.8190	0.8190	0.8878 (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
New Glazing (Uw = 1.40)			1.7600	1.3258	2.3333		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.3258	2.7841		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)

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Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046	(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952	(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977	(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275	(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1500	6.0060	(30)
Loft voids	12.1600		12.1600	0.1395	1.6967	(30)
Total net area of external elements Aum(A, m2)			193.5200			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		61.2975	(33)
Party Wall 1			44.9900	0.0000	0.0000	(32)
Party Floor 1			52.0200			(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)						38.7040 (36)
Point Thermal bridges					(36a) =	0.0000
Total fabric heat loss					(33) + (36) + (36a) =	100.0015 (37)

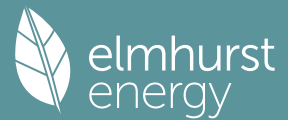
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	68.8908	64.8034	66.1352	60.9916	60.9916	55.2509	56.3378	58.6035	57.4553	59.7822	59.7822	64.8034	(38)
Average = Sum(39)m / 12 =	168.8923	164.8049	166.1367	160.9931	160.9931	155.2524	156.3393	158.6050	157.4568	159.7837	159.7837	164.8049	(39)
	161.1538												
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.8776	1.8322	1.8470	1.7898	1.7898	1.7260	1.7381	1.7633	1.7505	1.7764	1.7764	1.8322	(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													2.6250 (42)
Hot water usage for mixer showers													
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for other uses	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Average daily hot water use (litres/day)	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
	65.0584												(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy content (annual)	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)
Distribution loss (46)m = 0.15 x (45)m													1080.4805
Water storage loss:	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	(46)
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	29.7936	26.9061	29.7826	28.8118	29.7654	28.7988	29.7558	29.7600	28.8046	29.7725	28.8220	29.7925	(61)
Total heat required for water heating calculated for each month	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(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	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719	(64)
													1431.0462 (64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
													621.5636 (64a)
Heat gains from water heating, kWh/month	58.4865	51.5831	54.9284	49.1362	48.0698	43.8303	43.8762	45.4997	45.8112	50.4022	52.6591	58.0096	(65)

5. Internal gains (see Table 5 and 5a)													
Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Pumps, fans	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Water heating gains (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Total internal gains	78.6108	76.7606	73.8284	68.2447	64.6099	60.8754	58.9733	61.1555	63.6267	67.7449	73.1376	77.9699	(72)
	574.8199	573.2455	555.9042	525.0872	492.1565	459.9131	443.1242	445.0306	461.9110	494.2623	528.9509	559.2921	(73)

6. Solar gains													
[Jan]													
	Area	Solar flux											
	m2	Table 6a	Specific data	g	FF	Access	Gains						
		W/m2	or Table 6b	or Table 6c	factor	Table 6d	W						
North	1.7600	11.5821	0.6300	0.7000	0.7700	6.2297	(74)						
South	2.1000	29.0000	0.6300	0.7000	1.0000	24.1712	(82)						
North	3.5300	11.5821	0.7200	0.7000	0.7700	14.2799	(74)						
East	1.6000	21.5869	0.7200	0.7000	0.7700	12.0635	(76)						
South	5.0300	49.2853	0.7200	0.7000	0.7700	86.5863	(78)						
Solar gains	143.3307	228.6278	338.1055	475.2445	548.3224	599.1950	572.9205	510.3825	419.7132	283.1643	179.2926	124.3581	(83)

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Total gains 718.1506 801.8733 894.0097 1000.3317 1040.4790 1059.1081 1016.0447 955.4131 881.6241 777.4266 708.2435 683.6502 (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	14.7941	15.1610	15.0395	15.5200	15.5200	16.0939	15.9820	15.7537	15.8685	15.6375	15.6375	15.1610
alpha	1.9863	2.0107	2.0026	2.0347	2.0347	2.0729	2.0655	2.0502	2.0579	2.0425	2.0425	2.0107
util living area	0.9438	0.9289	0.8947	0.8282	0.7231	0.5361	0.3499	0.3960	0.6607	0.8429	0.9210	0.9479 (86)
MIT	17.4597	17.7737	18.4573	19.3410	20.1257	20.7234	20.9335	20.9067	20.4975	19.5718	18.4351	17.4754 (87)
Th 2	19.4162	19.4476	19.4373	19.4771	19.4771	19.5223	19.5137	19.4958	19.5049	19.4866	19.4866	19.4476 (88)
util rest of house	0.9329	0.9153	0.8727	0.7895	0.6496	0.4037	0.1531	0.1927	0.5469	0.7977	0.9031	0.9378 (89)
MIT 2	16.3456	16.6703	17.3326	18.2011	18.9160	19.4142	19.5082	19.4854	19.2558	18.4434	17.3486	16.3792 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.7077	17.0288	17.6981	18.5716	19.3091	19.8396	19.9714	19.9473	19.6593	18.8101	17.7017	16.7354 (92)
Temperature adjustment	0.0000											
adjusted MIT	16.7077	17.0288	17.6981	18.5716	19.3091	19.8396	19.9714	19.9473	19.6593	18.8101	17.7017	16.7354 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9055	0.8853	0.8396	0.7604	0.6400	0.4354	0.2182	0.2593	0.5607	0.7715	0.8734	0.9117 (94)
Useful gains	650.2726	709.8997	750.6165	760.6948	665.9273	461.0869	221.6695	247.7071	494.2953	599.7787	618.5513	623.2965 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	1909.7751	1850.5668	1644.4374	1331.6634	951.3209	534.0077	230.0338	261.2664	639.1687	1072.1580	1502.2316	1868.1336 (97)
Space heating kWh	937.0699	766.5282	665.0027	411.0974	212.3328	0.0000	0.0000	0.0000	0.0000	351.4502	636.2498	926.1588 (98a)
Space heating requirement - total per year (kWh/year)												4905.8898
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	937.0699	766.5282	665.0027	411.0974	212.3328	0.0000	0.0000	0.0000	0.0000	351.4502	636.2498	926.1588 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4905.8898
Space heating per m2												(98c) / (4) = 54.5402 (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 %)												88.9000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	937.0699	766.5282	665.0027	411.0974	212.3328	0.0000	0.0000	0.0000	0.0000	351.4502	636.2498	926.1588 (98)
Space heating efficiency (main heating system 1)	88.9000	88.9000	88.9000	88.9000	88.9000	0.0000	0.0000	0.0000	0.0000	88.9000	88.9000	88.9000 (210)
Space heating fuel (main heating system)	1054.0719	862.2365	748.0346	462.4267	238.8445	0.0000	0.0000	0.0000	0.0000	395.3321	715.6916	1041.7984 (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	142.2064	125.2060	132.6141	116.7803	113.0940	101.8952	101.0349	105.3631	106.7788	118.9991	126.3024	140.7719 (64)
Efficiency of water heater (217)m	88.8071	88.8010	88.7828	88.7442	88.6555	88.2000	88.2000	88.2000	88.2000	88.7219	88.7833	88.2000 (216)
Fuel for water heating, kWh/month	160.1295	140.9961	149.3691	131.5921	127.5657	115.5274	114.5521	119.4593	121.0644	134.1260	142.2592	158.5144 (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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (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)
(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)	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												5518.4363 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												88.2000
Water heating fuel used												1615.1552 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
main heating flue fan												45.0000 (230e)
Total electricity for the above, kWh/year												86.0000 (231)

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Electricity for lighting (calculated in Appendix L)	216.4307 (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	8057.5858 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5518.4363	4.8000	264.8849 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1615.1552	4.8000	77.5274 (247)
Energy for instantaneous electric shower(s)	621.5636	21.5100	133.6983 (247a)
Pumps, fans and electric keep-hot	86.0000	21.5100	18.4986 (249)
Energy for lighting	216.4307	21.5100	46.5543 (250)
Additional standing charges			98.0000 (251)
Total energy cost			639.1636 (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	5518.4363	0.2100	1158.8716 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1615.1552	0.2100	339.1826 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1498.0542 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1627.6944 (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	5518.4363	1.1300	6235.8330 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1615.1552	1.1300	1825.1253 (278)
Energy for instantaneous electric shower(s)	621.5636	1.5143	941.2551 (278a)
Space and water heating			8060.9583 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	216.4307	1.5338	331.9687 (282)
Total Primary energy kWh/year			9464.2829 (286)



Appendix 2:

Lean Full SAP 10 Calculation Worksheets

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Property Reference	Flat 1 - Lean			Issued on Date	07/11/2023
Assessment Reference	00001	Prop Type Ref	18416		
Property	Flat 1 - Lean, 26, Ravenstone Road, London, N8 0JP				
SAP Rating	31 F	DER		TER	
Environmental	85 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.28	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Andrew Bamford			Assessor ID	F391-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	85.4200 (1b)	2.9200 (2b)	249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		249.4264 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	249.4264 (5)

2. Ventilation rate

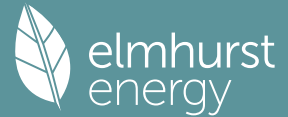
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0802 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8302 (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) = 0.7679 (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)
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	0.9791	0.9599	0.9407	0.8447	0.8255	0.7295	0.7295	0.7103	0.7679	0.8255	0.8639	0.9023 (22b)
Effective ac	0.9793	0.9607	0.9425	0.8568	0.8407	0.7661	0.7661	0.7523	0.7949	0.8407	0.8732	0.9071 (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
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.1450	2.2443		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum (A, m ²)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.8666		(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							49.4100 (36)

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Point Thermal bridges
Total fabric heat loss (33) + (36) + (36a) = 0.0000
144.2766 (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	80.6083	79.0762	77.5746	70.5213	69.2016	63.0585	63.0585	61.9208	65.4247	69.2016	71.8713	74.6623 (38)
Heat transfer coeff	224.8849	223.3529	221.8512	214.7979	213.4783	207.3351	207.3351	206.1975	209.7014	213.4783	216.1479	218.9389 (39)
Average = Sum(39)m / 12 =												214.7916
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	2.6327	2.6148	2.5972	2.5146	2.4992	2.4272	2.4272	2.4139	2.4549	2.4992	2.5304	2.5631 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	2.5145 31

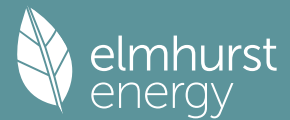
4. Water heating energy requirements (kWh/year)												
Assumed occupancy												2.5577 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												28.9802 (42b)
Hot water usage for other uses												40.8235 (42c)
Average daily hot water use (litres/day)												63.9814 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056 (44)
Energy content (annual)	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422 (45)
Distribution loss (46)m = 0.15 x (45)m												1062.5943
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1340 (55)
Total storage loss												
If cylinder contains dedicated solar storage												
Primary loss												35.1540 (57)
Combi loss												0.0000 (59)
Total heat required for water heating calculated for each month												
WWHRS												144.2962 (62)
PV diverter												0.0000 (63a)
Solar input												0.0000 (63b)
FGHRS												0.0000 (63c)
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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
Pumps, fans												
Losses e.g. evaporation (negative values) (Table 5)												
Water heating gains (Table 5)												
Total internal gains												

6. Solar gains												
[Jan]												
North												
East												
East												
Southeast												
South												
Southwest												
Solar gains												
Total gains												

7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)

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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	10.5511	10.6234	10.6954	11.0466	11.1148	11.4442	11.4442	11.5073	11.3150	11.1148	10.9776	10.8376
alpha	1.7034	1.7082	1.7130	1.7364	1.7410	1.7629	1.7629	1.7672	1.7543	1.7410	1.7318	1.7225
util living area	0.9529	0.9403	0.9189	0.8791	0.8170	0.7220	0.6201	0.6563	0.7953	0.8956	0.9398	0.9563 (86)
MIT	16.2155	16.5605	17.2318	18.2050	19.1587	20.0190	20.4864	20.4094	19.7202	18.5070	17.2373	16.2037 (87)
Th 2	18.9449	18.9550	18.9649	19.0123	19.0213	19.0637	19.0637	19.0717	19.0473	19.0213	19.0032	18.9844 (88)
util rest of house	0.9428	0.9272	0.8999	0.8472	0.7589	0.6108	0.4313	0.4789	0.7061	0.8614	0.9244	0.9470 (89)
MIT 2	13.8897	14.3129	15.1347	16.3254	17.4560	18.4315	18.8708	18.8236	18.1325	16.7138	15.1614	13.8831 (90)
Living area fraction									FLA = Living area /	(4) =		0.4303 (91)
MIT	14.8906	15.2801	16.0372	17.1343	18.1887	19.1147	19.5661	19.5060	18.8158	17.4855	16.0548	14.8818 (92)
Temperature adjustment												-0.1500
adjusted MIT	14.7406	15.1301	15.8872	16.9843	18.0387	18.9647	19.4161	19.3560	18.6658	17.3355	15.9048	14.7318 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9071	0.8868	0.8542	0.7992	0.7193	0.6035	0.4738	0.5120	0.6821	0.8166	0.8847	0.9130 (94)
Useful gains	635.3932	701.6093	750.2902	772.7989	737.6336	607.8432	457.1417	459.2550	564.9537	607.7209	602.5590	609.4469 (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	2347.9362	2284.9239	2082.5555	1736.4904	1353.1788	904.9525	583.8749	609.5281	957.4493	1437.8897	1903.1294	2305.8150 (97)
Space heating kWh	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (98a)
Space heating requirement - total per year (kWh/year)												7297.3025
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	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7297.3025
Space heating per m2										(98c) / (4) =		85.4285 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306 (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												7297.3025 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1476.5043 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												201.2601 (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)

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Energy used 0.0000 (237)
Total delivered energy for all uses 9627.3465 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	7297.3025	16.4900	1203.3252	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1476.5043	16.4900	243.4756	(247)
Energy for instantaneous electric shower(s)	611.2796	16.4900	100.8000	(247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609	(249)
Energy for lighting	201.2601	16.4900	33.1878	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1587.5494	(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] = 4.3821 (257)
SAP value 31.4769
SAP rating (Section 12) 31 (258)
SAP band F

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	7297.3025	0.1535	1120.3688	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1476.5043	0.1408	207.8534	(264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425	(264a)
Space and water heating			1328.2223	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	201.2601	0.1443	29.0480	(268)
Total CO2, kg/year			1448.0001	(272)
CO2 emissions per m2			16.9500	(273)
EI value			85.1225	
EI rating			85	(274)
EI band			B	

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

1. Overall dwelling characteristics

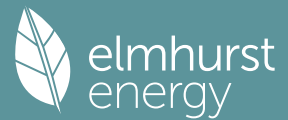
	Area (m2)	Storey height (m)	Volume (m3)	
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)	
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)	
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.4264 (5)	

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000 (6a)	
Number of open flues	0 * 20 =	0.0000 (6b)	
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)	
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)	
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)	
Number of blocked chimneys	0 * 20 =	0.0000 (6f)	
Number of intermittent extract fans	2 * 10 =	20.0000 (7a)	
Number of passive vents	0 * 10 =	0.0000 (7b)	
Number of flueless gas fires	0 * 40 =	0.0000 (7c)	
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0802 (8)
Pressure Test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8302	(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) =	0.7679	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Adj infilt rate	0.8831	0.8255	0.8447	0.7679	0.7679	0.6719	0.6911	0.7295	0.7103	0.7487	0.7487	0.8255	(22b)
Effective ac	0.8899	0.8407	0.8568	0.7949	0.7949	0.7257	0.7388	0.7661	0.7523	0.7803	0.7803	0.8407	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389			(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667			(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615			(26)
RL1-RL2			1.9600	1.1450	2.2443			(27a)
Extension Ground			27.5600	0.1800	4.9608			(28a)
Existing Ground			57.8600	0.6600	38.1876			(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390			(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880			(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952			(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140			(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755			(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062			(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890			(30)
Total net area of external elements Aum(A, m2)			247.0500					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.8666			(33)
Party Wall 1			25.3500	0.0000	0.0000			(32)
Party Ceiling 1			52.0100					(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)								49.4100 (36)
Point Thermal bridges							(36a) =	0.0000
Total fabric heat loss							(33) + (36) + (36a) =	144.2766 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	73.2516	69.2016	70.5213	65.4247	65.4247	59.7366	60.8135	63.0585	61.9208	64.2264	64.2264	69.2016	(38)
Heat transfer coeff	217.5282	213.4783	214.7979	209.7014	209.7014	204.0132	205.0902	207.3351	206.1975	208.5031	208.5031	213.4783	(39)
Average = Sum(39)m / 12 =												209.8606	
HLP	2.5466	2.4992	2.5146	2.4549	2.4549	2.3884	2.4010	2.4272	2.4139	2.4409	2.4409	2.4992	(40)
HLP (average)												2.4568	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

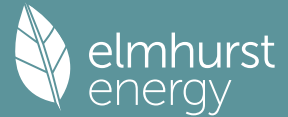
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5577 (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	28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822	(42b)
Hot water usage for other uses	40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235	(42c)
Average daily hot water use (litres/day)												63.9814	(43)
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	(44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Energy content (annual)												1062.5943	
Distribution loss (46)m = 0.15 x (45)m	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1340	(55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)
												1476.5043	(64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	(64a)
												611.2796	(64a)
Heat gains from water heating, kWh/month	78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341	(72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W	
North				6.3800	11.5821	0.6300		0.7000		0.7700		22.5828 (74)	
East				0.9900	21.5869	0.6300		0.7000		0.7700		6.5313 (76)	
East				1.9600	29.0000	0.6300		0.7000		1.0000		22.5598 (82)	
Southeast				1.0800	39.1209	0.7200		0.7000		0.7700		14.7569 (77)	
South				2.5200	49.2853	0.7200		0.7000		0.7700		43.3792 (78)	
Southwest				1.0800	39.1209	0.7200		0.7000		0.7700		14.7569 (79)	
Solar gains	124.5670	201.2699	304.1309	437.7978	513.3256	564.5506	538.3344	473.6515	381.2557	251.1938	156.3622	107.7298	(83)
Total gains	709.2529	784.5206	870.7824	974.8189	1018.6759	1038.7051	996.2385	933.3174	857.0679	758.1960	696.7629	677.4049	(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	10.9079	11.1148	11.0466	11.3150	11.3150	11.6305	11.5694	11.4442	11.5073	11.3801	11.3801	11.1148
alpha	1.7272	1.7410	1.7364	1.7543	1.7543	1.7754	1.7713	1.7629	1.7672	1.7587	1.7587	1.7410
util living area	0.9463	0.9346	0.9071	0.8543	0.7678	0.6069	0.4231	0.4709	0.7186	0.8661	0.9278	0.9496 (86)
MIT	16.6861	16.9698	17.7312	18.7091	19.6822	20.4908	20.8498	20.8033	20.1832	19.0461	17.7381	16.6883 (87)
Th 2	18.9938	19.0213	19.0123	19.0473	19.0473	19.0870	19.0794	19.0637	19.0717	19.0556	19.0556	19.0213 (88)
util rest of house	0.9341	0.9199	0.8837	0.8126	0.6838	0.4312	0.1168	0.1634	0.5801	0.8169	0.9081	0.9382 (89)
MIT 2	14.4788	14.8303	15.7574	16.9410	18.0618	18.8804	19.0744	19.0519	18.6243	17.3694	15.7887	14.4880 (90)
Living area fraction	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	19.2952	18.0909	16.6276	15.4349 (92)
MIT	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	19.2952	18.0909	16.6276	-0.1500
Temperature adjustment	15.2787	15.6010	16.4568	17.5519	18.6091	19.4234	19.6884	19.6556	19.1452	17.9409	16.4776	15.2849 (93)
adjusted MIT	15.2787	15.6010	16.4568	17.5519	18.6091	19.4234	19.6884	19.6556	19.1452	17.9409	16.4776	15.2849 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8962	0.8784	0.8372	0.7670	0.6590	0.4688	0.2291	0.2748	0.5870	0.7752	0.8661	0.9017 (94)
Useful gains	635.6312	689.1559	728.9865	747.6988	671.2737	486.9147	228.2183	256.4933	503.0822	587.7212	603.4696	610.8325 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	2148.8911	2092.2972	1859.4717	1520.7375	1092.3633	616.8113	243.7383	281.0599	731.0119	1217.8521	1705.0591	2110.2126 (97)
Space heating kWh	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98a)
Space heating requirement - total per year (kWh/year)												6157.2366
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	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6157.2366
Space heating per m2										(98c) / (4) =		72.0819 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306 (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)												

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(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												6157.2366	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1476.5043	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												201.2601	(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												8487.2806	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6157.2366	21.5100	1324.4216	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1476.5043	21.5100	317.5961	(247)
Energy for instantaneous electric shower(s)	611.2796	21.5100	131.4862	(247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191	(249)
Energy for lighting	201.2601	21.5100	43.2910	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1825.6141	(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	6157.2366	0.1542	949.3704	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1476.5043	0.1408	207.8534	(264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425	(264a)
Space and water heating			1157.2239	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	201.2601	0.1443	29.0480	(268)
Total CO2, kg/year			1277.0017	(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	6157.2366	1.5709	9672.0959	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1476.5043	1.5205	2245.0606	(278)
Energy for instantaneous electric shower(s)	611.2796	1.5143	925.6816	(278a)
Space and water heating			11917.1565	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	201.2601	1.5338	308.6994	(282)
Total Primary energy kWh/year			13213.5623	(286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: F 31
Current environmental impact rating: B 85

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

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

Recommended measures (none)	Typical annual savings		Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m ²	

Potential energy efficiency rating: F 31
Potential environmental impact rating: B 85

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

Electricity	Current £1826	Potential £1826	Saving £0
Space heating	£1333	£1333	£0
Water heating	£449	£449	£0
Lighting	£43	£43	£0
Total cost of fuels	£1826	£1826	£0
Total cost of uses	£1825	£1825	£0
Delivered energy	99 kWh/m ²	99 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.3 tonnes	1.3 tonnes	0.0 tonnes
CO2 emissions per m ²	15 kg/m ²	15 kg/m ²	0 kg/m ²
Primary energy	155 kWh/m ²	155 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.4264 (5)

2. Ventilation rate

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	Air changes per hour	20.0000 / (5) = 0.0802 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8302	(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) =	0.7679	(21)

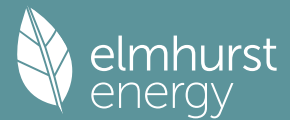
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.9791	0.9599	0.9407	0.8447	0.8255	0.7295	0.7295	0.7103	0.7679	0.8255	0.8639	0.9023 (22b)
Effective ac	0.9793	0.9607	0.9425	0.8568	0.8407	0.7661	0.7661	0.7523	0.7949	0.8407	0.8732	0.9071 (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
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.1450	2.2443		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum(A, m ²)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.8666		(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							49.4100 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	144.2766 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	80.6083	79.0762	77.5746	70.5213	69.2016	63.0585	63.0585	61.9208	65.4247	69.2016	71.8713	74.6623 (38)
Heat transfer coeff												

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Average = Sum(39)m / 12 =	224.8849	223.3529	221.8512	214.7979	213.4783	207.3351	207.3351	206.1975	209.7014	213.4783	216.1479	218.9389 (39)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP	2.6327	2.6148	2.5972	2.5146	2.4992	2.4272	2.4272	2.4139	2.4549	2.4992	2.5304	2.5631 (40)
HLP (average)												2.5145
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5577 (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	28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822 (42b)
Hot water usage for other uses	40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235 (42c)
Average daily hot water use (litres/day)												63.9814 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056 (44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422 (45)
Energy content (annual)										Total = Sum(45)m =		1062.5943
Distribution loss (46)m = 0.15 x (45)m	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1340 (55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
								Total per year (kWh/year) = Sum(64)m =				1476.5043 (64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391 (64a)
								Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =				611.2796 (64a)
Heat gains from water heating, kWh/month	78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341 (72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751 (73)

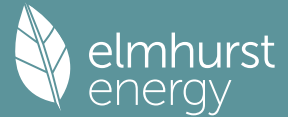
6. Solar gains

[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				6.3800	10.6334	0.6300	0.7000		0.7700		20.7331 (74)	
East				0.9900	19.6403	0.6300	0.7000		0.7700		5.9423 (76)	
East				1.9600	26.0000	0.6300	0.7000		1.0000		20.2260 (82)	
Southeast				1.0800	36.7938	0.7200	0.7000		0.7700		13.8791 (77)	
South				2.5200	46.7521	0.7200	0.7000		0.7700		41.1496 (78)	
Southwest				1.0800	36.7938	0.7200	0.7000		0.7700		13.8791 (79)	
Solar gains	115.8093	207.9293	311.6920	429.9375	520.1504	533.0044	506.9848	437.3776	352.4019	237.2475	140.6821	97.8195 (83)
Total gains	700.4951	791.1800	878.3435	966.9586	1025.5008	1007.1589	964.8889	897.0435	828.2142	744.2498	681.0827	667.4946 (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	10.5511	10.6234	10.6954	11.0466	11.1148	11.4442	11.4442	11.5073	11.3150	11.1148	10.9776	10.8376
alpha	1.7034	1.7082	1.7130	1.7364	1.7410	1.7629	1.7629	1.7672	1.7543	1.7410	1.7318	1.7225
util living area	0.9529	0.9403	0.9189	0.8791	0.8170	0.7220	0.6201	0.6563	0.7953	0.8956	0.9398	0.9563 (86)

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MIT	16.2155	16.5605	17.2318	18.2050	19.1587	20.0190	20.4864	20.4094	19.7202	18.5070	17.2373	16.2037 (87)
Th 2	18.9449	18.9550	18.9649	19.0123	19.0213	19.0637	19.0637	19.0717	19.0473	19.0213	19.0032	18.9844 (88)
util rest of house												
	0.9428	0.9272	0.8999	0.8472	0.7589	0.6108	0.4313	0.4789	0.7061	0.8614	0.9244	0.9470 (89)
MIT 2	13.8897	14.3129	15.1347	16.3254	17.4560	18.4315	18.8708	18.8236	18.1325	16.7138	15.1614	13.8831 (90)
Living area fraction									fLA = Living area /	(4) =		0.4303 (91)
MIT	14.8906	15.2801	16.0372	17.1343	18.1887	19.1147	19.5661	19.5060	18.8158	17.4855	16.0548	14.8818 (92)
Temperature adjustment												-0.1500
adjusted MIT	14.7406	15.1301	15.8872	16.9843	18.0387	18.9647	19.4161	19.3560	18.6658	17.3355	15.9048	14.7318 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9071	0.8868	0.8542	0.7992	0.7193	0.6035	0.4738	0.5120	0.6821	0.8166	0.8847	0.9130	(94)
Useful gains	635.3932	701.6093	750.2902	772.7989	737.6336	607.8432	457.1417	459.2550	564.9537	607.7209	602.5590	609.4469	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W													
Space heating kWh	2347.9362	2284.9239	2082.5555	1736.4904	1353.1788	904.9525	583.8749	609.5281	957.4493	1437.8897	1903.1294	2305.8150	(97)
Space heating requirement - total per year (kWh/year)	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(98a)
Solar heating kWh													
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	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7297.3025	
Space heating per m2												85.4285	(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 %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(217)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306	(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												7297.3025	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1476.5043	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												201.2601	(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												9627.3465	(238)

10a. Fuel costs - using Table 12 prices

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7297.3025	16.4900	1203.3252 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1476.5043	16.4900	243.4756 (247)
Energy for instantaneous electric shower(s)	611.2796	16.4900	100.8000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	201.2601	16.4900	33.1878 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1587.5494 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	4.3821 (257)
SAP value		31.4769
SAP rating (Section 12)		31 (258)
SAP band		F

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	7297.3025	0.1535	1120.3688 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1476.5043	0.1408	207.8534 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			1328.2223 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	201.2601	0.1443	29.0480 (268)
Total CO2, kg/year			1448.0001 (272)
CO2 emissions per m2			16.9500 (273)
EI value			85.1225
EI rating			85 (274)
EI band			B

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	249.4264 (5)

2. Ventilation rate

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

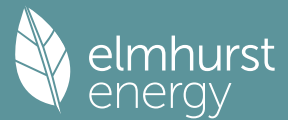
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) =	0.0802 (8)
Pressure test		No	
Pressure Test Method		Blower Door	
Measured/design AP50		15.0000	(17)
Infiltration rate		0.8302	(18)
Number of sides sheltered		1	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.9250	(20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.7679	(21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.8831	0.8255	0.8447	0.7679	0.7679	0.6719	0.6911	0.7295	0.7103	0.7487	0.7487	0.8255 (22b)
Effective ac	0.8899	0.8407	0.8568	0.7949	0.7949	0.7257	0.7388	0.7661	0.7523	0.7803	0.7803	0.8407 (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
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New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389	(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667	(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615	(26)
RL1-RL2			1.9600	1.1450	2.2443	(27a)
Extension Ground			27.5600	0.1800	4.9608	(28a)
Existing Ground			57.8600	0.6600	38.1876	(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390	(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880	(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952	(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140	(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755	(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062	(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890	(30)
Total net area of external elements Aum(A, m2)			247.0500			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.8666	(33)
Party Wall 1			25.3500	0.0000	0.0000	(32)
Party Ceiling 1			52.0100			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K						100.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)						49.4100	(36)
Point Thermal bridges						0.0000	(36a)
Total fabric heat loss						(33) + (36) + (36a) =	144.2766 (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	73.2516	69.2016	70.5213	65.4247	65.4247	59.7366	60.8135	63.0585	61.9208	64.2264	64.2264	69.2016	(38)
Average = Sum(39)m / 12 =	217.5282	213.4783	214.7979	209.7014	209.7014	204.0132	205.0902	207.3351	206.1975	208.5031	208.5031	213.4783	(39)
												209.8606	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.5466	2.4992	2.5146	2.4549	2.4549	2.3884	2.4010	2.4272	2.4139	2.4409	2.4409	2.4992	(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													2.5577	(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	0.0000	(42a)
Hot water usage for baths														
28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822	28.8822	28.8822	(42b)
Hot water usage for other uses														
40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235	40.8235	40.8235	(42c)
Average daily hot water use (litres/day)													63.9814	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	69.7056	(44)	
Energy content (annual)	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	109.1422	(45)
Distribution loss (46)m = 0.15 x (45)m										Total =	Sum(45)m =	1062.5943		
16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713	16.3713	(46)	
Water storage loss:														
Store volume													150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8900	(48)
Temperature factor from Table 2b													0.6000	(49)
Enter (49) or (54) in (55)													1.1340	(55)
Total storage loss														
35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	(56)	
If cylinder contains dedicated solar storage														
35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	(57)	
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month														
145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	144.2962	(62)	
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)	
										Total per year (kWh/year) =	Sum(64)m =	1476.5043	(64)	
Electric shower(s)														
53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	53.7391	(64a)	
										Total Energy used by instantaneous electric shower(s) (kWh/year) =	Sum(64a)m =	611.2796	(64a)	
Heat gains from water heating, kWh/month														
78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478	77.8478	(65)	

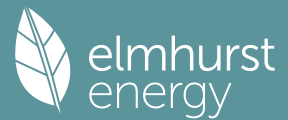
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341	(72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North					6.3800	11.5821	0.6300		0.7000		0.7700	22.5828 (74)
East					0.9900	21.5869	0.6300		0.7000		0.7700	6.5313 (76)
East					1.9600	29.0000	0.6300		0.7000		1.0000	22.5598 (82)
Southeast					1.0800	39.1209	0.7200		0.7000		0.7700	14.7569 (77)
South					2.5200	49.2853	0.7200		0.7000		0.7700	43.3792 (78)
Southwest					1.0800	39.1209	0.7200		0.7000		0.7700	14.7569 (79)
Solar gains	124.5670	201.2699	304.1309	437.7978	513.3256	564.5506	538.3344	473.6515	381.2557	251.1938	156.3622	107.7298 (83)
Total gains	709.2529	784.5206	870.7824	974.8189	1018.6759	1038.7051	996.2385	933.3174	857.0679	758.1960	696.7629	677.4049 (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	10.9079	11.1148	11.0466	11.3150	11.3150	11.6305	11.5694	11.4442	11.5073	11.3801	11.3801	11.1148
alpha	1.7272	1.7410	1.7364	1.7543	1.7543	1.7754	1.7713	1.7629	1.7672	1.7587	1.7587	1.7410
util living area	0.9463	0.9346	0.9071	0.8543	0.7678	0.6069	0.4231	0.4709	0.7186	0.8661	0.9278	0.9496 (86)
MIT	16.6861	16.9698	17.7312	18.7091	19.6822	20.4908	20.8498	20.8033	20.1832	19.0461	17.7381	16.6883 (87)
Th 2	18.9938	19.0213	19.0123	19.0473	19.0473	19.0870	19.0794	19.0637	19.0717	19.0556	19.0556	19.0213 (88)
util rest of house	0.9341	0.9199	0.8837	0.8126	0.6838	0.4312	0.1168	0.1634	0.5801	0.8169	0.9081	0.9382 (89)
MIT 2	14.4788	14.8303	15.7574	16.9410	18.0618	18.8804	19.0744	19.0519	18.6243	17.3694	15.7887	14.4880 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	19.2952	18.0909	16.6276	15.4349 (92)
Temperature adjustment	-0.1500											
adjusted MIT	15.2787	15.6010	16.4568	17.5519	18.6091	19.4234	19.6884	19.6556	19.1452	17.9409	16.4776	15.2849 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8962	0.8784	0.8372	0.7670	0.6590	0.4688	0.2291	0.2748	0.5870	0.7752	0.8661	0.9017 (94)
Useful gains	635.6312	689.1559	728.9865	747.6988	671.2737	486.9147	228.2183	256.4933	503.0822	587.7212	603.4696	610.8325 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	2148.8911	2092.2972	1859.4717	1520.7375	1092.3633	616.8113	243.7383	281.0599	731.0119	1217.8521	1705.0591	2110.2126 (97)
Space heating kWh	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98a)
Space heating requirement - total per year (kWh/year)	6157.2366											
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	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	6157.2366											
Space heating per m2	(98c) / (4) = 72.0819 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
Water heating requirement	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (219)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	6157.2366	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1476.5043	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
Total electricity for the above, kWh/year	41.0000	(231)
Electricity for lighting (calculated in Appendix L)	201.2601	(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	8487.2806	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	6157.2366	21.5100	1324.4216 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1476.5043	21.5100	317.5961 (247)
Energy for instantaneous electric shower(s)	611.2796	21.5100	131.4862 (247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191 (249)
Energy for lighting	201.2601	21.5100	43.2910 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1825.6141 (255)

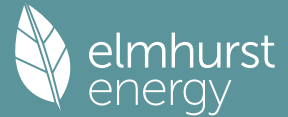
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	6157.2366	0.1542	949.3704 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1476.5043	0.1408	207.8534 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			1157.2239 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	201.2601	0.1443	29.0480 (268)
Total CO2, kg/year			1277.0017 (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	6157.2366	1.5709	9672.0959 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1476.5043	1.5205	2245.0606 (278)
Energy for instantaneous electric shower(s)	611.2796	1.5143	925.6816 (278a)
Space and water heating			11917.1565 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	201.2601	1.5338	308.6994 (282)
Total Primary energy kWh/year			13213.5623 (286)

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Property Reference	Flat 2 - Lean			Issued on Date	07/11/2023
Assessment Reference	00001	Prop Type Ref	18416		
Property	Flat 2 - Lean, 26, Ravenstone Road, London, N8 0JP				
SAP Rating	45 E	DER		TER	
Environmental	88 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.02	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Andrew Bamford			Assessor ID	F391-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

2. Ventilation rate

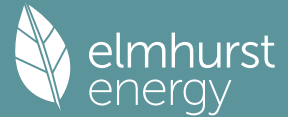
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (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	1.0445	1.0240	1.0035	0.9011	0.8806	0.7782	0.7782	0.7578	0.8192	0.8806	0.9216	0.9626 (22b)
Effective ac	1.0445	1.0240	1.0035	0.9060	0.8878	0.8028	0.8028	0.7871	0.8355	0.8878	0.9247	0.9633 (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
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.1450	2.4046		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072		(30)
Loft voids	12.1600		12.1600	0.1651	2.0081		(30)
Total net area of external elements Aum(A, m ²)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125		(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)

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Thermal bridges (Default value 0.200 * total exposed area)
Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 100.8165 (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	76.2431	74.7482	73.2532	66.1352	64.8034	58.6035	58.6035	57.4553	60.9916	64.8034	67.4977	70.3144	(38)
Heat transfer coeff	177.0596	175.5646	174.0697	166.9517	165.6199	159.4199	159.4199	158.2718	161.8081	165.6199	168.3142	171.1309	(39)
Average = Sum(39)m / 12 =												166.9375	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	1.9684	1.9518	1.9352	1.8561	1.8412	1.7723	1.7723	1.7596	1.7989	1.8412	1.8712	1.9025	(40)
HLP (average)												1.8559	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy 2.6250 (42)

Hot water usage for mixer showers 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)

Hot water usage for baths 29.4656 29.0280 28.4118 27.2755 26.4247 25.4813 24.9718 25.5837 26.2500 27.2594 28.4191 29.3660 (42b)

Hot water usage for other uses 41.5130 40.0034 38.4939 36.9843 35.4747 33.9652 33.9652 35.4747 36.9843 38.4939 40.0034 41.5130 (42c)

Average daily hot water use (litres/day) 16.8619 14.7450 15.4247 13.1953 12.4993 10.9645 10.6919 11.3405 11.6961 13.3840 14.6221 16.6469 (43)

Daily hot water use

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(44)
Energy content (annual)												1080.4805	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8900 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													1.1340 (55)
Total storage loss													
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	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
WWHRS	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
Heat gains from water heating, kWh/month	79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636	(64a)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(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)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590	(72)
Total internal gains	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812	(73)

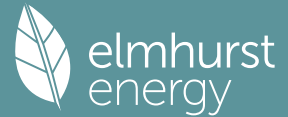
6. Solar gains

[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	1.7600	10.6334	0.6300	0.7000	0.7700	5.7195	(74)						
South	2.1000	26.0000	0.6300	0.7000	1.0000	21.6707	(82)						
North	3.5300	10.6334	0.7200	0.7000	0.7700	13.1102	(74)						
East	1.6000	19.6403	0.7200	0.7000	0.7700	10.9757	(76)						
South	5.0300	46.7521	0.7200	0.7000	0.7700	82.1358	(78)						
Solar gains	133.6119	236.9810	347.8720	468.4739	557.3474	567.2481	541.1209	472.9628	389.4901	268.4116	161.7784	113.1994	(83)
Total gains	736.2206	838.0168	931.5685	1021.3570	1077.3021	1054.9615	1012.0465	945.7934	879.1994	790.4697	718.5216	700.2806	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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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	14.1117	14.2319	14.3541	14.9661	15.0864	15.6731	15.6731	15.7868	15.4418	15.0864	14.8449	14.6006
alpha	1.9408	1.9488	1.9569	1.9977	2.0058	2.0449	2.0449	2.0525	2.0295	2.0058	1.9897	1.9734
util living area	0.9486	0.9323	0.9053	0.8546	0.7772	0.6603	0.5436	0.5815	0.7459	0.8745	0.9318	0.9527 (86)
MIT	17.0188	17.3776	18.0092	18.9115	19.7148	20.3964	20.7179	20.6667	20.1475	19.1148	17.9731	17.0341 (87)
Th 2	19.3545	19.3657	19.3769	19.4310	19.4413	19.4894	19.4894	19.4984	19.4708	19.4413	19.4206	19.3991 (88)
util rest of house	0.9390	0.9197	0.8867	0.8238	0.7234	0.5663	0.4006	0.4436	0.6660	0.8415	0.9172	0.9440 (89)
MIT 2	14.9539	15.4018	16.1882	17.3127	18.2740	19.0573	19.3584	19.3295	18.8036	17.5861	16.1675	14.9828 (90)
Living area fraction									FLA = Living area / (4) =			0.3250 (91)
MIT	15.6249	16.0438	16.7800	17.8323	18.7422	19.4924	19.8002	19.7640	19.2403	18.0828	16.7543	15.6494 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.4749	15.8938	16.6300	17.6823	18.5922	19.3424	19.6502	19.6140	19.0903	17.9328	16.6043	15.4994 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9025	0.8783	0.8405	0.7773	0.6864	0.5555	0.4180	0.4559	0.6410	0.7965	0.8767	0.9096 (94)
Useful gains	664.4385	736.0168	782.9899	793.9245	739.4764	585.9870	423.0412	431.1882	563.5867	629.5958	629.9138	637.0045 (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	1978.6280	1930.1254	1763.3195	1466.2125	1141.4810	756.0353	486.2580	508.6915	807.4751	1214.4630	1599.7041	1933.6785 (97)
Space heating kWh	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98a)
Space heating requirement - total per year (kWh/year)												5390.8177
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	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5390.8177
Space heating per m2										(98c) / (4) =		59.9313 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (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												5390.8177 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1494.3905 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												216.4307 (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)

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Energy used 0.0000 (237)
Total delivered energy for all uses 7764.2026 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5390.8177	16.4900	888.9458 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	16.4900	246.4250 (247)
Energy for instantaneous electric shower(s)	621.5636	16.4900	102.4958 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	216.4307	16.4900	35.6894 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1280.3170 (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] = 3.4154 (257)
SAP value 44.6357
SAP rating (Section 12) 45 (258)
SAP band E

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	5390.8177	0.1540	829.9217 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1040.3075 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1163.7056 (272)
CO2 emissions per m2			12.9400 (273)
EI value			88.4449
EI rating			88 (274)
EI band			B

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

1. Overall dwelling characteristics

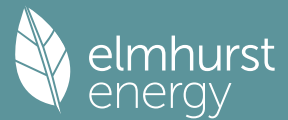
	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.9421	0.8806	0.9011	0.8192	0.8192	0.7168	0.7373	0.7782	0.7578	0.7987	0.7987	0.8806 (22b)
Effective ac	0.9438	0.8878	0.9060	0.8355	0.8355	0.7569	0.7718	0.8028	0.7871	0.8190	0.8190	0.8878 (25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153			(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148			(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615			(26)
RL1-RL3			2.1000	1.1450	2.4046			(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892			(28b)
Exposed Floor			1.0600	0.1800	0.1908			(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960			(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046			(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952			(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977			(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275			(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072			(30)
Loft voids	12.1600		12.1600	0.1651	2.0081			(30)
Total net area of external elements Aum(A, m2)			193.5200					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	62.1125		(33)
Party Wall 1			44.9900	0.0000	0.0000			(32)
Party Floor 1			52.0200					(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K								100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)								38.7040 (36)
Point Thermal bridges								0.0000
Total fabric heat loss						(33) + (36) + (36a) =	100.8165	(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	68.8908	64.8034	66.1352	60.9916	60.9916	55.2509	56.3378	58.6035	57.4553	59.7822	59.7822	64.8034	(38)
Average = Sum(39)m / 12 =	169.7072	165.6199	166.9517	161.8081	161.8081	156.0674	157.1543	159.4199	158.2718	160.5987	160.5987	165.6199	(39)
												161.9688	
HLP	1.8867	1.8412	1.8561	1.7989	1.7989	1.7350	1.7471	1.7723	1.7596	1.7854	1.7854	1.8412	(40)
HLP (average)												1.8007	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

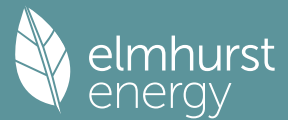
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.6250 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Hot water usage for other uses	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
Average daily hot water use (litres/day)												65.0584	(43)
Daily hot water use	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy content (annual)	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)
Distribution loss (46)m = 0.15 x (45)m	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1340	(55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(64)
												1494.3905	(64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
												621.5636	(64a)
Heat gains from water heating, kWh/month	79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590	(72)
Total internal gains	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812	(73)

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6. Solar gains

[Jan]				Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d		Gains W
North				1.7600	11.5821	0.6300		0.7000		0.7700		6.2297 (74)
South				2.1000	29.0000	0.6300		0.7000		1.0000		24.1712 (82)
North				3.5300	11.5821	0.7200		0.7000		0.7700		14.2799 (74)
East				1.6000	21.5869	0.7200		0.7000		0.7700		12.0635 (76)
South				5.0300	49.2853	0.7200		0.7000		0.7700		86.5863 (78)
Solar gains	143.3307	228.6278	338.1055	475.2445	548.3224	599.1950	572.9205	510.3825	419.7132	283.1643	179.2926	124.3581 (83)
Total gains	745.9393	829.6636	921.8021	1028.1276	1068.2772	1086.9085	1043.8461	983.2131	909.4225	805.2224	736.0359	711.4393 (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	14.7231	15.0864	14.9661	15.4418	15.4418	16.0098	15.8991	15.6731	15.7868	15.5581	15.5581	15.0864
alpha	1.9815	2.0058	1.9977	2.0295	2.0295	2.0673	2.0599	2.0449	2.0525	2.0372	2.0372	2.0058
util living area	0.9403	0.9250	0.8900	0.8223	0.7158	0.5283	0.3434	0.3883	0.6513	0.8356	0.9161	0.9443 (86)
MIT	17.4885	17.8007	18.4817	19.3605	20.1393	20.7292	20.9353	20.9093	20.5089	19.5946	18.4635	17.5048 (87)
Th 2	19.4099	19.4413	19.4310	19.4708	19.4708	19.5158	19.5072	19.4894	19.4984	19.4802	19.4802	19.4413 (88)
util rest of house	0.9287	0.9108	0.8672	0.7826	0.6414	0.3962	0.1490	0.1874	0.5367	0.7889	0.8972	0.9336 (89)
MIT 2	15.5550	15.9503	16.7912	17.8721	18.7716	19.3821	19.5006	19.4768	19.1911	18.1801	16.7971	15.5842 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	16.1833	16.5516	17.3406	18.3558	19.2161	19.8198	19.9668	19.9423	19.6194	18.6398	17.3386	16.2083 (92)
Temperature adjustment												
adjusted MIT	16.0333	16.4016	17.1906	18.2058	19.0661	19.6698	19.8168	19.7923	19.4694	18.4898	17.1886	16.0583 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8902	0.8690	0.8209	0.7398	0.6176	0.4116	0.1925	0.2318	0.5340	0.7479	0.8550	0.8968 (94)
Useful gains	664.0590	720.9538	756.7507	760.6118	659.7248	447.4126	200.9832	227.8644	485.6624	602.2373	629.2813	638.0328 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	1804.5481	1755.8377	1567.7691	1279.2203	916.8136	510.3153	206.9436	237.9050	612.4117	1026.1864	1427.5014	1765.2329 (97)
Space heating kWh	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98a)
Space heating requirement - total per year (kWh/year)	4440.8092											
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	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	4440.8092											
Space heating per m ²	(98c) / (4) = 49.3698 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (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)												

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(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												4440.8092	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1494.3905	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.4307	(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												6814.1942	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	4440.8092	21.5100	955.2181	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1494.3905	21.5100	321.4434	(247)
Energy for instantaneous electric shower(s)	621.5636	21.5100	133.6983	(247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191	(249)
Energy for lighting	216.4307	21.5100	46.5543	(250)
Additional standing charges			0.0000	(251)
Total energy cost			1465.7332	(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	4440.8092	0.1547	686.9212	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1494.3905	0.1408	210.3857	(264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733	(264a)
Space and water heating			897.3070	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	216.4307	0.1443	31.2376	(268)
Total CO2, kg/year			1020.7051	(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	4440.8092	1.5727	6983.9994	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1494.3905	1.5206	2272.3108	(278)
Energy for instantaneous electric shower(s)	621.5636	1.5143	941.2551	(278a)
Space and water heating			9256.3102	(279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248	(281)
Energy for lighting	216.4307	1.5338	331.9687	(282)
Total Primary energy kWh/year			10591.5588	(286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating:	E 45
Current environmental impact rating:	B 88

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

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

Recommended measures (none)	Typical annual savings		Energy efficiency	Environmental impact
	Total Savings	£0	0.00 kg/m ²	

Potential energy efficiency rating:	E 45
Potential environmental impact rating:	B 88

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current £1466	Potential £1466	Saving £0
Electricity			
Space heating	£964	£964	£0
Water heating	£455	£455	£0
Lighting	£47	£47	£0
Total cost of fuels	£1466	£1466	£0
Total cost of uses	£1466	£1466	£0
Delivered energy	76 kWh/m ²	76 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.0 tonnes	1.0 tonnes	0.0 tonnes
CO2 emissions per m ²	11 kg/m ²	11 kg/m ²	0 kg/m ²
Primary energy	118 kWh/m ²	118 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.2003 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c)	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (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	1.0445	1.0240	1.0035	0.9011	0.8806	0.7782	0.7782	0.7578	0.8192	0.8806	0.9216	0.9626 (22b)
Effective ac	1.0445	1.0240	1.0035	0.9060	0.8878	0.8028	0.8028	0.7871	0.8355	0.8878	0.9247	0.9633 (25)

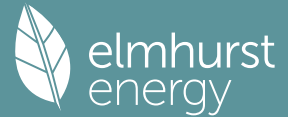
3. Heat losses and heat loss parameter

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
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.1450	2.4046		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072		(30)
Loft voids	12.1600		12.1600	0.1651	2.0081		(30)
Total net area of external elements Aum(A, m ²)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125		(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32a)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							38.7040 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	100.8165 (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	76.2431	74.7482	73.2532	66.1352	64.8034	58.6035	58.6035	57.4553	60.9916	64.8034	67.4977	70.3144 (38)

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Heat transfer coeff	177.0596	175.5646	174.0697	166.9517	165.6199	159.4199	159.4199	158.2718	161.8081	165.6199	168.3142	171.1309 (39)
Average = Sum(39)m / 12 =												166.9375
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9684	1.9518	1.9352	1.8561	1.8412	1.7723	1.7723	1.7596	1.7989	1.8412	1.8712	1.9025 (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												2.6250 (42)
Hot water usage for mixer showers												
0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths												
29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Hot water usage for other uses												
41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
Average daily hot water use (litres/day)												65.0584 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790 (44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794 (45)
Energy content (annual)										Total = Sum(45)m =		1080.4805
Distribution loss (46)m = 0.15 x (45)m												
16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	(46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1340 (55)
Total storage loss												
35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage												
35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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												
147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(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												
147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(64)
									Total per year (kWh/year) = Sum(64)m =			1494.3905 (64)
Electric shower(s)												
54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 621.5636 (64a)
Heat gains from water heating, kWh/month												
79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847	(65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5												
30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												
356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5												
53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)												
-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)												
106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590	(72)
Total internal gains												
602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812	(73)

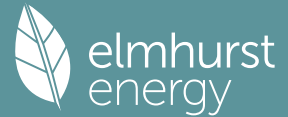
6. Solar gains

[Jan]												Gains
				Area	Solar flux		g		FF		Access	
				m2	Table 6a		Specific data		Specific data		factor	
					W/m2		or Table 6b		or Table 6c		Table 6d	W
North				1.7600	10.6334		0.6300		0.7000		0.7700	5.7195 (74)
South				2.1000	26.0000		0.6300		0.7000		1.0000	21.6707 (82)
North				3.5300	10.6334		0.7200		0.7000		0.7700	13.1102 (74)
East				1.6000	19.6403		0.7200		0.7000		0.7700	10.9757 (76)
South				5.0300	46.7521		0.7200		0.7000		0.7700	82.1358 (78)
Solar gains	133.6119	236.9810	347.8720	468.4739	557.3474	567.2481	541.1209	472.9628	389.4901	268.4116	161.7784	113.1994 (83)
Total gains	736.2206	838.0168	931.5685	1021.3570	1077.3021	1054.9615	1012.0465	945.7934	879.1994	790.4697	718.5216	700.2806 (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 from living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	14.1117	14.2319	14.3541	14.9661	15.0864	15.6731	15.6731	15.7868	15.4418	15.0864	14.8449	14.6006
alpha	1.9408	1.9488	1.9569	1.9977	2.0058	2.0449	2.0449	2.0525	2.0295	2.0058	1.9897	1.9734
util living area												
	0.9486	0.9323	0.9053	0.8546	0.7772	0.6603	0.5436	0.5815	0.7459	0.8745	0.9318	0.9527 (86)

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MIT	17.0188	17.3776	18.0092	18.9115	19.7148	20.3964	20.7179	20.6667	20.1475	19.1148	17.9731	17.0341 (87)
Th 2	19.3545	19.3657	19.3769	19.4310	19.4413	19.4894	19.4894	19.4984	19.4708	19.4413	19.4206	19.3991 (88)
util rest of house												
	0.9390	0.9197	0.8867	0.8238	0.7234	0.5663	0.4006	0.4436	0.6660	0.8415	0.9172	0.9440 (89)
MIT 2	14.9539	15.4018	16.1882	17.3127	18.2740	19.0573	19.3584	19.3295	18.8036	17.5861	16.1675	14.9828 (90)
Living area fraction									fLA = Living area /	(4) =		0.3250 (91)
MIT	15.6249	16.0438	16.7800	17.8323	18.7422	19.4924	19.8002	19.7640	19.2403	18.0828	16.7543	15.6494 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.4749	15.8938	16.6300	17.6823	18.5922	19.3424	19.6502	19.6140	19.0903	17.9328	16.6043	15.4994 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9025	0.8783	0.8405	0.7773	0.6864	0.5555	0.4180	0.4559	0.6410	0.7965	0.8767	0.9096	(94)
Useful gains	664.4385	736.0168	782.9899	793.9245	739.4764	585.9870	423.0412	431.1882	563.5867	629.5958	629.9138	637.0045	(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													
1978.6280	1930.1254	1763.3195	1466.2125	1141.4810	756.0353	486.2580	508.6915	807.4751	1214.4630	1599.7041	1933.6785		(97)
Space heating kWh	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255	(98a)
Space heating requirement - total per year (kWh/year)												5390.8177	
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	
Space heating kWh	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5390.8177	
Space heating per m2											(98c) / (4) =	59.9313	(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 %)												100.0000 (206)		
Efficiency of main space heating system 2 (in %)												0.0000 (207)		
Efficiency of secondary/supplementary heating system, %												0.0000 (208)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Space heating requirement	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255	(98)	
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)	
Space heating fuel (main heating system)	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(64)	
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)	
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)	
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626	(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													5390.8177 (211)	
Space heating fuel - main system 2													0.0000 (213)	
Space heating fuel - secondary													0.0000 (215)	
Efficiency of water heater													100.0000	
Water heating fuel used													1494.3905 (219)	
Space cooling fuel													0.0000 (221)	
Electricity for pumps and fans: central heating pump														41.0000 (230c)
Total electricity for the above, kWh/year														41.0000 (231)
Electricity for lighting (calculated in Appendix L)														216.4307 (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 energav for all uses														7764.2026 (238)

10a. Fuel costs - using Table 12 prices

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	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5390.8177	16.4900	888.9458 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	16.4900	246.4250 (247)
Energy for instantaneous electric shower(s)	621.5636	16.4900	102.4958 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	216.4307	16.4900	35.6894 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1280.3170 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	3.4154 (257)
SAP value		44.6357
SAP rating (Section 12)		45 (258)
SAP band		E

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	5390.8177	0.1540	829.9217 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1040.3075 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1163.7056 (272)
CO2 emissions per m2			12.9400 (273)
EI value			88.4449
EI rating			88 (274)
EI band			B

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

2. Ventilation rate

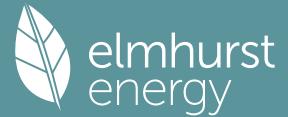
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.9421	0.8806	0.9011	0.8192	0.8192	0.7168	0.7373	0.7782	0.7578	0.7987	0.7987	0.8806 (22b)
Effective ac	0.9438	0.8878	0.9060	0.8355	0.8355	0.7569	0.7718	0.8028	0.7871	0.8190	0.8190	0.8878 (25)

3. Heat losses and heat loss parameter

Element	Gross	Openings	NetArea	U-value	A x U	K-value	A x K
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	m2	m2	m2	W/m2K	W/K	kJ/m2K	kJ/K	
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153			(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148			(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615			(26)
RL1-RL3			2.1000	1.1450	2.4046			(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892			(28b)
Exposed Floor			1.0600	0.1800	0.1908			(28b)
Existing Solid Wall - upgraded		10.1600	62.3200	0.3000	18.6960			(29a)
Dormer Wall	72.4800	1.7600	14.4700	0.1800	2.6046			(29a)
Sheltered Wall to Stairwell	16.2300	1.8900	16.2200	0.1600	2.5952			(29a)
Loft Stud Wall	18.1100		8.8100	0.1700	1.4977			(29a)
Dormer Flat Roof	8.8100		12.8500	0.1500	1.9275			(30)
Pitched Roof	12.8500	2.1000	40.0400	0.1800	7.2072			(30)
Loft voids	42.1400		12.1600	0.1651	2.0081			(30)
Total net area of external elements Aum (A, m2)	12.1600		193.5200					(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125			(33)
Party Wall 1			44.9900	0.0000	0.0000			(32)
Party Floor 1			52.0200					(32d)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	100.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	38.7040	(36)
Point Thermal bridges	(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =	100.8165 (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	68.8908	64.8034	66.1352	60.9916	60.9916	55.2509	56.3378	58.6035	57.4553	59.7822	59.7822	64.8034	(38)
Average = Sum(39)m / 12 =	169.7072	165.6199	166.9517	161.8081	161.8081	156.0674	157.1543	159.4199	158.2718	160.5987	160.5987	165.6199	(39)
												161.9688	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.8867	1.8412	1.8561	1.7989	1.7989	1.7350	1.7471	1.7723	1.7596	1.7854	1.7854	1.8412	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

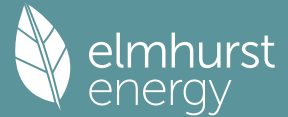
Assumed occupancy													2.6250	(42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	29.3660	(42b)
Hot water usage for other uses	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	41.5130	(42c)
Average daily hot water use (litres/day)													65.0584	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Energy conte	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	70.8790	(44)
Energy content (annual)	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	110.9794	(45)
Distribution loss (46)m = 0.15 x (45)m	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	16.6469	(46)
Water storage loss:													150.0000	(47)
Store volume													1.8900	(48)
a) If manufacturer declared loss factor is known (kWh/day):													0.6000	(49)
Temperature factor from Table 2b													1.1340	(55)
Enter (49) or (54) in (55)														
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	(57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	146.1334	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	146.1334	(64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	54.6432	(64a)
Heat gains from water heating, kWh/month	79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847	78.6847	(65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(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)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(71)
Water heating gains (Table 5)	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590	(72)
Total internal gains	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812	(73)

6. Solar gains

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[Jan]	Area m2		Solar flux Table 6a W/m2		Specific data or Table 6b		Specific data or Table 6c		Access factor Table 6d		Gains W	
North	1.7600		11.5821		0.6300		0.7000		0.7700		6.2297 (74)	
South	2.1000		29.0000		0.6300		0.7000		1.0000		24.1712 (82)	
North	3.5300		11.5821		0.7200		0.7000		0.7700		14.2799 (74)	
East	1.6000		21.5869		0.7200		0.7000		0.7700		12.0635 (76)	
South	5.0300		49.2853		0.7200		0.7000		0.7700		86.5863 (78)	

Solar gains	143.3307	228.6278	338.1055	475.2445	548.3224	599.1950	572.9205	510.3825	419.7132	283.1643	179.2926	124.3581 (83)
Total gains	745.9393	829.6636	921.8021	1028.1276	1068.2772	1086.9085	1043.8461	983.2131	909.4225	805.2224	736.0359	711.4393 (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	14.7231	15.0864	14.9661	15.4418	15.4418	16.0098	15.8991	15.6731	15.7868	15.5581	15.5581	15.0864
alpha	1.9815	2.0058	1.9977	2.0295	2.0295	2.0673	2.0599	2.0449	2.0525	2.0372	2.0372	2.0058
util living area	0.9403	0.9250	0.8900	0.8223	0.7158	0.5283	0.3434	0.3883	0.6513	0.8356	0.9161	0.9443 (86)
MIT	17.4885	17.8007	18.4817	19.3605	20.1393	20.7292	20.9353	20.9093	20.5089	19.5946	18.4635	17.5048 (87)
Th 2	19.4099	19.4413	19.4310	19.4708	19.4708	19.5158	19.5072	19.4894	19.4984	19.4802	19.4802	19.4413 (88)
util rest of house	0.9287	0.9108	0.8672	0.7826	0.6414	0.3962	0.1490	0.1874	0.5367	0.7889	0.8972	0.9336 (89)
MIT 2	15.5550	15.9503	16.7912	17.8721	18.7716	19.3821	19.5006	19.4768	19.1911	18.1801	16.7971	15.5842 (90)
Living area fraction	16.1833	16.5516	17.3406	18.3558	19.2161	19.8198	19.9668	19.9423	19.6194	18.6398	17.3386	16.2083 (92)
Temperature adjustment	16.0333	16.4016	17.1906	18.2058	19.0661	19.6698	19.8168	19.7923	19.4694	18.4898	17.1886	-0.1500
adjusted MIT												16.0583 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8902	0.8690	0.8209	0.7398	0.6176	0.4116	0.1925	0.2318	0.5340	0.7479	0.8550	0.8968 (94)
Useful gains	664.0590	720.9538	756.7507	760.6118	659.7248	447.4126	200.9832	227.8644	485.6624	602.2373	629.2813	638.0328 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	1804.5481	1755.8377	1567.7691	1279.2203	916.8136	510.3153	206.9436	237.9050	612.4117	1026.1864	1427.5014	1765.2329 (97)
Space heating kWh	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98a)
Space heating requirement - total per year (kWh/year)												4440.8092
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	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4440.8092
Space heating per m2										(98c) / (4) =		49.3698 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (221)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (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)

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Annual totals kWh/year		
Space heating fuel - main system 1	4440.8092	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1494.3905	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
Total electricity for the above, kWh/year	41.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.4307	(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	6814.1942	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4440.8092	21.5100	955.2181 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	21.5100	321.4434 (247)
Energy for instantaneous electric shower(s)	621.5636	21.5100	133.6983 (247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191 (249)
Energy for lighting	216.4307	21.5100	46.5543 (250)
Additional standing charges			0.0000 (251)
Total energy cost			1465.7332 (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	4440.8092	0.1547	686.9212 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			897.3070 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Total CO2, kg/year			1020.7051 (272)

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

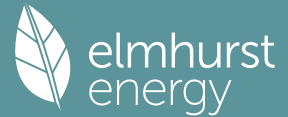
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	4440.8092	1.5727	6983.9994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	1.5206	2272.3108 (278)
Energy for instantaneous electric shower(s)	621.5636	1.5143	941.2551 (278a)
Space and water heating			9256.3102 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	216.4307	1.5338	331.9687 (282)
Total Primary energy kWh/year			10591.5588 (286)



Appendix 3:

Proposed Green Full SAP 10 Calculation Worksheets

Full SAP Calculation Printout



Property Reference	Flat 1 - As Proposed			Issued on Date	07/11/2023
Assessment Reference	00001	Prop Type Ref	18416		
Property	Flat 1 - As Proposed, 26, Ravenstone Road, London, N8 0JP				
SAP Rating	35 F	DER		TER	
Environmental	86 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	1.19	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Andrew Bamford			Assessor ID	F391-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	85.4200 (1b)	2.9200 (2b)	249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		249.4264 (4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	249.4264 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	20.0000 / (5) = 0.0802 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8302 (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) = 0.7679 (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)
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	0.9791	0.9599	0.9407	0.8447	0.8255	0.7295	0.7295	0.7103	0.7679	0.8255	0.8639	0.9023 (22b)
Effective ac	0.9793	0.9607	0.9425	0.8568	0.8407	0.7661	0.7661	0.7523	0.7949	0.8407	0.8732	0.9071 (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
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.1450	2.2443		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum (A, m ²)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.8666		(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							49.4100 (36)

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Point Thermal bridges
Total fabric heat loss

(33) + (36) + (36a) = 0.0000
144.2766 (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	80.6083	79.0762	77.5746	70.5213	69.2016	63.0585	63.0585	61.9208	65.4247	69.2016	71.8713	74.6623	(38)
Heat transfer coeff	224.8849	223.3529	221.8512	214.7979	213.4783	207.3351	207.3351	206.1975	209.7014	213.4783	216.1479	218.9389	(39)
Average = Sum(39)m / 12 =												214.7916	
HLP	2.6327	2.6148	2.5972	2.5146	2.4992	2.4272	2.4272	2.4139	2.4549	2.4992	2.5304	2.5631	(40)
HLP (average)												2.5145	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5577 (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	28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822	(42b)
Hot water usage for other uses	40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235	(42c)
Average daily hot water use (litres/day)												63.9814	(43)
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	(44)
Energy content (annual)	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Distribution loss (46)m = 0.15 x (45)m	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1340	(55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)
Total per year (kWh/year) = Sum(64)m =												1476.5043	(64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												611.2796	(64a)
Heat gains from water heating, kWh/month	78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341	(72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751	(73)

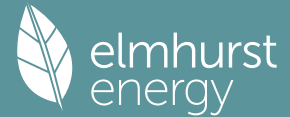
6. Solar gains

[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			6.3800		10.6334		0.6300		0.7000		0.7700		20.7331 (74)
East			0.9900		19.6403		0.6300		0.7000		0.7700		5.9423 (76)
East			1.9600		26.0000		0.6300		0.7000		1.0000		20.2260 (82)
Southeast			1.0800		36.7938		0.7200		0.7000		0.7700		13.8791 (77)
South			2.5200		46.7521		0.7200		0.7000		0.7700		41.1496 (78)
Southwest			1.0800		36.7938		0.7200		0.7000		0.7700		13.8791 (79)
Solar gains	115.8093	207.9293	311.6920	429.9375	520.1504	533.0044	506.9848	437.3776	352.4019	237.2475	140.6821		97.8195 (83)
Total gains	700.4951	791.1800	878.3435	966.9586	1025.5008	1007.1589	964.8889	897.0435	828.2142	744.2498	681.0827		667.4946 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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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	10.5511	10.6234	10.6954	11.0466	11.1148	11.4442	11.4442	11.5073	11.3150	11.1148	10.9776	10.8376
alpha	1.7034	1.7082	1.7130	1.7364	1.7410	1.7629	1.7629	1.7672	1.7543	1.7410	1.7318	1.7225
util living area	0.9529	0.9403	0.9189	0.8791	0.8170	0.7220	0.6201	0.6563	0.7953	0.8956	0.9398	0.9563 (86)
MIT	16.2155	16.5605	17.2318	18.2050	19.1587	20.0190	20.4864	20.4094	19.7202	18.5070	17.2373	16.2037 (87)
Th 2	18.9449	18.9550	18.9649	19.0123	19.0213	19.0637	19.0637	19.0717	19.0473	19.0213	19.0032	18.9844 (88)
util rest of house	0.9428	0.9272	0.8999	0.8472	0.7589	0.6108	0.4313	0.4789	0.7061	0.8614	0.9244	0.9470 (89)
MIT 2	13.8897	14.3129	15.1347	16.3254	17.4560	18.4315	18.8708	18.8236	18.1325	16.7138	15.1614	13.8831 (90)
Living area fraction									FLA = Living area /	(4) =		0.4303 (91)
MIT	14.8906	15.2801	16.0372	17.1343	18.1887	19.1147	19.5661	19.5060	18.8158	17.4855	16.0548	14.8818 (92)
Temperature adjustment												-0.1500
adjusted MIT	14.7406	15.1301	15.8872	16.9843	18.0387	18.9647	19.4161	19.3560	18.6658	17.3355	15.9048	14.7318 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9071	0.8868	0.8542	0.7992	0.7193	0.6035	0.4738	0.5120	0.6821	0.8166	0.8847	0.9130 (94)
Useful gains	635.3932	701.6093	750.2902	772.7989	737.6336	607.8432	457.1417	459.2550	564.9537	607.7209	602.5590	609.4469 (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	2347.9362	2284.9239	2082.5555	1736.4904	1353.1788	904.9525	583.8749	609.5281	957.4493	1437.8897	1903.1294	2305.8150 (97)
Space heating kWh	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (98a)
Space heating requirement - total per year (kWh/year)												7297.3025
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	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7297.3025
Space heating per m2										(98c) / (4) =		85.4285 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.3699	3.4822 (231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-17.6303	-28.2095	-45.7945	-57.5950	-66.4520	-55.1733	-54.5494	-49.4026	-40.8956	-34.1836	-20.4031	-14.8760 (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	-1.9034	-4.3867	-9.7206	-16.8061	-25.4643	-35.1950	-34.6247	-28.5092	-20.1250	-7.4863	-2.7667	-1.4704 (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												7297.3025 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1476.5043 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans: central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												201.2601 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-673.6234 (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)

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Energy used 0.0000 (237)
Total delivered energy for all uses 8953.7231 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7297.3025	16.4900	1203.3252 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1476.5043	16.4900	243.4756 (247)
Energy for instantaneous electric shower(s)	611.2796	16.4900	100.8000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	201.2601	16.4900	33.1878 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-485.1650	16.4900	-80.0037
PV Unit electricity exported	-188.4583	5.5900	-10.5348
Total			-90.5385 (252)
Total energy cost			1497.0109 (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] = 4.1322 (257)
SAP value 34.5499
SAP rating (Section 12) 35 (258)
SAP band F

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	7297.3025	0.1535	1120.3688 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1476.5043	0.1408	207.8534 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			1328.2223 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	201.2601	0.1443	29.0480 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-485.1650	0.1335	-64.7543
PV Unit electricity exported	-188.4583	0.1185	-22.3355
Total			-87.0898 (269)
Total CO2, kg/year			1360.9102 (272)
CO2 emissions per m2			15.9300 (273)
EI value			86.0173
EI rating			86 (274)
EI band			B

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200	2.9200	249.4264
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		
Dwelling volume			249.4264

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	2 * 10 = 20.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	Air changes per hour
Pressure test	20.0000 / (5) = 0.0802 (8)
Pressure Test Method	No
Measured/design AP50	Blower Door
Infiltration rate	15.0000 (17)
Number of sides sheltered	0.8302 (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) = 0.7679 (21)

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Wind speed	Jan 4.6000	Feb 4.3000	Mar 4.4000	Apr 4.0000	May 4.0000	Jun 3.5000	Jul 3.6000	Aug 3.8000	Sep 3.7000	Oct 3.9000	Nov 3.9000	Dec 4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.8831	0.8255	0.8447	0.7679	0.7679	0.6719	0.6911	0.7295	0.7103	0.7487	0.7487	0.8255 (22b)
Effective ac	0.8899	0.8407	0.8568	0.7949	0.7949	0.7257	0.7388	0.7661	0.7523	0.7803	0.7803	0.8407 (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
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.1450	2.2443		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum(A, m2)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	94.8666	(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)	49.4100 (36)
Point Thermal bridges	(36a) = 0.0000
Total fabric heat loss	(33) + (36) + (36a) = 144.2766 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan 73.2516	Feb 69.2016	Mar 70.5213	Apr 65.4247	May 65.4247	Jun 59.7366	Jul 60.8135	Aug 63.0585	Sep 61.9208	Oct 64.2264	Nov 64.2264	Dec 69.2016 (38)
Heat transfer coeff	217.5282	213.4783	214.7979	209.7014	209.7014	204.0132	205.0902	207.3351	206.1975	208.5031	208.5031	213.4783 (39)
Average = Sum(39)m / 12 =												209.8606

HLP	Jan 2.5466	Feb 2.4992	Mar 2.5146	Apr 2.4549	May 2.4549	Jun 2.3884	Jul 2.4010	Aug 2.4272	Sep 2.4139	Oct 2.4409	Nov 2.4409	Dec 2.4992 (40)
HLP (average)												2.4568
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

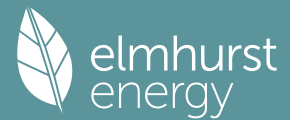
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.5577 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42b)
Hot water usage for other uses	28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822 (42b)
Average daily hot water use (litres/day)	40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235 (42c)
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056 (44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422 (45)
Energy content (annual)										Total = Sum(45)m =		1062.5943
Distribution loss (46)m = 0.15 x (45)m	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1340 (55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391 (64a)
Heat gains from water heating, kWh/month	78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 153.4623	Feb 153.4623	Mar 153.4623	Apr 153.4623	May 153.4623	Jun 153.4623	Jul 153.4623	Aug 153.4623	Sep 153.4623	Oct 153.4623	Nov 153.4623	Dec 153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341 (72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751 (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					6.3800	11.5821		0.6300	0.7000			0.7700	22.5828 (74)			
East					0.9900	21.5869		0.6300	0.7000			0.7700	6.5313 (76)			
East					1.9600	29.0000		0.6300	0.7000			1.0000	22.5598 (82)			
Southeast					1.0800	39.1209		0.7200	0.7000			0.7700	14.7569 (77)			
South					2.5200	49.2853		0.7200	0.7000			0.7700	43.3792 (78)			
Southwest					1.0800	39.1209		0.7200	0.7000			0.7700	14.7569 (79)			

Solar gains					124.5670	201.2699	304.1309	437.7978	513.3256	564.5506	538.3344	473.6515	381.2557	251.1938	156.3622	107.7298 (83)
Total gains					709.2529	784.5206	870.7824	974.8189	1018.6759	1038.7051	996.2385	933.3174	857.0679	758.1960	696.7629	677.4049 (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	10.9079	11.1148	11.0466	11.3150	11.3150	11.6305	11.5694	11.4442	11.5073	11.3801	11.3801	11.1148
alpha	1.7272	1.7410	1.7364	1.7543	1.7543	1.7754	1.7713	1.7629	1.7672	1.7587	1.7587	1.7410
util living area	0.9463	0.9346	0.9071	0.8543	0.7678	0.6069	0.4231	0.4709	0.7186	0.8661	0.9278	0.9496 (86)
MIT	16.6861	16.9698	17.7312	18.7091	19.6822	20.4908	20.8498	20.8033	20.1832	19.0461	17.7381	16.6883 (87)
Th 2	18.9938	19.0213	19.0123	19.0473	19.0473	19.0870	19.0794	19.0637	19.0717	19.0556	19.0556	19.0213 (88)
util rest of house	0.9341	0.9199	0.8837	0.8126	0.6838	0.4312	0.1168	0.1634	0.5801	0.8169	0.9081	0.9382 (89)
MIT 2	14.4788	14.8303	15.7574	16.9410	18.0618	18.8804	19.0744	19.0519	18.6243	17.3694	15.7887	14.4880 (90)
Living area fraction	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	19.2952	18.0909	16.6276	15.4349 (92)
MIT	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	19.2952	18.0909	16.6276	15.4349 (92)
Temperature adjustment	15.2787	15.6010	16.4568	17.5519	18.6091	19.4234	19.6884	19.6556	19.1452	17.9409	16.4776	-0.1500
adjusted MIT	15.2787	15.6010	16.4568	17.5519	18.6091	19.4234	19.6884	19.6556	19.1452	17.9409	16.4776	15.2849 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8962	0.8784	0.8372	0.7670	0.6590	0.4688	0.2291	0.2748	0.5870	0.7752	0.8661	0.9017 (94)
Ext temp.	635.6312	689.1559	728.9865	747.6988	671.2737	486.9147	228.2183	256.4933	503.0822	587.7212	603.4696	610.8325 (95)
Heat loss rate W	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Space heating kWh	2148.8911	2092.2972	1859.4717	1520.7375	1092.3633	616.8113	243.7383	281.0599	731.0119	1217.8521	1705.0591	2110.2126 (97)
Space heating requirement - total per year (kWh/year)	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (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)	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (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 (99)
Space heating per m2	(98c) / (4) = 72.0819 (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 %)	100.0000 (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
1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (64)
Water heating requirement	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (217)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)

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Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.9305	-27.3487	-44.4057	-57.4028	-63.5210	-57.4097	-56.8759	-52.3917	-43.5469	-35.5331	-22.4909	-16.3508 (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	-2.2368	-4.3873	-9.8903	-18.2384	-26.8591	-37.9134	-37.4385	-31.7594	-22.5151	-8.7921	-3.4433	-1.7912 (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												6157.2366 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1476.5043 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												201.2601 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-701.4726 (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												7785.8080 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6157.2366	21.5100	1324.4216 (240)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1476.5043	21.5100	317.5961 (247)	
Energy for instantaneous electric shower(s)	611.2796	21.5100	131.4862 (247a)	
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191 (249)	
Energy for lighting	201.2601	21.5100	43.2910 (250)	
Additional standing charges			0.0000 (251)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-496.2077	21.5100	-106.7343	
PV Unit electricity exported	-205.2649	5.5900	-11.4743	
Total			-118.2086 (252)	
Total energy cost			1707.4055 (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	6157.2366	0.1542	949.3704 (261)	
Total CO2 associated with community systems			0.0000 (373)	
Water heating (other fuel)	1476.5043	0.1408	207.8534 (264)	
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)	
Space and water heating			1157.2239 (265)	
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)	
Energy for lighting	201.2601	0.1443	29.0480 (268)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-496.2077	0.1333	-66.1257	
PV Unit electricity exported	-205.2649	0.1184	-24.2996	
Total			-90.4253 (269)	
Total CO2, kg/year			1186.5763 (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	6157.2366	1.5709	9672.0959 (275)	
Total CO2 associated with community systems			0.0000 (473)	
Water heating (other fuel)	1476.5043	1.5205	2245.0606 (278)	
Energy for instantaneous electric shower(s)	611.2796	1.5143	925.6816 (278a)	
Space and water heating			11917.1565 (279)	
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)	
Energy for lighting	201.2601	1.5338	308.6994 (282)	
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-496.2077	1.4924	-740.5639	
PV Unit electricity exported	-205.2649	0.4338	-89.0507	
Total			-829.6146 (283)	
Total Primary energy kWh/year			12383.9477 (286)	

SAP 10 EPC IMPROVEMENTS

00001

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Current energy efficiency rating: F 35
Current environmental impact rating: B 86

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

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

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

Potential energy efficiency rating: F 35
Potential environmental impact rating: B 86

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
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	£1826	£1826	£0
Space heating	£1333	£1333	£0
Water heating	£449	£449	£0
Lighting	£43	£43	£0
Generated (PV)	-£118	-£118	£0
Total cost of fuels	£1708	£1708	£0
Total cost of uses	£1707	£1707	£0
Delivered energy	91 kWh/m ²	91 kWh/m ²	0 kWh/m ²
Carbon dioxide emissions	1.2 tonnes	1.2 tonnes	0.0 tonnes
CO2 emissions per m ²	14 kg/m ²	14 kg/m ²	0 kg/m ²
Primary energy	145 kWh/m ²	145 kWh/m ²	0 kWh/m ²

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	85.4200 (1b)	2.9200 (2b)	249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		249.4264 (4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n) = 249.4264 (5)

2. Ventilation rate

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

Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 20.0000 / (5) = 0.0802 (8)
Pressure test No
Pressure Test Method Blower Door
Measured/design AP50 15.0000 (17)
Infiltration rate 0.8302 (18)
Number of sides sheltered 1 (19)

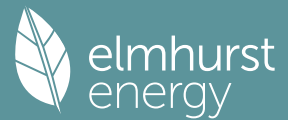
Shelter factor (20) = 1 - [0.075 x (19)] = 0.9250 (20)
Infiltration rate adjusted to include shelter factor (21) = (18) x (20) = 0.7679 (21)

	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	0.9791	0.9599	0.9407	0.8447	0.8255	0.7295	0.7295	0.7103	0.7679	0.8255	0.8639	0.9023 (22b)
Effective ac	0.9793	0.9607	0.9425	0.8568	0.8407	0.7661	0.7661	0.7523	0.7949	0.8407	0.8732	0.9071 (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
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389		(27)

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Existing Windows (Uw = 2.00)		4.6800	1.8519	8.6667	(27)
Sheltered Door (Ru = 2.5)		1.8900	0.3500	0.6615	(26)
RL1-RL2		1.9600	1.1450	2.2443	(27a)
Extension Ground		27.5600	0.1800	4.9608	(28a)
Existing Ground		57.8600	0.6600	38.1876	(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390 (29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880 (29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952 (29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140 (30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755 (30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062 (30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890 (30)
Total net area of external elements Aum(A, m2)		247.0500			(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =	94.8666	(33)
Party Wall 1		25.3500	0.0000	0.0000	(32)
Party Ceiling 1		52.0100			(32b)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K					100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)					49.4100 (36)
Point Thermal bridges				(36a) =	0.0000
Total fabric heat loss				(33) + (36) + (36a) =	144.2766 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	80.6083	79.0762	77.5746	70.5213	69.2016	63.0585	63.0585	61.9208	65.4247	69.2016	71.8713	74.6623	(38)
Heat transfer coeff	224.8849	223.3529	221.8512	214.7979	213.4783	207.3351	207.3351	206.1975	209.7014	213.4783	216.1479	218.9389	(39)
Average = Sum(39)m / 12 =												214.7916	
HLP	2.6327	2.6148	2.5972	2.5146	2.4992	2.4272	2.4272	2.4139	2.4549	2.4992	2.5304	2.5631	(40)
HLP (average)												2.5145	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.5577 (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	28.9802	28.5498	27.9437	26.8262	25.9894	25.0615	24.5603	25.1622	25.8175	26.8103	27.9508	28.8822	(42b)
Hot water usage for other uses	40.8235	39.3390	37.8545	36.3700	34.8855	33.4010	33.4010	34.8855	36.3700	37.8545	39.3390	40.8235	(42c)
Average daily hot water use (litres/day)												63.9814	(43)
Daily hot water use	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	(44)
Energy conte	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Energy content (annual)												1062.5943	
Distribution loss (46)m = 0.15 x (45)m	16.5828	14.5009	15.1694	12.9769	12.2924	10.7830	10.5149	11.1527	11.5025	13.1624	14.3800	16.3713	(46)
Water storage loss:													
Store volume												150.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900	(48)
Temperature factor from Table 2b												0.6000	(49)
Enter (49) or (54) in (55)												1.1340	(55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391	(64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												611.2796	(64a)
Heat gains from water heating, kWh/month	78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478	(65)

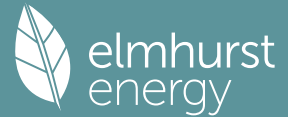
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	(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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	(71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341	(72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751	(73)

6. Solar gains

[Jan]	Area m2	Solar flux Table 6a	g Specific data	FF Specific data	Access factor	Gains W
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				W/m2		or Table 6b		or Table 6c		Table 6d			
North				6.3800	10.6334		0.6300		0.7000		0.7700		20.7331 (74)
East				0.9900	19.6403		0.6300		0.7000		0.7700		5.9423 (76)
East				1.9600	26.0000		0.6300		0.7000		1.0000		20.2260 (82)
Southeast				1.0800	36.7938		0.7200		0.7000		0.7700		13.8791 (77)
South				2.5200	46.7521		0.7200		0.7000		0.7700		41.1496 (78)
Southwest				1.0800	36.7938		0.7200		0.7000		0.7700		13.8791 (79)
Solar gains	115.8093	207.9293	311.6920	429.9375	520.1504	533.0044	506.9848	437.3776	352.4019	237.2475	140.6821	97.8195	(83)
Total gains	700.4951	791.1800	878.3435	966.9586	1025.5008	1007.1589	964.8889	897.0435	828.2142	744.2498	681.0827	667.4946	(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	10.5511	10.6234	10.6954	11.0466	11.1148	11.4442	11.4442	11.5073	11.3150	11.1148	10.9776	10.8376	
alpha	1.7034	1.7082	1.7130	1.7364	1.7410	1.7629	1.7629	1.7672	1.7543	1.7410	1.7318	1.7225	
util living area	0.9529	0.9403	0.9189	0.8791	0.8170	0.7220	0.6201	0.6563	0.7953	0.8956	0.9398	0.9563	(86)
MIT	16.2155	16.5605	17.2318	18.2050	19.1587	20.0190	20.4864	20.4094	19.7202	18.5070	17.2373	16.2037	(87)
Th 2	18.9449	18.9550	18.9649	19.0123	19.0213	19.0637	19.0637	19.0717	19.0473	19.0213	19.0032	18.9844	(88)
util rest of house	0.9428	0.9272	0.8999	0.8472	0.7589	0.6108	0.4313	0.4789	0.7061	0.8614	0.9244	0.9470	(89)
MIT 2	13.8897	14.3129	15.1347	16.3254	17.4560	18.4315	18.8708	18.8236	18.1325	16.7138	15.1614	13.8831	(90)
Living area fraction									fLA = Living area / (4) =				0.4303 (91)
MIT	14.8906	15.2801	16.0372	17.1343	18.1887	19.1147	19.5661	19.5060	18.8158	17.4855	16.0548	14.8818	(92)
Temperature adjustment												-0.1500	
adjusted MIT	14.7406	15.1301	15.8872	16.9843	18.0387	18.9647	19.4161	19.3560	18.6658	17.3355	15.9048	14.7318	(93)
8. Space heating requirement													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9071	0.8868	0.8542	0.7992	0.7193	0.6035	0.4738	0.5120	0.6821	0.8166	0.8847	0.9130	(94)
Useful gains	635.3932	701.6093	750.2902	772.7989	737.6336	607.8432	457.1417	459.2550	564.9537	607.7209	602.5590	609.4469	(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	2347.9362	2284.9239	2082.5555	1736.4904	1353.1788	904.9525	583.8749	609.5281	957.4493	1437.8897	1903.1294	2305.8150	(97)
Space heating kWh	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(98a)
Space heating requirement - total per year (kWh/year)												7297.3025	
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	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												7297.3025	
Space heating per m2										(98c) / (4) =		85.4285	(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 %)													100.0000 (206)
Efficiency of main space heating system 2 (in %)													0.0000 (207)
Efficiency of secondary/supplementary heating system, %													0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000	(210)
Space heating fuel (main heating system)	1274.1320	1063.9874	991.2054	693.8579	457.9657	0.0000	0.0000	0.0000	0.0000	617.6456	936.4107	1262.0978	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822	(231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306	(232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-17.6303	-28.2095	-45.7945	-57.5950	-66.4520	-55.1733	-54.5494	-49.4026	-40.8956	-34.1836	-20.4031	-14.8760	(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	-1.9034	-4.3867	-9.7206	-16.8061	-25.4643	-35.1950	-34.6247	-28.5092	-20.1250	-7.4863	-2.7667	-1.4704	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity) (234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity) (235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation) (235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													

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Space heating fuel - main system 1	7297.3025 (211)
Space heating fuel - main system 2	0.0000 (213)
Space heating fuel - secondary	0.0000 (215)
Efficiency of water heater	100.0000
Water heating fuel used	1476.5043 (219)
Space cooling fuel	0.0000 (221)
Electricity for pumps and fans:	
central heating pump	41.0000 (230c)
Total electricity for the above, kWh/year	41.0000 (231)
Electricity for lighting (calculated in Appendix L)	201.2601 (232)
Energy saving/generation technologies (Appendices M ,N and Q)	
PV generation	-673.6234 (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	8953.7231 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	7297.3025	16.4900	1203.3252 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1476.5043	16.4900	243.4756 (247)
Energy for instantaneous electric shower(s)	611.2796	16.4900	100.8000 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	201.2601	16.4900	33.1878 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-485.1650	16.4900	-80.0037
PV Unit electricity exported	-188.4583	5.5900	-10.5348
Total			-90.5385 (252)
Total energy cost			1497.0109 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600 (256)
Energy cost factor (ECF)	4.1322 (257)
SAP value	34.5499
SAP rating (Section 12)	35 (258)
SAP band	F

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	7297.3025	0.1535	1120.3688 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1476.5043	0.1408	207.8534 (264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425 (264a)
Space and water heating			1328.2223 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	201.2601	0.1443	29.0480 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-485.1650	0.1335	-64.7543
PV Unit electricity exported	-188.4583	0.1185	-22.3355
Total			-87.0898 (269)
Total CO2, kg/year			1360.9102 (272)
CO2 emissions per m2			15.9300 (273)
EI value			86.0173
EI rating			86 (274)
EI band			B

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

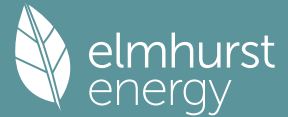
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	85.4200 (1b)	x 2.9200 (2b)	= 249.4264 (1b) - (3b)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	85.4200		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 249.4264 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		20.0000	Air changes per hour		0.0802 (8)
Pressure test						No
Pressure Test Method						Blower Door
Measured/design AP50						15.0000 (17)
Infiltration rate						0.8302 (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) =					0.7679 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000	(22)
Adj infilt rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750	(22a)
Effective ac	0.8831	0.8255	0.8447	0.7679	0.7679	0.6719	0.6911	0.7295	0.7103	0.7487	0.7487	0.8255	(22b)
	0.8899	0.8407	0.8568	0.7949	0.7949	0.7257	0.7388	0.7661	0.7523	0.7803	0.7803	0.8407	(25)

3. Heat losses and heat loss parameter

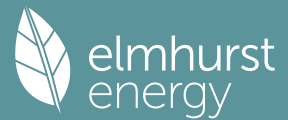
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
New Glazing (Uw = 1.20)			7.3700	1.1450	8.4389		(27)
Existing Windows (Uw = 2.00)			4.6800	1.8519	8.6667		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL2			1.9600	1.1450	2.2443		(27a)
Extension Ground			27.5600	0.1800	4.9608		(28a)
Existing Ground			57.8600	0.6600	38.1876		(28a)
Existing Solid Wall - upgraded	60.8100	4.6800	56.1300	0.3000	16.8390		(29a)
New Extension Wall	48.9700	7.3700	41.6000	0.1800	7.4880		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Extension Flat Roof	12.7600		12.7600	0.1500	1.9140		(30)
Extension Pitched Roof	15.1300	1.9600	13.1700	0.1500	1.9755		(30)
Sheltered Ceiling to Stairwell	4.5900		4.5900	0.1538	0.7062		(30)
Existing Roof (Bay)	1.2600		1.2600	0.1500	0.1890		(30)
Total net area of external elements Aum(A, m2)			247.0500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	94.8666		(33)
Party Wall 1			25.3500	0.0000	0.0000		(32)
Party Ceiling 1			52.0100				(32b)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							49.4100 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	144.2766 (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	73.2516	69.2016	70.5213	65.4247	65.4247	59.7366	60.8135	63.0585	61.9208	64.2264	64.2264	69.2016	(38)
Average = Sum(39)m / 12 =	217.5282	213.4783	214.7979	209.7014	209.7014	204.0132	205.0902	207.3351	206.1975	208.5031	208.5031	213.4783	(39)
												209.8606	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	2.5466	2.4992	2.5146	2.4549	2.4549	2.3884	2.4010	2.4272	2.4139	2.4409	2.4409	2.4992	(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													2.5577 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	69.8036	67.8887	65.7981	63.1961	60.8749	58.4625	57.9613	60.0477	62.1875	64.6648	67.2898	69.7056	(44)
Energy content (annual)	110.5518	96.6726	101.1293	86.5124	81.9493	71.8865	70.0992	74.3516	76.6834	87.7495	95.8667	109.1422	(45)
Distribution loss (46)m = 0.15 x (45)m													(46)
Water storage loss:													
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8900 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													1.1340 (55)
Total storage loss													
If cylinder contains dedicated solar storage													(57)
Primary loss													(59)
Combi loss													(61)
Total heat required for water heating calculated for each month													(62)
WWHRS													(63a)
PV diverter													(63b)
Solar input													(63c)
FGHRS													(63d)
Output from w/h													(64)

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												Total per year (kWh/year) = Sum(64)m =	1476.5043 (64)
Electric shower(s)	53.7391	47.8820	52.2853	49.8953	50.8315	48.4883	50.1046	50.8315	49.8953	52.2853	51.3022	53.7391 (64a)	
												Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	611.2796 (64a)
Heat gains from water heating, kWh/month	78.3165	69.5158	74.8200	68.4552	68.0792	63.2403	63.9573	65.5530	65.1870	70.3712	71.9172	77.8478 (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	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623	153.4623 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	28.4904	25.3050	20.5794	15.5799	11.6462	9.8322	10.6240	13.8095	18.5351	23.5346	27.4683	29.2823 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	343.8733	347.4417	338.4496	319.3065	295.1419	272.4305	257.2579	253.6895	262.6816	281.8247	305.9893	328.7007 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039	52.9039 (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)	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082	-102.3082 (71)
Water heating gains (Table 5)	105.2641	103.4461	100.5645	95.0766	91.5043	87.8338	85.9642	88.1088	90.5375	94.5850	99.8850	104.6341 (72)
Total internal gains	584.6859	583.2507	566.6515	537.0211	505.3504	474.1545	457.9041	459.6659	475.8123	507.0022	540.4007	569.6751 (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	6.3800	11.5821	0.6300	0.7000	0.7700	22.5828 (74)
East	0.9900	21.5869	0.6300	0.7000	0.7700	6.5313 (76)
East	1.9600	29.0000	0.6300	0.7000	1.0000	22.5598 (82)
Southeast	1.0800	39.1209	0.7200	0.7000	0.7700	14.7569 (77)
South	2.5200	49.2853	0.7200	0.7000	0.7700	43.3792 (78)
Southwest	1.0800	39.1209	0.7200	0.7000	0.7700	14.7569 (79)

Solar gains	124.5670	201.2699	304.1309	437.7978	513.3256	564.5506	538.3344	473.6515	381.2557	251.1938	156.3622	107.7298 (83)
Total gains	709.2529	784.5206	870.7824	974.8189	1018.6759	1038.7051	996.2385	933.3174	857.0679	758.1960	696.7629	677.4049 (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	10.9079	11.1148	11.0466	11.3150	11.3150	11.6305	11.5694	11.4442	11.5073	11.3801	11.3801	11.1148
alpha	1.7272	1.7410	1.7364	1.7543	1.7543	1.7754	1.7713	1.7629	1.7672	1.7587	1.7587	1.7410
util living area	0.9463	0.9346	0.9071	0.8543	0.7678	0.6069	0.4231	0.4709	0.7186	0.8661	0.9278	0.9496 (86)
MIT	16.6861	16.9698	17.7312	18.7091	19.6822	20.4908	20.8498	20.8033	20.1832	19.0461	17.7381	16.6883 (87)
Th 2	18.9938	19.0213	19.0123	19.0473	19.0473	19.0870	19.0794	19.0637	19.0717	19.0556	19.0556	19.0213 (88)
util rest of house	0.9341	0.9199	0.8837	0.8126	0.6838	0.4312	0.1168	0.1634	0.5801	0.8169	0.9081	0.9382 (89)
MIT 2	14.4788	14.8303	15.7574	16.9410	18.0618	18.8804	19.0744	19.0519	18.6243	17.3694	15.7887	14.4880 (90)
Living area fraction	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	fLA = Living area / (4) =	19.2952	18.0909	16.6276
MIT	15.4287	15.7510	16.6068	17.7019	18.7591	19.5734	19.8384	19.8056	19.2952	18.0909	16.6276	15.4349 (91)
Temperature adjustment												-0.1500
adjusted MIT	15.2787	15.6010	16.4568	17.5519	18.6091	19.4234	19.6884	19.6556	19.1452	17.9409	16.4776	15.2849 (93)

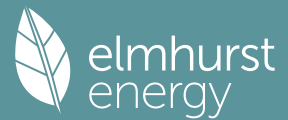
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.8962	0.8784	0.8372	0.7670	0.6590	0.4688	0.2291	0.2748	0.5870	0.7752	0.8661	0.9017 (94)
Useful gains	635.6312	689.1559	728.9865	747.6988	671.2737	486.9147	228.2183	256.4933	503.0822	587.7212	603.4696	610.8325 (95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Heat loss rate W	2148.8911	2092.2972	1859.4717	1520.7375	1092.3633	616.8113	243.7383	281.0599	731.0119	1217.8521	1705.0591	2110.2126 (97)
Space heating kWh	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98a)
Space heating requirement - total per year (kWh/year)												6157.2366
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	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												6157.2366
Space heating per m2										(98c) / (4) =		72.0819 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)

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Space heating fuel (main heating system)	1125.8654	942.9109	841.0810	556.5878	313.2907	0.0000	0.0000	0.0000	0.0000	468.8174	793.1444	1115.5388	(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	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	145.7058	128.4246	136.2833	120.5324	117.1033	105.9065	105.2532	109.5056	110.7034	122.9035	129.8867	144.2962	(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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	(231)
Lighting	24.9375	20.0058	18.0130	13.1971	10.1938	8.3284	9.2991	12.0874	15.7003	20.5997	23.2673	25.6306	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-18.9305	-27.3487	-44.4057	-57.4028	-63.5210	-57.4097	-56.8759	-52.3917	-43.5469	-35.5331	-22.4909	-16.3508	(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)	-2.2368	-4.3873	-9.8903	-18.2384	-26.8591	-37.9134	-37.4385	-31.7594	-22.5151	-8.7921	-3.4433	-1.7912	(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												6157.2366	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1476.5043	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												201.2601	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-701.4726	(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												7785.8080	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	6157.2366	21.5100	1324.4216	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1476.5043	21.5100	317.5961	(247)
Energy for instantaneous electric shower(s)	611.2796	21.5100	131.4862	(247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191	(249)
Energy for lighting	201.2601	21.5100	43.2910	(250)
Additional standing charges			0.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-496.2077	21.5100	-106.7343	
PV Unit electricity exported	-205.2649	5.5900	-11.4743	
Total			-118.2086	(252)
Total energy cost			1707.4055	(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	6157.2366	0.1542	949.3704	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1476.5043	0.1408	207.8534	(264)
Energy for instantaneous electric shower(s)	611.2796	0.1391	85.0425	(264a)
Space and water heating			1157.2239	(265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872	(267)
Energy for lighting	201.2601	0.1443	29.0480	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-496.2077	0.1333	-66.1257	
PV Unit electricity exported	-205.2649	0.1184	-24.2996	
Total			-90.4253	(269)
Total CO2, kg/year			1186.5763	(272)

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

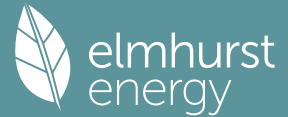
	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year	
Space heating - main system 1	6157.2366	1.5709	9672.0959	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1476.5043	1.5205	2245.0606	(278)

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Energy for instantaneous electric shower(s)	611.2796	1.5143	925.6816 (278a)
Space and water heating			11917.1565 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	201.2601	1.5338	308.6994 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-496.2077	1.4924	-740.5639
PV Unit electricity exported	-205.2649	0.4338	-89.0507
Total			-829.6146 (283)
Total Primary energy kWh/year			12383.9477 (286)

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Property Reference	Flat 2 - As Proposed			Issued on Date	07/11/2023
Assessment Reference	00001	Prop Type Ref	18416		
Property	Flat 2 - As Proposed, 26, Ravenstone Road, London, N8 0JP				
SAP Rating	49 E	DER		TER	
Environmental	89 B	% DER < TER			N/A
CO ₂ Emissions (t/year)	0.93	DFEE		TFEE	
Compliance Check	See BREL	% DFEE < TFEE			
% DPER < TPER		DPER		TPER	
Assessor Details	Mr. Andrew Bamford			Assessor ID	F391-0001
Client					

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	221.2003 (5)

2. Ventilation rate

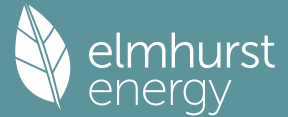
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (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	1.0445	1.0240	1.0035	0.9011	0.8806	0.7782	0.7782	0.7578	0.8192	0.8806	0.9216	0.9626 (22b)
Effective ac	1.0445	1.0240	1.0035	0.9060	0.8878	0.8028	0.8028	0.7871	0.8355	0.8878	0.9247	0.9633 (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
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.1450	2.4046		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072		(30)
Loft voids	12.1600		12.1600	0.1651	2.0081		(30)
Total net area of external elements Aum(A, m ²)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125		(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							100.0000 (35)

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Thermal bridges (Default value 0.200 * total exposed area)
 Point Thermal bridges (36a) = 38.7040 (36)
 Total fabric heat loss (33) + (36) + (36a) = 100.8165 (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	76.2431	74.7482	73.2532	66.1352	64.8034	58.6035	58.6035	57.4553	60.9916	64.8034	67.4977	70.3144 (38)
Average = Sum(39)m / 12 =	177.0596	175.5646	174.0697	166.9517	165.6199	159.4199	159.4199	158.2718	161.8081	165.6199	168.3142	171.1309 (39)
												166.9375
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.9684	1.9518	1.9352	1.8561	1.8412	1.7723	1.7723	1.7596	1.7989	1.8412	1.8712	1.9025 (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												2.6250 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths												29.4656 (42b)
Hot water usage for other uses												41.5130 (42c)
Average daily hot water use (litres/day)												65.0584 (43)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daily hot water use	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790 (44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794 (45)
Energy content (annual)												Total = Sum(45)m = 1080.4805
Distribution loss (46)m = 0.15 x (45)m												16.8619 (46)
Water storage loss:												
Store volume												150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):												1.8900 (48)
Temperature factor from Table 2b												0.6000 (49)
Enter (49) or (54) in (55)												1.1340 (55)
Total storage loss												35.1540 (56)
If cylinder contains dedicated solar storage												35.1540 (57)
Primary loss												0.0000 (59)
Combi loss												0.0000 (61)
Total heat required for water heating calculated for each month												
WWHRS	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432 (64a)
Heat gains from water heating, kWh/month	79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 621.5636 (64a)												

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

Metabolic gains (Table 5), Watts												
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568 (68)
Pumps, fans	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752 (69)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000 (70)
Water heating gains (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014 (71)
Total internal gains	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590 (72)
	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812 (73)

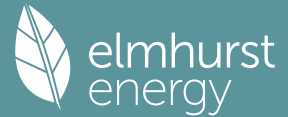
6. Solar gains

[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					1.7600	10.6334		0.6300	0.7000	0.7700		5.7195 (74)
South					2.1000	26.0000		0.6300	0.7000	1.0000		21.6707 (82)
North					3.5300	10.6334		0.7200	0.7000	0.7700		13.1102 (74)
East					1.6000	19.6403		0.7200	0.7000	0.7700		10.9757 (76)
South					5.0300	46.7521		0.7200	0.7000	0.7700		82.1358 (78)
Solar gains	133.6119	236.9810	347.8720	468.4739	557.3474	567.2481	541.1209	472.9628	389.4901	268.4116	161.7784	113.1994 (83)
Total gains	736.2206	838.0168	931.5685	1021.3570	1077.3021	1054.9615	1012.0465	945.7934	879.1994	790.4697	718.5216	700.2806 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C) 21.0000 (85)

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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	14.1117	14.2319	14.3541	14.9661	15.0864	15.6731	15.6731	15.7868	15.4418	15.0864	14.8449	14.6006
alpha	1.9408	1.9488	1.9569	1.9977	2.0058	2.0449	2.0449	2.0525	2.0295	2.0058	1.9897	1.9734
util living area	0.9486	0.9323	0.9053	0.8546	0.7772	0.6603	0.5436	0.5815	0.7459	0.8745	0.9318	0.9527 (86)
MIT	17.0188	17.3776	18.0092	18.9115	19.7148	20.3964	20.7179	20.6667	20.1475	19.1148	17.9731	17.0341 (87)
Th 2	19.3545	19.3657	19.3769	19.4310	19.4413	19.4894	19.4894	19.4984	19.4708	19.4413	19.4206	19.3991 (88)
util rest of house	0.9390	0.9197	0.8867	0.8238	0.7234	0.5663	0.4006	0.4436	0.6660	0.8415	0.9172	0.9440 (89)
MIT 2	14.9539	15.4018	16.1882	17.3127	18.2740	19.0573	19.3584	19.3295	18.8036	17.5861	16.1675	14.9828 (90)
Living area fraction									FLA = Living area / (4) =			0.3250 (91)
MIT	15.6249	16.0438	16.7800	17.8323	18.7422	19.4924	19.8002	19.7640	19.2403	18.0828	16.7543	15.6494 (92)
Temperature adjustment												-0.1500
adjusted MIT	15.4749	15.8938	16.6300	17.6823	18.5922	19.3424	19.6502	19.6140	19.0903	17.9328	16.6043	15.4994 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9025	0.8783	0.8405	0.7773	0.6864	0.5555	0.4180	0.4559	0.6410	0.7965	0.8767	0.9096 (94)
Useful gains	664.4385	736.0168	782.9899	793.9245	739.4764	585.9870	423.0412	431.1882	563.5867	629.5958	629.9138	637.0045 (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	1978.6280	1930.1254	1763.3195	1466.2125	1141.4810	756.0353	486.2580	508.6915	807.4751	1214.4630	1599.7041	1933.6785 (97)
Space heating kWh	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98a)
Space heating requirement - total per year (kWh/year)												5390.8177
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	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5390.8177
Space heating per m2										(98c) / (4) =		59.9313 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.3065	-29.1272	-46.9751	-58.5349	-67.0373	-57.6553	-57.0030	-51.6492	-42.7888	-35.0664	-21.1147	-15.4591 (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	-2.2289	-5.1405	-11.3868	-19.6816	-29.5926	-37.3474	-36.7441	-30.2581	-21.3610	-8.7404	-3.2433	-1.7256 (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												5390.8177 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1494.3905 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												216.4307 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-708.1682 (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)

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Energy used 0.0000 (237)
Total delivered energy for all uses 7056.0345 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5390.8177	16.4900	888.9458 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	16.4900	246.4250 (247)
Energy for instantaneous electric shower(s)	621.5636	16.4900	102.4958 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	216.4307	16.4900	35.6894 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.7176	16.4900	-82.5683
PV Unit electricity exported	-207.4506	5.5900	-11.5965
Total			-94.1648 (252)
Total energy cost			1186.1522 (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] = 3.1642 (257)
SAP value 48.7076
SAP rating (Section 12) 49 (258)
SAP band E

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	5390.8177	0.1540	829.9217 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1040.3075 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.7176	0.1334	-66.7790
PV Unit electricity exported	-207.4506	0.1197	-24.8323
Total			-91.6113 (269)
Total CO2, kg/year			1072.0943 (272)
CO2 emissions per m2			11.9200 (273)
EI value			89.3545
EI rating			89 (274)
EI band			B

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

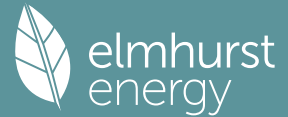
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.2003 (5)

2. Ventilation rate

	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	3 * 10 = 30.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1356 (8)
Pressure test	No
Pressure Test Method	Blower Door
Measured/design AP50	15.0000 (17)
Infiltration rate	0.8856 (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) = 0.8192 (21)

Wind speed	Jan 4.6000	Feb 4.3000	Mar 4.4000	Apr 4.0000	May 4.0000	Jun 3.5000	Jul 3.6000	Aug 3.8000	Sep 3.7000	Oct 3.9000	Nov 3.9000	Dec 4.3000 (22)
Wind factor	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Adj infilt rate	0.9421	0.8806	0.9011	0.8192	0.8192	0.7168	0.7373	0.7782	0.7578	0.7987	0.7987	0.8806 (22b)
Effective ac	0.9438	0.8878	0.9060	0.8355	0.8355	0.7569	0.7718	0.8028	0.7871	0.8190	0.8190	0.8878 (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
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.1450	2.4046		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072		(30)
Loft voids	12.1600		12.1600	0.1651	2.0081		(30)
Total net area of external elements Aum(A, m2)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125		(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32d)

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

Thermal bridges (Default value 0.200 * total exposed area)

Point Thermal bridges

Total fabric heat loss

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

(38)m	Jan 68.8908	Feb 64.8034	Mar 66.1352	Apr 60.9916	May 60.9916	Jun 55.2509	Jul 56.3378	Aug 58.6035	Sep 57.4553	Oct 59.7822	Nov 59.7822	Dec 64.8034 (38)
Heat transfer coeff	169.7072	165.6199	166.9517	161.8081	161.8081	156.0674	157.1543	159.4199	158.2718	160.5987	160.5987	165.6199 (39)
Average = Sum(39)m / 12 =												161.9688

HLP	Jan 1.8867	Feb 1.8412	Mar 1.8561	Apr 1.7989	May 1.7989	Jun 1.7350	Jul 1.7471	Aug 1.7723	Sep 1.7596	Oct 1.7854	Nov 1.7854	Dec 1.8412 (40)
HLP (average)												1.8007
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

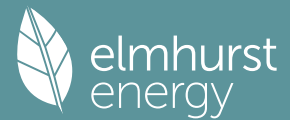
4. Water heating energy requirements (kWh/year)

Assumed occupancy												2.6250 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (42a)
Hot water usage for baths	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660 (42b)
Hot water usage for other uses	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130 (42c)
Average daily hot water use (litres/day)												65.0584 (43)
Daily hot water use	Jan 70.9786	Feb 69.0315	Mar 66.9056	Apr 64.2598	May 61.8995	Jun 59.4465	Jul 58.9369	Aug 61.0584	Sep 63.2343	Oct 65.7533	Nov 68.4225	Dec 70.8790 (44)
Energy conte	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794 (45)
Energy content (annual)										Total = Sum(45)m =		1080.4805
Distribution loss (46)m = 0.15 x (45)m	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469 (46)
Water storage loss:												150.0000 (47)
Store volume												1.8900 (48)
a) If manufacturer declared loss factor is known (kWh/day):												0.6000 (49)
Temperature factor from Table 2b												1.1340 (55)
Enter (49) or (54) in (55)												
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636 (64a)
Heat gains from water heating, kWh/month	79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847 (65)

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

Metabolic gains (Table 5), Watts												
(66)m	Jan 157.5021	Feb 157.5021	Mar 157.5021	Apr 157.5021	May 157.5021	Jun 157.5021	Jul 157.5021	Aug 157.5021	Sep 157.5021	Oct 157.5021	Nov 157.5021	Dec 157.5021 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5												

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Cooking gains	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568 (68)
	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752 (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)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014 (71)
Water heating gains (Table 5)	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590 (72)
Total internal gains	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812 (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					1.7600	11.5821	0.6300	0.7000	0.7700	6.2297 (74)			
South					2.1000	29.0000	0.6300	0.7000	1.0000	24.1712 (82)			
North					3.5300	11.5821	0.7200	0.7000	0.7700	14.2799 (74)			
East					1.6000	21.5869	0.7200	0.7000	0.7700	12.0635 (76)			
South					5.0300	49.2853	0.7200	0.7000	0.7700	86.5863 (78)			
Solar gains	143.3307	228.6278	338.1055	475.2445	548.3224	599.1950	572.9205	510.3825	419.7132	283.1643	179.2926	124.3581 (83)	
Total gains	745.9393	829.6636	921.8021	1028.1276	1068.2772	1086.9085	1043.8461	983.2131	909.4225	805.2224	736.0359	711.4393 (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	14.7231	15.0864	14.9661	15.4418	15.4418	16.0098	15.8991	15.6731	15.7868	15.5581	15.5581	15.0864
alpha	1.9815	2.0058	1.9977	2.0295	2.0295	2.0673	2.0599	2.0449	2.0525	2.0372	2.0372	2.0058
util living area	0.9403	0.9250	0.8900	0.8223	0.7158	0.5283	0.3434	0.3883	0.6513	0.8356	0.9161	0.9443 (86)
MIT	17.4885	17.8007	18.4817	19.3605	20.1393	20.7292	20.9353	20.9093	20.5089	19.5946	18.4635	17.5048 (87)
Th 2	19.4099	19.4413	19.4310	19.4708	19.4708	19.5158	19.5072	19.4894	19.4984	19.4802	19.4802	19.4413 (88)
util rest of house	0.9287	0.9108	0.8672	0.7826	0.6414	0.3962	0.1490	0.1874	0.5367	0.7889	0.8972	0.9336 (89)
MIT 2	15.5550	15.9503	16.7912	17.8721	18.7716	19.3821	19.5006	19.4768	19.1911	18.1801	16.7971	15.5842 (90)
Living area fraction	16.1833	16.5516	17.3406	18.3558	19.2161	19.8198	19.9668	19.9423	19.6194	18.6398	17.3386	16.2083 (91)
MIT	16.0333	16.4016	17.1906	18.2058	19.0661	19.6698	19.8168	19.7923	19.4694	18.4898	17.1886	16.0583 (93)
Temperature adjustment												-0.1500
adjusted MIT												16.0583 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.8902	0.8690	0.8209	0.7398	0.6176	0.4116	0.1925	0.2318	0.5340	0.7479	0.8550	0.8968 (94)
Ext temp.	664.0590	720.9538	756.7507	760.6118	659.7248	447.4126	200.9832	227.8644	485.6624	602.2373	629.2813	638.0328 (95)
Heat loss rate W	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000 (96)
Space heating kWh	1804.5481	1755.8377	1567.7691	1279.2203	916.8136	510.3153	206.9436	237.9050	612.4117	1026.1864	1427.5014	1765.2329 (97)
Space heating requirement - total per year (kWh/year)	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (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)	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (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 (99)
Space heating per m ²												49.3698 (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 %)	100.0000 (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
848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Water heating requirement	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Efficiency of water heater (217)m	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (219)
Fuel for water heating, kWh/month	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Space cooling fuel requirement (221)m	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)

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Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-19.6307	-28.2114	-45.4949	-58.2156	-64.1138	-59.9823	-59.4237	-54.7620	-45.5539	-36.3763	-23.2246	-16.9690 (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	-2.6221	-5.1521	-11.5854	-21.3047	-30.9012	-40.2292	-39.7273	-33.7045	-23.8960	-10.2220	-4.0395	-2.1034 (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												4440.8092 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												100.0000
Water heating fuel used												1494.3905 (219)
Space cooling fuel												0.0000 (221)
Electricity for pumps and fans:												
central heating pump												41.0000 (230c)
Total electricity for the above, kWh/year												41.0000 (231)
Electricity for lighting (calculated in Appendix L)												216.4307 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-737.4456 (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												6076.7486 (238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4440.8092	21.5100	955.2181 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	21.5100	321.4434 (247)
Energy for instantaneous electric shower(s)	621.5636	21.5100	133.6983 (247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191 (249)
Energy for lighting	216.4307	21.5100	46.5543 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.9581	21.5100	-110.1222
PV Unit electricity exported	-225.4875	5.5900	-12.6048
Total			-122.7269 (252)
Total energy cost			1343.0062 (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	4440.8092	0.1547	686.9212 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			897.3070 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.9581	0.1331	-68.1670
PV Unit electricity exported	-225.4875	0.1195	-26.9561
Total			-95.1232 (269)
Total CO2, kg/year			925.5819 (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	4440.8092	1.5727	6983.9994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	1.5206	2272.3108 (278)
Energy for instantaneous electric shower(s)	621.5636	1.5143	941.2551 (278a)
Space and water heating			9256.3102 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	216.4307	1.5338	331.9687 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.9581	1.4920	-763.8524
PV Unit electricity exported	-225.4875	0.4383	-98.8215
Total			-862.6739 (283)
Total Primary energy kWh/year			9728.8849 (286)

SAP 10 EPC IMPROVEMENTS

00001

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Current energy efficiency rating: E 49
Current environmental impact rating: B 89

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

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

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

Potential energy efficiency rating: E 49
Potential environmental impact rating: B 89

Fuel prices for cost data on this page from database revision number 531 TEST (31 Oct 2023)
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	£1466	£1466	£0
Space heating	£964	£964	£0
Water heating	£455	£455	£0
Lighting	£47	£47	£0
Generated (PV)	-£123	-£123	£0
Total cost of fuels	£1343	£1343	£0
Total cost of uses	£1343	£1343	£0
Delivered energy	68 kWh/m²	68 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.9 tonnes	0.9 tonnes	0.0 tonnes
CO2 emissions per m²	10 kg/m²	10 kg/m²	0 kg/m²
Primary energy	108 kWh/m²	108 kWh/m²	0 kWh/m²

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 221.2003 (5)

2. Ventilation rate

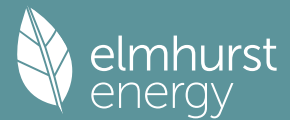
Number of open chimneys	0 * 80 =	0.0000 (6a)
Number of open flues	0 * 20 =	0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000 (6d)
Number of flues attached to other heater	0 * 35 =	0.0000 (6e)
Number of blocked chimneys	0 * 20 =	0.0000 (6f)
Number of intermittent extract fans	3 * 10 =	30.0000 (7a)
Number of passive vents	0 * 10 =	0.0000 (7b)
Number of flueless gas fires	0 * 40 =	0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1356 (8)
Pressure test	No	
Pressure Test Method	Blower Door	
Measured/design AP50	15.0000	(17)
Infiltration rate	0.8856	(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) =	0.8192 (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	1.0445	1.0240	1.0035	0.9011	0.8806	0.7782	0.7782	0.7578	0.8192	0.8806	0.9216	0.9626 (22b)
Effective ac	1.0445	1.0240	1.0035	0.9060	0.8878	0.8028	0.8028	0.7871	0.8355	0.8878	0.9247	0.9633 (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
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New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153	(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148	(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615	(26)
RL1-RL3			2.1000	1.1450	2.4046	(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892	(28b)
Exposed Floor			1.0600	0.1800	0.1908	(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960	(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046	(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952	(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977	(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275	(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072	(30)
Loft voids	12.1600		12.1600	0.1651	2.0081	(30)
Total net area of external elements Aum(A, m2)			193.5200			(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125	(33)
Party Wall 1			44.9900	0.0000	0.0000	(32)
Party Floor 1			52.0200			(32a)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K	100.0000	(35)
Thermal bridges (Default value 0.200 * total exposed area)	38.7040	(36)
Point Thermal bridges	0.0000	(36a) =
Total fabric heat loss	(33) + (36) + (36a) =	100.8165 (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	76.2431	74.7482	73.2532	66.1352	64.8034	58.6035	58.6035	57.4553	60.9916	64.8034	67.4977	70.3144	(39)
Average = Sum(39)m / 12 =	177.0596	175.5646	174.0697	166.9517	165.6199	159.4199	159.4199	158.2718	161.8081	165.6199	168.3142	171.1309	(39)
												166.9375	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.9684	1.9518	1.9352	1.8561	1.8412	1.7723	1.7723	1.7596	1.7989	1.8412	1.8712	1.9025	(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													2.6250 (42)
Hot water usage for mixer showers													(42a)
Hot water usage for baths													(42b)
Hot water usage for other uses													(42c)
Average daily hot water use (litres/day)													(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy content (annual)	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)
Distribution loss (46)m = 0.15 x (45)m													
Water storage loss:	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	(46)
Store volume													150.0000 (47)
a) If manufacturer declared loss factor is known (kWh/day):													1.8900 (48)
Temperature factor from Table 2b													0.6000 (49)
Enter (49) or (54) in (55)													1.1340 (55)
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(64)
Electric shower(s)	54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432	(64a)
Heat gains from water heating, kWh/month	79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847	(65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												621.5636	(64a)

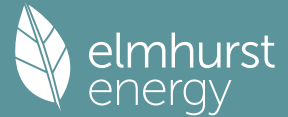
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts													
(66)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568	(69)
Pumps, fans	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	(70)
Losses e.g. evaporation (negative values) (Table 5)	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(71)
Water heating gains (Table 5)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	(72)
Total internal gains	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590	(73)
	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812	(73)

6. Solar gains

[Jan]	Area	Solar flux	g	FF	Access	Gains
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				m2	Table 6a W/m2	Specific data or Table 6b		Specific data or Table 6c		factor Table 6d		W
North				1.7600	10.6334		0.6300		0.7000		0.7700	5.7195 (74)
South				2.1000	26.0000		0.6300		0.7000		1.0000	21.6707 (82)
North				3.5300	10.6334		0.7200		0.7000		0.7700	13.1102 (74)
East				1.6000	19.6403		0.7200		0.7000		0.7700	10.9757 (76)
South				5.0300	46.7521		0.7200		0.7000		0.7700	82.1358 (78)
Solar gains	133.6119	236.9810	347.8720	468.4739	557.3474	567.2481	541.1209	472.9628	389.4901	268.4116	161.7784	113.1994 (83)
Total gains	736.2206	838.0168	931.5685	1021.3570	1077.3021	1054.9615	1012.0465	945.7934	879.1994	790.4697	718.5216	700.2806 (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	14.1117	14.2319	14.3541	14.9661	15.0864	15.6731	15.6731	15.7868	15.4418	15.0864	14.8449	14.6006
alpha	1.9408	1.9488	1.9569	1.9977	2.0058	2.0449	2.0449	2.0525	2.0295	2.0058	1.9897	1.9734
util living area	0.9486	0.9323	0.9053	0.8546	0.7772	0.6603	0.5436	0.5815	0.7459	0.8745	0.9318	0.9527 (86)
MIT	17.0188	17.3776	18.0092	18.9115	19.7148	20.3964	20.7179	20.6667	20.1475	19.1148	17.9731	17.0341 (87)
Th 2	19.3545	19.3657	19.3769	19.4310	19.4413	19.4894	19.4894	19.4984	19.4708	19.4413	19.4206	19.3991 (88)
util rest of house	0.9390	0.9197	0.8867	0.8238	0.7234	0.5663	0.4006	0.4436	0.6660	0.8415	0.9172	0.9440 (89)
MIT 2	14.9539	15.4018	16.1882	17.3127	18.2740	19.0573	19.3584	19.3295	18.8036	17.5861	16.1675	14.9828 (90)
Living area fraction	fLA = Living area / (4) = 0.3250 (91)											
MIT	15.6249	16.0438	16.7800	17.8323	18.7422	19.4924	19.8002	19.7640	19.2403	18.0828	16.7543	15.6494 (92)
Temperature adjustment	-0.1500											
adjusted MIT	15.4749	15.8938	16.6300	17.6823	18.5922	19.3424	19.6502	19.6140	19.0903	17.9328	16.6043	15.4994 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9025	0.8783	0.8405	0.7773	0.6864	0.5555	0.4180	0.4559	0.6410	0.7965	0.8767	0.9096 (94)
Useful gains	664.4385	736.0168	782.9899	793.9245	739.4764	585.9870	423.0412	431.1882	563.5867	629.5958	629.9138	637.0045 (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	1978.6280	1930.1254	1763.3195	1466.2125	1141.4810	756.0353	486.2580	508.6915	807.4751	1214.4630	1599.7041	1933.6785 (97)
Space heating kWh	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98a)
Space heating requirement - total per year (kWh/year)												5390.8177
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	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												5390.8177
Space heating per m2	(98c) / (4) =											59.9313 (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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (98)
Space heating efficiency (main heating system 1)	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)
Space heating fuel (main heating system)	977.7570	802.4410	729.3652	484.0473	299.0914	0.0000	0.0000	0.0000	0.0000	435.1412	698.2490	964.7255 (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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Efficiency of water heater (217)m	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000 (216)
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (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	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.4822	3.3699	3.4822	3.3699	3.4822 (231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-18.3065	-29.1272	-46.9751	-58.5349	-67.0373	-57.6553	-57.0030	-51.6492	-42.7888	-35.0664	-21.1147	-15.4591 (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	-2.2289	-5.1405	-11.3868	-19.6816	-29.5926	-37.3474	-36.7441	-30.2581	-21.3610	-8.7404	-3.2433	-1.7256 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												

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Space heating fuel - main system 1	5390.8177	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	100.0000	
Water heating fuel used	1494.3905	(219)
Space cooling fuel	0.0000	(221)
Electricity for pumps and fans:		
central heating pump	41.0000	(230c)
Total electricity for the above, kWh/year	41.0000	(231)
Electricity for lighting (calculated in Appendix L)	216.4307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-708.1682	(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	7056.0345	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	5390.8177	16.4900	888.9458 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	16.4900	246.4250 (247)
Energy for instantaneous electric shower(s)	621.5636	16.4900	102.4958 (247a)
Pumps, fans and electric keep-hot	41.0000	16.4900	6.7609 (249)
Energy for lighting	216.4307	16.4900	35.6894 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.7176	16.4900	-82.5683
PV Unit electricity exported	-207.4506	5.5900	-11.5965
Total			-94.1648 (252)
Total energy cost			1186.1522 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):	0.3600	(256)
Energy cost factor (ECF)	3.1642	(257)
SAP value	48.7076	
SAP rating (Section 12)	49	(258)
SAP band	E	

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	5390.8177	0.1540	829.9217 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			1040.3075 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-500.7176	0.1334	-66.7790
PV Unit electricity exported	-207.4506	0.1197	-24.8323
Total			-91.6113 (269)
Total CO2, kg/year			1072.0943 (272)
CO2 emissions per m2			11.9200 (273)
EI value			89.3545
EI rating			89
EI band			B

SAP 10 WORKSHEET FOR Conversion (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)
Ground floor	59.7700 (1b)	x 2.5900 (2b)	= 154.8043 (1b) - (3b)
First floor	30.1800 (1c)	x 2.2000 (2c)	= 66.3960 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	89.9500		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n)	= 221.2003 (5)

2. Ventilation rate

m3 per hour

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

Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000	Air changes per hour	30.0000 / (5) =	0.1356 (8)
Pressure test			No		
Pressure Test Method			Blower Door		
Measured/design AP50					15.0000 (17)
Infiltration rate					0.8856 (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) =				0.8192 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	4.6000	4.3000	4.4000	4.0000	4.0000	3.5000	3.6000	3.8000	3.7000	3.9000	3.9000	4.3000 (22)
Adj infilt rate	1.1500	1.0750	1.1000	1.0000	1.0000	0.8750	0.9000	0.9500	0.9250	0.9750	0.9750	1.0750 (22a)
Effective ac	0.9421	0.8806	0.9011	0.8192	0.8192	0.7168	0.7373	0.7782	0.7578	0.7987	0.7987	0.8806 (22b)
	0.9438	0.8878	0.9060	0.8355	0.8355	0.7569	0.7718	0.8028	0.7871	0.8190	0.8190	0.8878 (25)

3. Heat losses and heat loss parameter

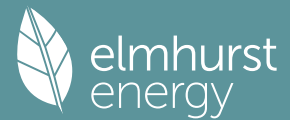
Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
New Glazing (Uw = 1.20)			1.7600	1.1450	2.0153		(27)
Existing Windows (Uw = 2.00)			10.1600	1.8519	18.8148		(27)
Sheltered Door (Ru = 2.5)			1.8900	0.3500	0.6615		(26)
RL1-RL3			2.1000	1.1450	2.4046		(27a)
Sheltered Floor to Stairwell			9.6800	0.1538	1.4892		(28b)
Exposed Floor			1.0600	0.1800	0.1908		(28b)
Existing Solid Wall - upgraded	72.4800	10.1600	62.3200	0.3000	18.6960		(29a)
Dormer Wall	16.2300	1.7600	14.4700	0.1800	2.6046		(29a)
Sheltered Wall to Stairwell	18.1100	1.8900	16.2200	0.1600	2.5952		(29a)
Loft Stud Wall	8.8100		8.8100	0.1700	1.4977		(29a)
Dormer Flat Roof	12.8500		12.8500	0.1500	1.9275		(30)
Pitched Roof	42.1400	2.1000	40.0400	0.1800	7.2072		(30)
Loft voids	12.1600		12.1600	0.1651	2.0081		(30)
Total net area of external elements Aum(A, m2)			193.5200				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	62.1125		(33)
Party Wall 1			44.9900	0.0000	0.0000		(32)
Party Floor 1			52.0200				(32d)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K							100.0000 (35)
Thermal bridges (Default value 0.200 * total exposed area)							38.7040 (36)
Point Thermal bridges						(36a) =	0.0000
Total fabric heat loss						(33) + (36) + (36a) =	100.8165 (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	68.8908	64.8034	66.1352	60.9916	60.9916	55.2509	56.3378	58.6035	57.4553	59.7822	59.7822	64.8034 (38)
Average = Sum(39)m / 12 =	169.7072	165.6199	166.9517	161.8081	161.8081	156.0674	157.1543	159.4199	158.2718	160.5987	160.5987	165.6199 (39)
												161.9688
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.8867	1.8412	1.8561	1.7989	1.7989	1.7350	1.7471	1.7723	1.7596	1.7854	1.7854	1.8412 (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													2.6250 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	29.4656	29.0280	28.4118	27.2755	26.4247	25.4813	24.9718	25.5837	26.2500	27.2594	28.4191	29.3660	(42b)
Hot water usage for other uses	41.5130	40.0034	38.4939	36.9843	35.4747	33.9652	33.9652	35.4747	36.9843	38.4939	40.0034	41.5130	(42c)
Average daily hot water use (litres/day)													65.0584 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	70.9786	69.0315	66.9056	64.2598	61.8995	59.4465	58.9369	61.0584	63.2343	65.7533	68.4225	70.8790	(44)
Energy content (annual)	112.4128	98.2999	102.8315	87.9685	83.3286	73.0964	71.2791	75.6031	77.9742	89.2266	97.4804	110.9794	(45)
Distribution loss (46)m = 0.15 x (45)m	16.8619	14.7450	15.4247	13.1953	12.4993	10.9645	10.6919	11.3405	11.6961	13.3840	14.6221	16.6469	(46)
Water storage loss:													150.0000 (47)
Store volume													1.8900 (48)
a) If manufacturer declared loss factor is known (kWh/day):													0.6000 (49)
Temperature factor from Table 2b													1.1340 (55)
Enter (49) or (54) in (55)													
Total storage loss	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(56)
If cylinder contains dedicated solar storage	35.1540	31.7520	35.1540	34.0200	35.1540	34.0200	35.1540	35.1540	34.0200	35.1540	34.0200	35.1540	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(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													

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147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334 (64)
Total per year (kWh/year) = Sum(64)m =											1494.3905 (64)
Electric shower(s)											
54.6432	48.6876	53.1650	50.7347	51.6867	49.3041	50.9476	51.6867	50.7347	53.1650	52.1653	54.6432 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											621.5636 (64a)
Heat gains from water heating, kWh/month											
79.1613	70.2582	75.6059	69.1492	68.7516	63.8466	64.5604	66.1829	65.8261	71.0823	72.6696	78.6847 (65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021	157.5021 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	30.6380	27.2124	22.1306	16.7543	12.5240	10.5733	11.4248	14.8504	19.9322	25.3086	29.5388	31.4895 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	356.6951	360.3965	351.0691	331.2123	306.1466	282.5884	266.8501	263.1487	272.4760	292.3329	317.3986	340.9568 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752	53.3752 (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)	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014	-105.0014 (71)
Water heating gains (Table 5)	106.3995	104.5509	101.6209	96.0406	92.4081	88.6758	86.7747	88.9555	91.4251	95.5407	100.9299	105.7590 (72)
Total internal gains	602.6086	601.0358	583.6966	552.8831	519.9547	487.7135	470.9256	472.8306	489.7094	522.0581	556.7433	587.0812 (73)

6. Solar gains

[Jan]	Area m ²	Solar flux Table 6a W/m ²	Specific data or Table 6b	Specific data or Table 6c	Access factor Table 6d	Gains W
North	1.7600	11.5821	0.6300	0.7000	0.7700	6.2297 (74)
South	2.1000	29.0000	0.6300	0.7000	1.0000	24.1712 (82)
North	3.5300	11.5821	0.7200	0.7000	0.7700	14.2799 (74)
East	1.6000	21.5869	0.7200	0.7000	0.7700	12.0635 (76)
South	5.0300	49.2853	0.7200	0.7000	0.7700	86.5863 (78)

Solar gains	143.3307	228.6278	338.1055	475.2445	548.3224	599.1950	572.9205	510.3825	419.7132	283.1643	179.2926	124.3581 (83)
Total gains	745.9393	829.6636	921.8021	1028.1276	1068.2772	1086.9085	1043.8461	983.2131	909.4225	805.2224	736.0359	711.4393 (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	14.7231	15.0864	14.9661	15.4418	15.4418	16.0098	15.8991	15.6731	15.7868	15.5581	15.5581	15.0864
alpha	1.9815	2.0058	1.9977	2.0295	2.0295	2.0673	2.0599	2.0449	2.0525	2.0372	2.0372	2.0058
util living area	0.9403	0.9250	0.8900	0.8223	0.7158	0.5283	0.3434	0.3883	0.6513	0.8356	0.9161	0.9443 (86)
MIT	17.4885	17.8007	18.4817	19.3605	20.1393	20.7292	20.9353	20.9093	20.5089	19.5946	18.4635	17.5048 (87)
Th 2	19.4099	19.4413	19.4310	19.4708	19.4708	19.5158	19.5072	19.4894	19.4984	19.4802	19.4802	19.4413 (88)
util rest of house												
	0.9287	0.9108	0.8672	0.7826	0.6414	0.3962	0.1490	0.1874	0.5367	0.7889	0.8972	0.9336 (89)
MIT 2	15.5550	15.9503	16.7912	17.8721	18.7716	19.3821	19.5006	19.4768	19.1911	18.1801	16.7971	15.5842 (90)
Living area fraction												
	16.1833	16.5516	17.3406	18.3558	19.2161	19.8198	19.9668	19.9423	19.6194	18.6398	17.3386	16.2083 (91)
fLA = Living area / (4) =												0.3250 (91)
MIT	16.1833	16.5516	17.3406	18.3558	19.2161	19.8198	19.9668	19.9423	19.6194	18.6398	17.3386	16.2083 (92)
Temperature adjustment												-0.1500
adjusted MIT	16.0333	16.4016	17.1906	18.2058	19.0661	19.6698	19.8168	19.7923	19.4694	18.4898	17.1886	16.0583 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.8902	0.8690	0.8209	0.7398	0.6176	0.4116	0.1925	0.2318	0.5340	0.7479	0.8550	0.8968	(94)
Useful gains	664.0590	720.9538	756.7507	760.6118	659.7248	447.4126	200.9832	227.8644	485.6624	602.2373	629.2813	638.0328	(95)
Ext temp.	5.4000	5.8000	7.8000	10.3000	13.4000	16.4000	18.5000	18.3000	15.6000	12.1000	8.3000	5.4000	(96)
Heat loss rate W	1804.5481	1755.8377	1567.7691	1279.2203	916.8136	510.3153	206.9436	237.9050	612.4117	1026.1864	1427.5014	1765.2329	(97)
Space heating kWh	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369	(98a)
Space heating requirement - total per year (kWh/year)												4440.8092	
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	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												4440.8092	
Space heating per m2											(98c) / (4) =	49.3698	(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 %)												100.0000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369 (98)
Space heating efficiency (main heating system 1)												
	100.0000	100.0000	100.0000	100.0000	100.0000	0.0000	0.0000	0.0000	0.0000	100.0000	100.0000	100.0000 (210)

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Space heating fuel (main heating system)	848.5239	695.4420	603.3977	373.3981	191.2741	0.0000	0.0000	0.0000	0.0000	315.4182	574.7184	838.6369	(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	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(64)
Efficiency of water heater	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	100.0000	(216)
Fuel for water heating, kWh/month	147.5668	130.0519	137.9855	121.9885	118.4826	107.1164	106.4331	110.7571	111.9942	124.3806	131.5004	146.1334	(217)
Space cooling fuel requirement	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	3.4822	3.1452	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	3.4822	3.3699	(231)
Lighting	26.8173	21.5138	19.3708	14.1919	10.9622	8.9562	10.0001	12.9985	16.8838	22.1524	25.0211	27.5626	(232)
Electricity generated by PVs (Appendix M) (negative quantity)	-19.6307	-28.2114	-45.4949	-58.2156	-64.1138	-59.9823	-59.4237	-54.7620	-45.5539	-36.3763	-23.2246	-16.9690	(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)	-2.6221	-5.1521	-11.5854	-21.3047	-30.9012	-40.2292	-39.7273	-33.7045	-23.8960	-10.2220	-4.0395	-2.1034	(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												4440.8092	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												100.0000	
Water heating fuel used												1494.3905	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
Total electricity for the above, kWh/year												41.0000	(231)
Electricity for lighting (calculated in Appendix L)												216.4307	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-737.4456	(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												6076.7486	(238)

10a. Fuel costs - using BEDF prices (531)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	4440.8092	21.5100	955.2181 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	21.5100	321.4434 (247)
Energy for instantaneous electric shower(s)	621.5636	21.5100	133.6983 (247a)
Pumps, fans and electric keep-hot	41.0000	21.5100	8.8191 (249)
Energy for lighting	216.4307	21.5100	46.5543 (250)
Additional standing charges			0.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.9581	21.5100	-110.1222
PV Unit electricity exported	-225.4875	5.5900	-12.6048
Total			-122.7269 (252)
Total energy cost			1343.0062 (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	4440.8092	0.1547	686.9212 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1494.3905	0.1408	210.3857 (264)
Energy for instantaneous electric shower(s)	621.5636	0.1391	86.4733 (264a)
Space and water heating			897.3070 (265)
Pumps, fans and electric keep-hot	41.0000	0.1387	5.6872 (267)
Energy for lighting	216.4307	0.1443	31.2376 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.9581	0.1331	-68.1670
PV Unit electricity exported	-225.4875	0.1195	-26.9561
Total			-95.1232 (269)
Total CO2, kg/year			925.5819 (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	4440.8092	1.5727	6983.9994 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1494.3905	1.5206	2272.3108 (278)

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Energy for instantaneous electric shower(s)	621.5636	1.5143	941.2551 (278a)
Space and water heating			9256.3102 (279)
Pumps, fans and electric keep-hot	41.0000	1.5128	62.0248 (281)
Energy for lighting	216.4307	1.5338	331.9687 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-511.9581	1.4920	-763.8524
PV Unit electricity exported	-225.4875	0.4383	-98.8215
Total			-862.6739 (283)
Total Primary energy kWh/year			9728.8849 (286)