

LAND ADJACENT TO 32 MANOR ROAD HAYES UB3 2DG



Residential Development



Energy & Sustainability Assessment



May 2025

REVISION	DATE	BY
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1. SUMMARY

It is our opinion that sufficient design works have been carried out at this early stage to demonstrate that the proposal is successfully addressing the requirements of London Plan Policy S12 and the local energy policies (LP22) of the London Borough of Hillingdon.

The energy hierarchy has been adopted to follow a Be Lean, Be Clean, Be Green methodology. The preferred energy strategy is to reduce energy demand and consequently the amount of conditioning and renewable energy contribution needed. This starts with a fabric first approach to improve thermal elements and controlled fittings. The feasibility of CHP systems and decentralised energy networks have been considered within the Be Clean case.

The final Be Green improvements have additionally explored the adoption and effect of adding renewable energy. The most appropriate renewable energy source has been identified as **PV Panels** which achieves minimum of 35% carbon dioxide emission reduction as required by London Borough of Hillingdon.

Be Green			
Reference	Be Green CO2 emission (DER)	BE Lean CO2 emisison (TER)	% Reductin over Part L 2021
Land adjacent to 32 Manor Road, Hayes, UB3 2DG	7.31	12.26	40.38%

The carbon footprint of regulated emission has been determined using the following National Calculation methodology (NCM). FSAP 10.2 – Part L1 2021

The building CO2 emissions for the development have been calculated to be improve **40.38%** beyond Lean Calculations. This has been achieved through energy efficiency measures, using improved building fabric, increasing the efficiency of the building services and finally the installation of a renewable energy source.

The Clean total energy requirements and carbon dioxide emissions have been calculated taking full account of all regulated emissions (space & hot water heating, and electricity for pumps, fans, lights). The Lean calculations was determined by using the orientation and the use of building elements (walls, windows etc.) with U-values consistent with achieving compliance with Approved Document Part L1A.

2. INTRODUCTION

This Energy Assessment relates to a planning application to erection of a 2-Bed dwelling at Land adjacent of 32 Manor Road, Hayes, UB3 2DG.

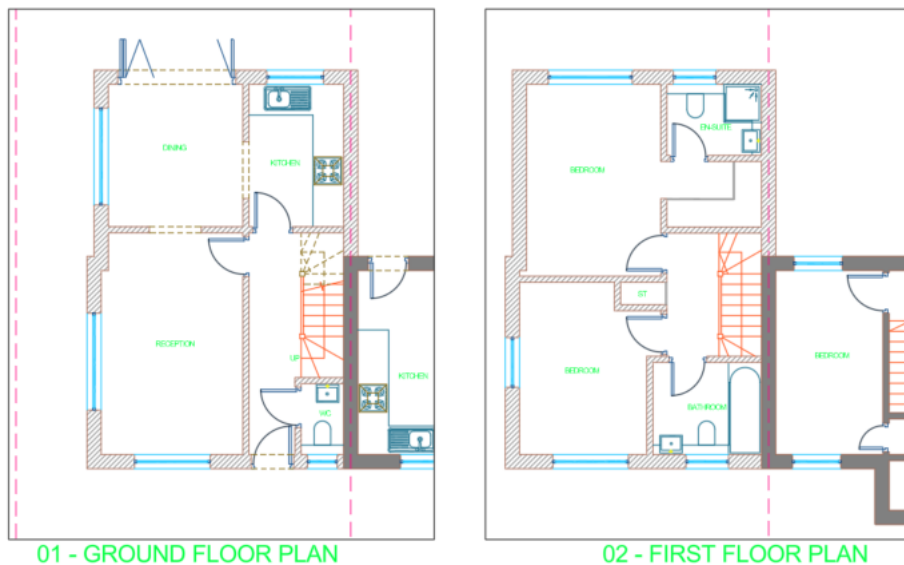
The requirement for new developments to obtain a proportion of their energy needs from on-site renewable energy sources is now a well-established feature of planning policy.

This Energy Assessment sets out the applicable policies on energy and CO2 emissions, and the methodology for and the results from an energy demand assessment.

It includes an overview of possible renewable energy technologies and identifies the technology most suitable for this development and reasons why other technologies have been excluded.

In presenting the information, this Energy Assessment demonstrates that the proposed development will fully satisfy, the current applicable planning policies relating to energy conservation, and renewable energy.

A Sustainability Statement has been prepared to demonstrate a commitment to enhance the environmental performance of the development. This includes the specification of materials, waste reduction, biodiversity, and internal water use limited by design to 105 L/p/d (litres per person per day).



3. STATUTORY REQUIREMENTS

BUILDING REGULATIONS – PART L 2021

This section of the building regulations deals with the conservation of energy in new domestic and commercial buildings; specifically the energy used for space heating/cooling, water heating, cooking, lighting and appliances. The methodology for the assessment of such has been adopted from the Building Research Establishment's Domestic Energy Model energy assessment method for the domestic dwelling.

This method requires the calculation of a target emissions rate (TER), which assumes standard or typical building components and the calculation of the buildings actual emissions (DER for SAP). It is a requirement that the building's actual emissions will be lower than the target emission rate.

"On 6 April 2014 the 2013 changes to Part L of the Building Regulations came into effect. Part L 2013 delivers an overall reduction in CO₂ emissions for new residential and new non-domestic buildings, with the targets for individual buildings being differentiated according to building type. This reduction in CO₂ emissions affected the percentage reduction necessary above the Part L 2013 regulations to meet the Mayor's targets in the London Plan.

As outlined in the Sustainable, Design and Construction SPG, since 6 April 2014 the Mayor has applied a 35 per cent carbon reduction target beyond Part L 2013 of the Building Regulations - this is deemed to be broadly equivalent to the 40 per cent target beyond Part L 2010 of the Building Regulations, as specified in Policy 5.2 of the London Plan for 2013-2016.

Detailed energy statements should be submitted as part of applications. This should demonstrate the predicted energy and associated carbon dioxide emission savings achieved through the incorporation of energy efficiency measures, decentralised energy and low/zero carbon technologies. This should be demonstrated in line with policy 5.2 of the London Plan, which requires a 35% reduction in CO₂ emissions above 2010 Building Regulations covering the period up to October 2013 and 40% thereafter."

The strategy outlined in this report has aimed to achieve a 35% reduction in CO₂ emissions against a Part L1A. This target has been achieved following the energy hierarchy presented in the London Plan.

NATIONAL PLANNING POLICY FRAMEWORK

The National Planning Policy Framework (NPPF) was adopted in March 2012 and updated in July 2021. The framework sets out a structure for delivering sustainable developments with relevance for energy and carbon issues.

The NPPF sets out 12 core planning principles, of which the following are directly related to sustainability:

- 1) Proactively drive and support sustainable economic development to deliver the homes, business and industrial units, infrastructure and thriving local places that the country needs;
- 2) Support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy);

- 3) Contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser environmental value, where consistent with other policies in this Framework (the NPPF)

PLANNING POLICY STATEMENT 22: RENEWABLE ENERGY (ODPM, 2004) Planning Policy Assessment covers the consideration of issues relating to renewable energy technologies and their application to new developments.

Technical advice and guidance on the various individual renewable technologies and examples of good practice within development plans and developments are also available. Requirements include:

- a) Renewable energy developments should be capable of being accommodated throughout England in locations where the technology is viable and environmental, economic, and social impacts can be addressed satisfactorily.
- b) The wider environmental and economic benefits of all proposals for renewable energy projects, whatever their scale, are material considerations that should be given significant weight in determining whether proposals should be granted planning permission.
- c) Development proposals should demonstrate any environmental, economic and social benefits as well as how any environmental and social impacts have been minimized through careful consideration of location, scale, design and other measures.

THE LONDON PLAN AND LONDON BOROUGH OF HILLINGDON.

This report has been prepared in accompaniment to a planning application for New Dwelling and a proportion of the report seeks to address policy 5.2/S12 of London Plan as well as LBRUT Core Strategy policies CP1 & CP2, also DM HD1, DM SD1 and DM SD2 of the Development Management Plan. The extract below outlines the approach for producing energy assessments as per 'Energy Planning Greater London Authority guidance on preparing energy assessments April 2015'.

LBRUT Policy LP 22 - Sustainable Design and Construction

Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation. Proposed developments are required to meet the following minimum reductions in carbon dioxide emissions:

- All new major residential developments (10 units or more) should achieve zero carbon standards in line with London Plan policy.
- All other new residential buildings should achieve a 35% reduction.
- All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy.

Targets are expressed as a percentage improvement over the target emission rate (TER) based on Part L of the 2013 Building Regulations. This should be achieved by following the Energy Hierarchy: Be Lean (use less energy), Be Clean (supply energy efficiently) and Be Green (use renewable energy).

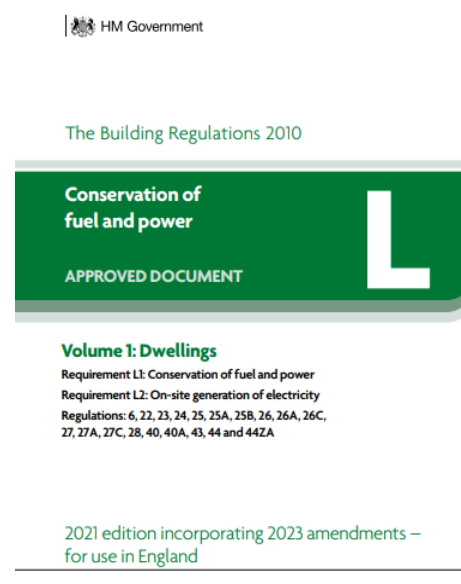
High standards of energy and water efficiency in existing developments will be supported wherever possible through retrofitting. Householder extensions and other development proposals that do not meet the thresholds set out in this policy are encouraged to complete and submit the Sustainable Construction Checklist SPD as far as possible, and opportunities for micro-generation of renewable energy will be supported in line with other policies in this Plan.

The London Plan Policy SI 2 - Minimising Greenhouse Gas Emissions

A. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

- be lean: use less energy and manage demand during operation;
- be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly;
- be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site;
- be seen: monitor, verify and report on energy performance.

B. Residential development should achieve 10 per cent on-site reduction beyond Building Regulations, and non-residential development should achieve 15 per cent through energy efficiency measures.



4. CALCULATION METHODOLOGY

This Energy Assessment takes a standard hierarchical approach as follows:

1. Lean

A calculation of baseline energy demand demonstrates the projected annual heating, cooling and electricity demand of the development. The assessment shows the carbon dioxide emissions resulting from the predicted energy use (Dwelling Emissions Rate) and improvement of the services and fabric over the baseline calculations.

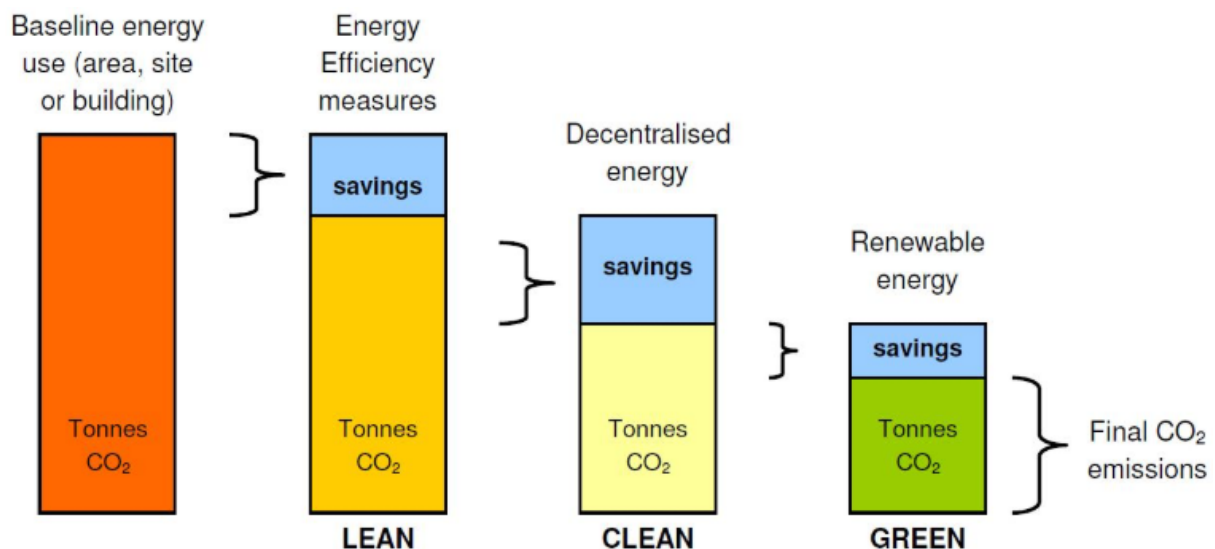
2. Clean

The feasibility of connecting to an existing or planned heat network was considered as part of this energy strategy. No existing or planned heat networks were identified within a reasonable distance of the site and the small scale of the site is not sufficient to support the inclusion of a CHP system.

3. Green

Details of renewable energy technologies to be incorporated in the development, demonstrating how much carbon dioxide emissions from expected energy use will be reduced through on-site renewable energy generation.

The starting point was to determine the performance of the “Lean” for the dwellings, using the orientation, level of insulation and the performance of building services equipment.



The Energy Hierarchy: In line with best practice, the Energy Hierarchy (as set out in the London Plan) has been adopted throughout the proposed design and the resulting CO₂ savings are set out in this report.

5. BE LEAN & LE CLEAN - ENERGY DEMAND AND EFFICIENCY

The total CO2 emissions has been calculated taking into full account of energy demands for space heating, hot water, and electricity for pumps, fans, lights. The baseline was determined by using the orientation and the building elements (walls, windows etc.) with U-values and other reference values.

Target Required: Domestic

- New main wall to achieve u-value of 0.18 W/m²K
- New Roof to achieve 0.15W/ m²K
- New Floor to achieve 0.12W/ m²K
- Windows to achieve u-value of 1.20W/ m²K
- Doors to achieve 1.20W/ m²K
- Highly efficient gas fired boiler
- Controls: Time and temperature zone controls, heaters
- Air pressure test 5.00 or less
- Ventilation – intermittent extract fans
- Accredited construction thermal bridging to table K1 applied

Be Clean -Improved Efficiency, building fabric and services

The following improvements have been applied to the services over the baseline(lean) calculations reducing the CO2 emissions:

Be Lean			
Reference	Be Lean CO2 emission (DER)	Be Green CO2 emission (DER)	% Reduction over Lean (DER)
Land adjacent to 32 Manor Road, Hayes, UB3 2DG	10.34	12.26	15.66%

Applied Details: Domestic

- Main wall to achieve u-value of 0.15 W/m²K
- New Roof to achieve 0.12W/ m²K
- New Floor to achieve 0.10W/ m²K
- Increased provision of PV Panels by 2.0 kWp

The tabulated calculations results are in table below. The results show the CO2 emissions from the baseline (lean) calculations.

Be Green			
Reference	Be Green CO2 emission (DER)	BE Lean CO2 emisison (TER)	% Reductin over Part L 2021
Land adjacent to 32 Manor Road, Hayes, UB3 2DG	7.31	12.26	40.38%

6. OVERVIEW OF RENEWABLE ENERGY

Energy from renewable sources has been defined in Article 2 of EU Directive 2010/13/EU 'on the energy performance of buildings' and includes wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. For the purposes of this energy Assessment and the use of renewable energy on a domestic scale these can be summarised as follows:

- Bio-fuels — combustion of solid or liquid bio-fuels to produce heat or electricity.
- Decentralised energy.
- Heat pumps — extraction of heat from the earth, atmosphere or water bodies.
- Hydroelectricity — use of water cycle driven flows to generate electricity.
- Photovoltaic — direct generation of electricity from sunlight.
- Solar thermal — direct heating of water for space heating or domestic hot water.
- Wind turbines — use of solar driven air movement to generate electricity.

The technologies and their potential application to this site are discussed in more detail in the following sections. However, one further pertinent point must be made. The reason for adopting renewable energy technologies is to reduce greenhouse gas emissions, mainly carbon dioxide, and none of the technologies are wholly "zero carbon". This is because, when the whole life cycle is taken into account some energy has to be put into every system to manufacture and maintain the equipment (which has a finite life) or to operate the equipment, and generally at present this energy is derived from non-renewable sources. Examples include the energy needed to refine and process the silicon used to manufacture photovoltaic panels, the diesel fuel used to transport wood pellets and to power the wood processing machinery for the production of wood fuel pellets.

Finally, due to the dynamic and innovative nature of the renewable energy technology industry even apparently similar products can differ in vital practical details which means that detailed design of installations must be undertaken by experts, often working closely with the product manufacturers, as virtually no two products are identical or interchangeable.

The following sections contain a summary of each possibly applicable technology, and a comparison of the advantages and disadvantages of technologies relevant to this development.

5.1 DECENTRALISED ENERGY

Not considered suitable for this development.

5.2 BIO-FUELS

Not considered suitable for this development.

5.3 AIR SOURCE HEAT PUMPS

A new technology which works very well in new build development. The ASHP can be used to provide both the hot water and heating for the dwelling.

Not considered a suitable for this development due to noise.

5.4 Ground source heat pumps

Not considered suitable for this development.

5.5 HYDROELECTRICITY

Not considered suitable for this development.

5.6 PHOTOVOLTAIC

Photovoltaic (PV) systems use areas of semiconductor material that produce electricity when exposed to light. They are connected to the building electricity supply via an inverter which converts the output to a form which is compatible with the mains electricity voltage and frequency. This also allows excess electricity to be exported at times when the actual demand from the dwellings is less than that being produced by the PV system. This ensures that all the electricity produced is used and achieves a reduction in carbon dioxide emissions. For all purposes relating to planning, the exported electricity is by convention treated as if it were used on site.

The output of photovoltaic systems is generally specified as kW peak, or kWp with each 1kWp of system expected to produce an average 800 kWh of electricity per year, although this may be reduced depending on location, orientation and over shading. The area required to produce an output of 1 kWp varies but for this exercise 6.7m² has been used. (The developer will be required to submit a quotation and technical evaluation to ensure that the calculated quantity of panels will produce the required on site generation per annum)

Because the availability of sunlight, to produce electricity, will generally not align with demand, it is normal for the system to be connected to the electricity grid and excess production exported. The introduction of the feed-in-tariff has improved the economics of solar PV systems.

There are no direct environmental consequences from the installation of PV panels but the installation can have a visual impact that may require consideration.

Considered a suitable for this development.

5.7 SOLAR THERMAL PANELS

Solar thermal panels harness solar energy to heat domestic hot water. They are usually supplemented with the main heating system, as they can only provide a portion of the hot water demand, depending on the time of year. Overall, it is estimated that a suitably sized system can provide up to 60% of the hot water energy. Solar thermal systems require the installation of a thermal store and / or a domestic hot water cylinder. This is not currently planned for this development as it is proposed to use combination boilers to provide the heating and domestic hot water.

It is for this reason that solar thermal systems are not considered suitable for the development.

5.8 WIND TURBINES

Not considered suitable for this development.

7. CONCLUSION

This section looks at how the development can reduce overall energy usage and demand from renewable energy sources.

All possible renewable energy technologies were evaluated in relation to the site, starting with Combined Heat and Power (CHP). Most technologies were excluded because of the small scale of the development and location. One technology was identified as being most suitable for installation; the use of photovoltaic (PV) panels mounted on the roof of the development.

Therefore, In order to achieve the enhanced reduction, we propose to have 6.5kWp of PV panels for the new dwelling.

Be Green			
Reference	Be Green CO2 emission (DER)	BE Lean CO2 emisison (TER)	% Reductin over Part L 2021
Land adjacent to 32 Manor Road, Hayes, UB3 2DG	7.31	12.26	40.38%

The building CO2 emissions have been calculated to be reduced by average of **40.38%** beyond Lean (DER). This has been achieved through energy efficiency measures, using improved building fabric, increasing the efficiency of the building services.

The developer will be required to submit a quotation and technical evaluation to ensure that the calculated quantity of panels will produce the required on-site generation per annum and the amount of required panels can fit on the building.

APPENDIX A

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 21 Apr 2025 19:34:26

Project Information			
Assessed By	Chris Law	Building Type	House, Semi-detached
OCDEA Registration	EES/027443	Assessment Date	2025-04-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	79 m ²
Site Reference	32 Manor Road 15%	Plot Reference	00001
Address	32 Manor Road, Hayes, UB3 2DG		

Client Details	
Name	Syed Rafi
Company	ZAIDI Building Services Associates
Address	ZBSA, Swindon, SN1 2DJ

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	12.26 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	10.34 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	64.06 kWh _{PE} /m ²		
Dwelling primary energy	55.02 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	38.8 kWh/m ²		
Dwelling fabric energy efficiency	37.1 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.18	Walls (1) (0.18)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.15	Heatloss Floor 1 (0.15)	OK
Roofs	0.16	0.15	Roof (1) (0.15)	OK
Windows, doors, and roof windows	1.6	1.18	Front (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	75.88	0.18	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	39.47	0.15	
Exposed roof: Roof (1)	39.47	0.15	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front, External Door	1.8	West	N/A	1 (!)
Front, Window	5.43	West	0.7	1.2
Side, Window	6.38	North	0.7	1.2
Rear, Window	9.8	East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.025 (!)	
External wall	E3: Sill	Not government-approved scheme	0.022 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Not government-approved scheme	0.017 (!)	
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.058	
External wall	E6: Intermediate floor within a dwelling	Not government-approved scheme	0.001 (!)	
External wall	E10: Eaves (insulation at ceiling level)	Not government-approved scheme	0.057	
External wall	E12: Gable (insulation at ceiling level)	Not government-approved scheme	0.043	
External wall	E16: Corner (normal)	Not government-approved scheme	0.042	
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.041	
Party wall	P1: Ground floor	Not government-approved scheme	0.044	
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Not government-approved scheme	0.04	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value		OK
Air permeability test certificate reference			

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas	
Efficiency	87.7%
Emitter type	Radiators
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant Group
Model	Flexicom 30cx
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: N/A	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	4.4 kWp	
Orientation	East	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:	Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	32 Manor Road 15%		Issued on Date	21/04/2025
Assessment Reference	00001	Prop Type Ref		
Property	32, Manor Road, Hayes, UB3 2DG			

SAP Rating	97 A	DER	10.34	TER	12.26
Environmental	92 A	% DER < TER			15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81
Compliance Check	See BREL	% DFEE < TFEE			4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West
Property Tenure	1
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
Which Floor	0
2.0 Number of Storeys	2
3.0 Date Built	2025
3.0 Property Age Band	L
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	194.27 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	21.47 m	39.47 m ²	2.30 m
		21.70 m	39.39 m ²	2.30 m

8.0 Living Area	13.66 m ²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall 1	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.18	140.00	99.29	75.88	0.00	None	23.41	Enter Gross Area

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.15	9.00	39.47	39.47	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.15	None	0.00	110.00	39.47

12.0 Opening Types	Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
	External Door	Manufacturer	Half Glazed Door	Double glazed			0.76		0.70	1.00
	Window	Manufacturer	Window	Double glazed			0.76		0.70	1.20

13.0 Openings	Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
	Front	External Door	External Wall 1	West	1.80	0
	Front	Window	External Wall 1	West	5.43	0

Summary for Input Data

Side Rear	Window Window	External Wall 1 External Wall 1	North East	6.38 9.80	0 0
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14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	17.10	0.03	0.03	No
E3 Sill	Non Gov Approved Schemes	13.70	0.02	0.02	No
E4 Jamb	Non Gov Approved Schemes	31.78	0.02	0.02	No
E5 Ground floor (normal)	Non Gov Approved Schemes	21.47	0.06	0.06	No
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	21.70	0.00	0.00	No
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	17.18	0.06	0.06	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	4.26	0.04	0.04	No
E16 Corner (normal)	Non Gov Approved Schemes	13.80	0.04	0.04	No
E18 Party wall between dwellings	Non Gov Approved Schemes	4.60	0.04	0.04	No
P1 Party wall - Ground floor	Non Gov Approved Schemes	4.27	0.04	0.04	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	4.27	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	4.27	0.04	0.04	No

Y-value

0.03

W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

0

Number of open flues

0

Number of chimneys/flues attached to closed fire

0

Number of flues attached to solid fuel boiler

0

Number of flues attached to other heater

0

Number of blocked chimneys

0

Number of intermittent extract fans

3

Number of passive vents

0

Number of flueless gas fires

0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀

5.00

m³/(h.m²) @ 50 Pa

Property Tested?

Yes

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
Lighting 1	80.00	25.00	2000.00	24

24.0 Main Heating 1

Database

Percentage of Heat

100.00

%

Database Ref. No.

15024

Fuel Type

Mains gas

SAP Code

0

In Winter

87.70

In Summer

79.10

Model Name

Flexicom 30cx

Manufacturer

Vaillant Group

System Type

Combi boiler

Controls SAP Code

2110

Summary for Input Data

Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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27.0 Secondary Heating	None
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28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.3 Waste Water Heat Recovery System	
--	--

29.0 Hot Water Cylinder	None
Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

31.0 Thermal Store	None
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32.0 Photovoltaic Unit	One Dwelling
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
4.40	East	45°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro	None
Electricity Generated	0.00
Apportioned	0.00 kWh/Year

Summary for Input Data



Connected to dwelling's electricity meter

Yes

Electricity Generation

Annual

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Recommendations

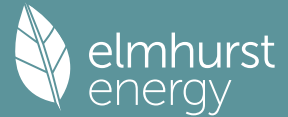
Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating			A 98	A 93
			0	0
			0	0

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Property Reference	32 Manor Road 15%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	97 A	DER	10.34	TER	12.26	
Environmental	92 A	% DER < TER				15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

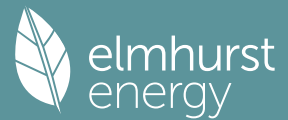
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1500	5.9205	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1800	13.6584	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1500	5.9205	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0437		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014
E3 Sill	31.7800	0.0170	0.5403
E4 Jamb	21.4700	0.0580	1.2453
E5 Ground floor (normal)	21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling	17.1800	0.0570	0.9793
E10 Eaves (insulation at ceiling level)	4.2600	0.0430	0.1832
E12 Gable (insulation at ceiling level)			

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E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	56.8691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	92.8619	92.6264	92.3955	91.3112	91.1083	90.1638	90.1638	89.9889	90.5276	91.1083	91.5187	91.9478 (39)
												91.3102
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1776	1.1746	1.1716	1.1579	1.1553	1.1433	1.1433	1.1411	1.1480	1.1553	1.1605	1.1660 (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												2.4409 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886 (44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615 (45)
Distribution loss (46)m = 0.15 x (45)m												1754.7779
Water storage loss:	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892 (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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
12Total per year (kWh/year)												2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4725	121.2017	109.4725	113.1216	109.4725	113.1216	109.4725	109.4725	113.1216	109.4725	113.1216	109.4725 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Pumps, fans	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
	487.4644	499.2754	477.8167	460.6701	436.3931	416.6555	399.8424	401.0012	413.8645	431.5145	458.7771	476.7874 (73)

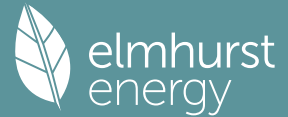
6. Solar gains

[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		0.7600		0.7000		0.7700		25.0114 (74)
East				9.8000	19.6403		0.7600		0.7000		0.7700		70.9608 (76)
West				5.4300	19.6403		0.7600		0.7000		0.7700		39.3181 (80)
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386	(83)
Total gains	622.7546	762.8022	914.3118	1109.2778	1247.1442	1254.8374	1194.3615	1071.9564	924.7168	744.3921	627.1366	588.3261	(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	45.8271	45.9436	46.0584	46.6054	46.7092	47.1984	47.1984	47.2902	47.0088	46.7092	46.4997	46.2827
alpha	4.0551	4.0629	4.0706	4.1070	4.1139	4.1466	4.1466	4.1527	4.1339	4.1139	4.1000	4.0855
util living area	0.9851	0.9668	0.9217	0.8026	0.6278	0.4498	0.3299	0.3816	0.6255	0.8879	0.9713	0.9879 (86)
MIT	19.4626	19.7629	20.1837	20.6465	20.8940	20.9791	20.9954	20.9919	20.9237	20.5277	19.9086	19.4157 (87)
Th 2	19.9380	19.9404	19.9428	19.9538	19.9559	19.9656	19.9656	19.9674	19.9619	19.9559	19.9517	19.9473 (88)
util rest of house	0.9813	0.9589	0.9038	0.7645	0.5708	0.3809	0.2534	0.2981	0.5477	0.8548	0.9631	0.9849 (89)
MIT 2	18.1679	18.5469	19.0668	19.6129	19.8706	19.9534	19.9640	19.9642	19.9107	19.4989	18.7429	18.1148 (90)
Living area fraction									FLA = Living area / (4) =			0.1732 (91)
MIT	18.3922	18.7575	19.2603	19.7919	20.0479	20.1311	20.1426	20.1422	20.0862	19.6771	18.9449	18.3401 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2422	18.6075	19.1103	19.6419	19.8979	19.9811	19.9926	19.9922	19.9362	19.5271	18.7949	18.1901 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9726	0.9455	0.8866	0.7519	0.5675	0.3820	0.2554	0.3001	0.5457	0.8384	0.9505	0.9774 (94)
Useful gains	605.7163	721.2296	810.6019	834.0122	707.6952	479.3470	305.0900	321.7004	504.6026	624.0676	596.0875	575.0121 (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	1294.6961	1269.6781	1165.1323	980.8589	746.8963	485.1768	305.8926	323.2585	528.3331	813.3351	1070.2979	1286.3608 (97)
Space heating kWh	512.6009	368.5574	263.7706	105.7297	29.1656	0.0000	0.0000	0.0000	0.0000	140.8150	341.4315	529.2434 (98a)
Space heating requirement - total per year (kWh/year)												2291.3142
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	512.6009	368.5574	263.7706	105.7297	29.1656	0.0000	0.0000	0.0000	0.0000	140.8150	341.4315	529.2434 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2291.3142
Space heating per m2										(98c) / (4) =		29.0555 (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 %)												87.7000 (206)
Efficiency of main space heating system 2 (in %)												7.0000 (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	512.6009	368.5574	263.7706	105.7297	29.1656	0.0000	0.0000	0.0000	0.0000	140.8150	341.4315	529.2434 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	584.4936	420.2479	300.7647	120.5583	33.2561	0.0000	0.0000	0.0000	0.0000	160.5645	389.3175	603.4703 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.8208	84.4118	83.5803	81.9457	80.1594	79.1000	79.1000	79.1000	79.1000	82.4908	84.2436	79.1000 (216)
Fuel for water heating, kWh/month	274.3230	243.7796	261.7307	235.3156	233.5712	212.0913	208.8047	218.9334	221.7005	236.5365	245.6363	271.1607 (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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.8211	-61.4388	-91.6520	-103.5863	-109.7002	-101.3823	-99.9710	-95.4171	-85.7124	-71.0439	-46.5245	-35.5714 (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	-26.0831	-61.2715	-139.8091	-235.1397	-330.5288	-339.6121	-331.7936	-267.8773	-178.6929	-92.1744	-35.9330	-19.9289 (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												2612.6729 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.1000
Water heating fuel used												2863.5837 (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)												237.4410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3002.6653 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2797.0323 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2612.6729	0.2100	548.6613 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2863.5837	0.2100	601.3526 (264)
Space and water heating			1150.0139 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	0.1344	-126.8546
PV Unit electricity exported	-2058.8444	0.1232	-253.6465
Total			-380.5012 (269)
Total CO2, kg/year			815.7121 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2612.6729	1.1300	2952.3204 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2863.5837	1.1300	3235.8496 (278)
Space and water heating			6188.1700 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.4410	1.5338	364.1950 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	1.4967	-1412.6552
PV Unit electricity exported	-2058.8444	0.4521	-930.8086
Total			-2343.4638 (283)
Total Primary energy kWh/year			4339.0020 (286)
Dwelling Primary energy Rate (DPER)			55.0200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (5)

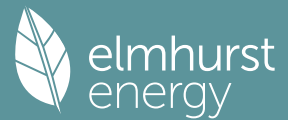
2. Ventilation rate

	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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

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Element			Gross m2	Openings m2		NetArea m2	U-value W/m2K		A x U W/K		K-value kJ/m2K		A x K kJ/K
Main dwelling													
TER Semi-glazed door						1.8000	1.0000		1.8000				(26a)
TER Opening Type						17.9100	1.1450		20.5076				(27)
Heatloss Floor 1						39.4700	0.1300		5.1311				(28a)
External Wall 1			99.2900	19.7100		79.5800	0.1800		14.3244				(29a)
External Roof 1			39.4700			39.4700	0.1100		4.3417				(30)
Total net area of external elements Aum(A, m2)						178.2300							(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =			46.1048				(33)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.2700	(35)
List of Thermal Bridges													
K1 Element							Length		Psi-value			Total	
E2 Other lintels (including other steel lintels)							17.1000		0.0500			0.8550	
E3 Sill							13.7000		0.0500			0.6850	
E4 Jamb							31.7800		0.0500			1.5890	
E5 Ground floor (normal)							21.4700		0.1600			3.4352	
E6 Intermediate floor within a dwelling							21.7000		0.0000			0.0000	
E10 Eaves (insulation at ceiling level)							17.1800		0.0600			1.0308	
E12 Gable (insulation at ceiling level)							4.2600		0.0600			0.2556	
E16 Corner (normal)							13.8000		0.0900			1.2420	
E18 Party wall between dwellings							4.6000		0.0600			0.2760	
P1 Party wall - Ground floor							4.2700		0.0800			0.3416	
P2 Party wall - Intermediate floor within a dwelling							4.2700		0.0000			0.0000	
P4 Party wall - Roof (insulation at ceiling level)							4.2700		0.1200			0.5124	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)											(36a) =	10.2226	(36)
Point Thermal bridges											(33) + (36) + (36a) =	0.0000	
Total fabric heat loss												56.3274	(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	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787	(38)
Average = Sum(39)m / 12 =	92.3202	92.0847	91.8538	90.7695	90.5666	89.6221	89.6221	89.4473	89.9859	90.5666	90.9770	91.4061	(39)
												90.7685	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(40)
HLP (average)	1.1707	1.1677	1.1648	1.1510	1.1484	1.1365	1.1365	1.1343	1.1411	1.1484	1.1537	1.1591	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	
												1.1510	
												31	

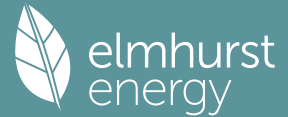
4. Water heating energy requirements (kWh/year)													

Assumed occupancy													2.4409 (42)
Hot water usage for mixer showers													0.0000 (42a)
Hot water usage for baths	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
Average daily hot water use (litres/day)													105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886	(44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)
12Total per year (kWh/year)													2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442	(65)

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

Metabolic gains (Table 5), Watts													
(66)m	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4502	121.1771	109.4502	113.0986	109.4502	113.0986	109.4502	109.4502	113.0986	109.4502	113.0986	109.4502	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	(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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	(71)
Water heating gains (Table 5)	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368	(72)
Total internal gains	487.4422	499.2508	477.7945	460.6471	436.3709	416.6326	399.8202	400.9789	413.8415	431.4922	458.7542	476.7652	(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					5.2900	10.6334		0.6300	0.7000	0.7700		17.1909 (74)
East					8.1200	19.6403		0.6300	0.7000	0.7700		48.7388 (76)
West					4.5000	19.6403		0.6300	0.7000	0.7700		27.0104 (80)
Solar gains	92.9402	181.0344	299.8589	445.5782	556.9724	575.8197	545.8228	460.9323	350.9413	214.9369	115.6577	76.6237 (83)
Total gains	580.3824	680.2852	777.6534	906.2253	993.3433	992.4522	945.6430	861.9113	764.7828	646.4291	574.4118	553.3889 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0960	46.2139	46.3300	46.8835	46.9885	47.4837	47.4837	47.5766	47.2917	46.9885	46.7766	46.5570
alpha	4.0731	4.0809	4.0887	4.1256	4.1326	4.1656	4.1656	4.1718	4.1528	4.1326	4.1184	4.1038
util living area	0.9883	0.9770	0.9507	0.8737	0.7337	0.5515	0.4106	0.4657	0.7142	0.9226	0.9785	0.9902 (86)
MIT	19.4096	19.6556	20.0254	20.4943	20.8128	20.9566	20.9899	20.9833	20.8765	20.4297	19.8416	19.3735 (87)
Th 2	19.9435	19.9459	19.9483	19.9594	19.9615	19.9712	19.9712	19.9730	19.9674	19.9615	19.9573	19.9529 (88)
util rest of house	0.9853	0.9713	0.9383	0.8437	0.6780	0.4725	0.3176	0.3671	0.6365	0.8969	0.9721	0.9877 (89)
MIT 2	18.1047	18.4173	18.8812	19.4530	19.8033	19.9447	19.9674	19.9661	19.8800	19.3937	18.6638	18.0652 (90)
Living area fraction										fLA = Living area / (4) =		0.1732 (91)
MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9615	0.9253	0.8329	0.6790	0.4843	0.3335	0.3837	0.6435	0.8850	0.9628	0.9820 (94)
Useful gains	567.9963	654.1225	719.5347	754.7820	674.4924	480.6758	315.4159	330.7502	492.1314	572.1151	553.0364	543.4044 (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	1295.3228	1264.4906	1155.4642	974.2594	749.7233	494.7113	317.6663	334.7394	535.6532	812.6704	1070.6024	1288.0762 (97)
Space heating kWh	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98a)
Space heating requirement - total per year (kWh/year)												2595.2817
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	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.2817
Space heating per m2										(98c) / (4) =		32.9100 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	585.6395	443.9040	351.0081	171.0213	60.5755	0.0000	0.0000	0.0000	0.0000	193.6939	403.2982	599.6058 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	86.1264	85.8290	85.2235	83.9581	82.1285	80.3000	80.3000	80.3000	80.3000	84.1967	85.6258	80.3000 (216)
Fuel for water heating, kWh/month	270.1647	239.7543	256.6843	229.6753	227.9713	208.9218	205.6843	215.6616	218.3874	231.7439	241.6713	267.1072 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7416	18.2442	16.4268	12.0350	9.2962	7.5951	8.4803	11.0230	14.3178	18.7857	21.2184	23.3737 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.7904	-51.8008	-74.3722	-83.5291	-89.9991	-83.9791	-82.9298	-78.3115	-70.1684	-59.1704	-40.4180	-31.8144 (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	-21.0014	-44.1525	-87.7070	-131.6625	-174.0294	-174.8388	-172.7919	-146.3430	-107.3118	-63.1343	-28.0371	-16.6105 (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)												

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(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												2808.7465	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2813.4274	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.5377	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1950.9036	(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												3940.8079	(238)

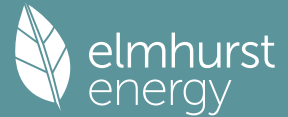
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2808.7465	0.2100	589.8368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.4274	0.2100	590.8198 (264)
Space and water heating			1180.6565 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.5377	0.1443	26.4902 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	0.1346	-105.4386
PV Unit electricity exported	-1167.6203	0.1259	-147.0152
Total			-252.4538 (269)
Total CO2, kg/year			966.6221 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2808.7465	1.1300	3173.8835 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.4274	1.1300	3179.1730 (278)
Space and water heating			6353.0565 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.5377	1.5338	281.5163 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	1.4975	-1172.9677
PV Unit electricity exported	-1167.6203	0.4622	-539.6476
Total			-1712.6153 (283)
Total Primary energy kWh/year			5052.0582 (286)
Target Primary Energy Rate (TPER)			64.0600 (287)

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Property Reference	32 Manor Road 15%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	97 A	DER	10.34	TER	12.26	
Environmental	92 A	% DER < TER				15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1500	5.9205	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1800	13.6584	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1500	5.9205	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		52.0437		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014
E3 Sill	31.7800	0.0170	0.5403
E4 Jamb	21.4700	0.0580	1.2453
E5 Ground floor (normal)	21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling			

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E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832
E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	56.8691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	92.8619	92.6264	92.3955	91.3112	91.1083	90.1638	90.1638	89.9889	90.5276	91.1083	91.5187	91.9478 (39)
												91.3102
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1776	1.1746	1.1716	1.1579	1.1553	1.1433	1.1433	1.1411	1.1480	1.1553	1.1605	1.1660 (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												2.4409 (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	28.1378	27.7199	27.1314	26.0464	25.2339	24.3330	23.8464	24.4308	25.0670	26.0310	27.1384	28.0426 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												62.1127 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	67.7648	65.9059	63.8764	61.3504	59.0970	56.7551	56.2685	58.2938	60.3711	62.7760	65.3244	67.6696 (44)
Energy content (annual)	107.3228	93.8491	98.1757	83.9857	79.5559	69.7870	68.0519	72.1799	74.4436	85.1865	93.0666	105.9543 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1031.5591
Water 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 (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	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	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612 (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	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612 (64)
12Total per year (kWh/year)								Total per year (kWh/year) = Sum(64)m =				876.8252 (64)
Electric shower(s)	52.1704	46.4843	50.7590	48.4387	49.3477	47.0729	48.6420	49.3477	48.4387	50.7590	49.8046	52.1704 (64a)
Heat gains from water heating, kWh/month	35.8487	31.5640	33.5521	29.9566	29.2425	26.5980	26.6215	27.6752	27.9289	30.7919	32.2278	35.5579 (65)
												593.4353 (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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4725	121.2017	109.4725	113.1216	109.4725	113.1216	109.4725	109.4725	113.1216	109.4725	113.1216	109.4725 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	48.1837	46.9702	45.0969	41.6064	39.3045	36.9416	35.7816	37.1978	38.7902	41.3869	44.7608	47.7929 (72)
Total internal gains	434.3108	447.0787	427.8007	415.8768	394.6739	381.6254	367.2399	366.4038	377.3208	388.3509	410.6258	424.3435 (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	0.7600		0.7000		0.7700		25.0114 (74)	
East			9.8000	19.6403	0.7600		0.7000		0.7700		70.9608 (76)	
West			5.4300	19.6403	0.7600		0.7000		0.7700		39.3181 (80)	
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386 (83)
Total gains	569.6010	710.6055	864.2957	1064.4845	1205.4249	1219.8072	1161.7589	1037.3590	888.1731	701.2286	578.9853	535.8821 (84)

7. Mean internal temperature (heating season)

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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	45.8271	45.9436	46.0584	46.6054	46.7092	47.1984	47.1984	47.2902	47.0088	46.7092	46.4997	46.2827
alpha	4.0551	4.0629	4.0706	4.1070	4.1139	4.1466	4.1466	4.1527	4.1339	4.1139	4.1000	4.0855
util living area	0.9890	0.9736	0.9332	0.8189	0.6443	0.4616	0.3389	0.3937	0.6450	0.9041	0.9780	0.9913 (86)
MIT	19.3805	19.6880	20.1243	20.6159	20.8835	20.9770	20.9950	20.9909	20.9146	20.4832	19.8379	19.3335 (87)
Th 2	19.9380	19.9404	19.9428	19.9538	19.9559	19.9656	19.9656	19.9674	19.9619	19.9559	19.9517	19.9473 (88)
util rest of house	0.9862	0.9671	0.9173	0.7822	0.5870	0.3914	0.2605	0.3078	0.5667	0.8742	0.9715	0.9891 (89)
MIT 2	18.4776	18.7819	19.2051	19.6628	19.8823	19.9551	19.9642	19.9646	19.9167	19.5614	18.9414	18.4380 (90)
Living area fraction									fLA = Living area /	(4) =		0.1732 (91)
MIT	18.6340	18.9388	19.3643	19.8279	20.0558	20.1321	20.1427	20.1423	20.0896	19.7210	19.0967	18.5931 (92)
Temperature adjustment												0.0000
adjusted MIT	18.6340	18.9388	19.3643	19.8279	20.0558	20.1321	20.1427	20.1423	20.0896	19.7210	19.0967	18.5931 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9814	0.9591	0.9069	0.7774	0.5927	0.4029	0.2740	0.3226	0.5769	0.8662	0.9643	0.9850 (94)
Useful gains	559.0291	681.5753	783.8382	827.4917	714.4714	491.4906	318.3291	334.6355	512.3925	607.3906	558.3432	527.8661 (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	1331.0801	1300.3656	1188.6027	997.8402	761.2789	498.7944	319.4260	336.7696	542.2206	831.0027	1097.9186	1323.4142 (97)
Space heating kWh	574.4060	415.8271	301.1448	122.6509	34.8248	0.0000	0.0000	0.0000	0.0000	166.3674	388.4943	591.8878 (98a)
Space heating requirement - total per year (kWh/year)												2595.6031
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	574.4060	415.8271	301.1448	122.6509	34.8248	0.0000	0.0000	0.0000	0.0000	166.3674	388.4943	591.8878 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.6031
Space heating per m2										(98c) / (4) =		32.9141 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	847.5400	667.2123	683.9159	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9448	0.9697	0.9529	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	800.7711	647.0252	651.7108	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1383.7571	1318.0409	1174.7736	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	419.7499	499.2357	389.1587	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fC = cooled area /	(4) =		1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	104.9375	124.8089	97.2897	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												327.0361 (107)
Energy for space heating												32.9141 (99)
Energy for space cooling												4.1470 (108)
Total												37.0611 (109)
Fabric Energy Efficiency (DFEE)												37.1 (109)

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

CALCULATION OF TARGET FABRIC ENERGY EFFICIENCY

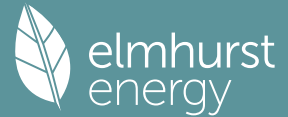
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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)
	Air changes per hour
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1654 (8)

Full SAP Calculation Printout



Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.4154 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3531 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			1.8000	1.0000	1.8000		(26a)
TER Opening Type			17.9100	1.1450	20.5076		(27)
Heatloss Floor 1			39.4700	0.1300	5.1311		(28a)
External Wall 1	99.2900	19.7100	79.5800	0.1800	14.3244		(29a)
External Roof 1	39.4700		39.4700	0.1100	4.3417		(30)
Total net area of external elements Aum(A, m2)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 46.1048		(33)

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

List of Thermal Bridges												194.2700 (35)
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
E16 Corner (normal)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P2 Party wall - Intermediate floor within a dwelling												
P4 Party wall - Roof (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.2226 (36)
Point Thermal bridges												(36a) = 0.0000
Total fabric heat loss												(33) + (36) + (36a) = 56.3274 (37)

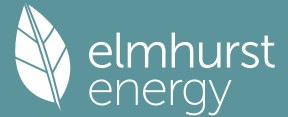
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	92.3202	92.0847	91.8538	90.7695	90.5666	89.6221	89.6221	89.4473	89.9859	90.5666	90.9770	91.4061 (39)
												90.7685
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1707	1.1677	1.1648	1.1510	1.1484	1.1365	1.1365	1.1343	1.1411	1.1484	1.1537	1.1591 (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													2.4409 (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	28.1378	27.7199	27.1314	26.0464	25.2339	24.3330	23.8464	24.4308	25.0670	26.0310	27.1384	28.0426	(42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
Average daily hot water use (litres/day)													62.1127 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	67.7648	65.9059	63.8764	61.3504	59.0970	56.7551	56.2685	58.2938	60.3711	62.7760	65.3244	67.6696	(44)
Distribution loss (46)m = 0.15 x (45)m	107.3228	93.8491	98.1757	83.9857	79.5559	69.7870	68.0519	72.1799	74.4436	85.1865	93.0666	105.9543	(45)
										Total = Sum (45)m =		1031.5591	
Water 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	(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	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	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612	(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	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612	(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =			876.8252	(64)
Electric shower(s)	52.1704	46.4843	50.7590	48.4387	49.3477	47.0729	48.6420	49.3477	48.4387	50.7590	49.8046	52.1704	(64a)
												593.4353	(64a)
Heat gains from water heating, kWh/month	35.8487	31.5640	33.5521	29.9566	29.2425	26.5980	26.6215	27.6752	27.9289	30.7919	32.2278	35.5579	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4502	121.1771	109.4502	113.0986	109.4502	113.0986	109.4502	109.4502	113.0986	109.4502	113.0986	109.4502 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	48.1837	46.9702	45.0969	41.6064	39.3045	36.9416	35.7816	37.1978	38.7902	41.3869	44.7608	47.7929 (72)
Total internal gains	434.2885	447.0541	427.7784	415.8538	394.6516	381.6024	367.2176	366.3816	377.2978	388.3287	410.6029	424.3212 (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	5.2900		10.6334		0.6300		0.7000		0.7700		17.1909 (74)	
East	8.1200		19.6403		0.6300		0.7000		0.7700		48.7388 (76)	
West	4.5000		19.6403		0.6300		0.7000		0.7700		27.0104 (80)	
Solar gains	92.9402	181.0344	299.8589	445.5782	556.9724	575.8197	545.8228	460.9323	350.9413	214.9369	115.6577	76.6237 (83)
Total gains	527.2288	628.0885	727.6374	861.4320	951.6240	957.4221	913.0404	827.3139	728.2391	603.2656	526.2605	500.9450 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0960	46.2139	46.3300	46.8835	46.9885	47.4837	47.4837	47.5766	47.2917	46.9885	46.7766	46.5570
alpha	4.0731	4.0809	4.0887	4.1256	4.1326	4.1656	4.1656	4.1718	4.1528	4.1326	4.1184	4.1038
util living area	0.9916	0.9825	0.9598	0.8888	0.7532	0.5685	0.4244	0.4834	0.7369	0.9365	0.9840	0.9932 (86)
MIT	19.3263	19.5774	19.9581	20.4512	20.7928	20.9515	20.9886	20.9809	20.8607	20.3778	19.7688	19.2904 (87)
Th 2	19.9435	19.9459	19.9483	19.9594	19.9615	19.9712	19.9712	19.9730	19.9674	19.9615	19.9573	19.9529 (88)
util rest of house	0.9895	0.9779	0.9494	0.8612	0.6985	0.4881	0.3287	0.3818	0.6602	0.9144	0.9791	0.9914 (89)
MIT 2	18.4281	18.6782	19.0527	19.5271	19.8236	19.9479	19.9678	19.9668	19.8894	19.4725	18.8782	18.3995 (90)
Living area fraction	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	0.1732 (91)
MIT	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	18.5538 (92)
Temperature adjustment	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	0.0000
adjusted MIT	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	18.5538 (93)

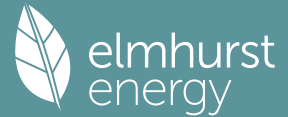
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9855	0.9716	0.9401	0.8528	0.7002	0.5004	0.3451	0.3990	0.6676	0.9056	0.9732	0.9880 (94)
Useful gains	519.5938	610.2394	684.0333	734.5911	666.3440	479.0492	315.1177	330.1345	486.1564	546.3004	512.1705	494.9457 (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	1318.6758	1283.1045	1167.4226	979.1459	750.9328	494.8709	317.6775	334.7506	536.1042	817.7551	1085.5831	1312.0249 (97)
Space heating kWh	594.5170	452.1653	359.6416	176.0794	62.9341	0.0000	0.0000	0.0000	0.0000	201.9623	412.8570	607.9069 (98a)
Space heating requirement - total per year (kWh/year)												2868.0638
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	594.5170	452.1653	359.6416	176.0794	62.9341	0.0000	0.0000	0.0000	0.0000	201.9623	412.8570	607.9069 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2868.0638
Space heating per m ²												(98c) / (4) = 36.3691 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W												
	0.0000	0.0000	0.0000	0.0000	0.0000	842.4482	663.2039	679.7991	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8911	0.9361	0.9091	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	750.7234	620.8137	617.9985	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1077.0981	1027.3549	929.2895	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.9898	302.4666	231.6006	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.7475	75.6166	57.9001	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												192.2642 (107)
Energy for space heating												36.3691 (99)
Energy for space cooling												2.4380 (108)
Total												38.8071 (109)
Fabric Energy Efficiency (TFEE)												38.8 (109)

Full SAP Calculation Printout



Property Reference	32 Manor Road 15%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	97 A	DER	10.34	TER	12.26	
Environmental	92 A	% DER < TER				15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

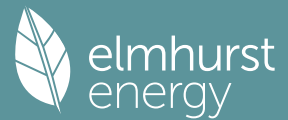
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1500	5.9205	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1800	13.6584	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1500	5.9205	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0437		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014
E3 Sill	31.7800	0.0170	0.5403
E4 Jamb	21.4700	0.0580	1.2453
E5 Ground floor (normal)	21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling	17.1800	0.0570	0.9793
E10 Eaves (insulation at ceiling level)	4.2600	0.0430	0.1832
E12 Gable (insulation at ceiling level)			

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E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss		(33) + (36) + (36a) =	56.8691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	92.8619	92.6264	92.3955	91.3112	91.1083	90.1638	90.1638	89.9889	90.5276	91.1083	91.5187	91.9478 (39)
												91.3102
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1776	1.1746	1.1716	1.1579	1.1553	1.1433	1.1433	1.1411	1.1480	1.1553	1.1605	1.1660 (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												2.4409 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886 (44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615 (45)
Distribution loss (46)m = 0.15 x (45)m										Total = Sum(45)m =		1754.7779
Water storage loss:	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892 (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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
12Total per year (kWh/year)										Total per year (kWh/year) = Sum(64)m =		2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4725	121.2017	109.4725	113.1216	109.4725	113.1216	109.4725	109.4725	113.1216	109.4725	113.1216	109.4725 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Pumps, fans	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
	487.4644	499.2754	477.8167	460.6701	436.3931	416.6555	399.8424	401.0012	413.8645	431.5145	458.7771	476.7874 (73)

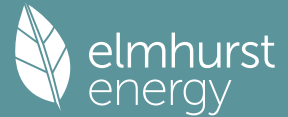
6. Solar gains

[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		0.7600		0.7000		0.7700		25.0114 (74)
East				9.8000	19.6403		0.7600		0.7000		0.7700		70.9608 (76)
West				5.4300	19.6403		0.7600		0.7000		0.7700		39.3181 (80)
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386	(83)
Total gains	622.7546	762.8022	914.3118	1109.2778	1247.1442	1254.8374	1194.3615	1071.9564	924.7168	744.3921	627.1366	588.3261	(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	45.8271	45.9436	46.0584	46.6054	46.7092	47.1984	47.1984	47.2902	47.0088	46.7092	46.4997	46.2827
alpha	4.0551	4.0629	4.0706	4.1070	4.1139	4.1466	4.1466	4.1527	4.1339	4.1139	4.1000	4.0855
util living area	0.9851	0.9668	0.9217	0.8026	0.6278	0.4498	0.3299	0.3816	0.6255	0.8879	0.9713	0.9879 (86)
MIT	19.4626	19.7629	20.1837	20.6465	20.8940	20.9791	20.9954	20.9919	20.9237	20.5277	19.9086	19.4157 (87)
Th 2	19.9380	19.9404	19.9428	19.9538	19.9559	19.9656	19.9656	19.9674	19.9619	19.9559	19.9517	19.9473 (88)
util rest of house	0.9813	0.9589	0.9038	0.7645	0.5708	0.3809	0.2534	0.2981	0.5477	0.8548	0.9631	0.9849 (89)
MIT 2	18.1679	18.5469	19.0668	19.6129	19.8706	19.9534	19.9640	19.9642	19.9107	19.4989	18.7429	18.1148 (90)
Living area fraction									FLA = Living area / (4) =			0.1732 (91)
MIT	18.3922	18.7575	19.2603	19.7919	20.0479	20.1311	20.1426	20.1422	20.0862	19.6771	18.9449	18.3401 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.2422	18.6075	19.1103	19.6419	19.8979	19.9811	19.9926	19.9922	19.9362	19.5271	18.7949	18.1901 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9726	0.9455	0.8866	0.7519	0.5675	0.3820	0.2554	0.3001	0.5457	0.8384	0.9505	0.9774 (94)
Useful gains	605.7163	721.2296	810.6019	834.0122	707.6952	479.3470	305.0900	321.7004	504.6026	624.0676	596.0875	575.0121 (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	1294.6961	1269.6781	1165.1323	980.8589	746.8963	485.1768	305.8926	323.2585	528.3331	813.3351	1070.2979	1286.3608 (97)
Space heating kWh	512.6009	368.5574	263.7706	105.7297	29.1656	0.0000	0.0000	0.0000	0.0000	140.8150	341.4315	529.2434 (98a)
Space heating requirement - total per year (kWh/year)												2291.3142
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	512.6009	368.5574	263.7706	105.7297	29.1656	0.0000	0.0000	0.0000	0.0000	140.8150	341.4315	529.2434 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2291.3142
Space heating per m2										(98c) / (4) =		29.0555 (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 %)												87.7000 (206)
Efficiency of main space heating system 2 (in %)												7.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	512.6009	368.5574	263.7706	105.7297	29.1656	0.0000	0.0000	0.0000	0.0000	140.8150	341.4315	529.2434 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	584.4936	420.2479	300.7647	120.5583	33.2561	0.0000	0.0000	0.0000	0.0000	160.5645	389.3175	603.4703 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.8208	84.4118	83.5803	81.9457	80.1594	79.1000	79.1000	79.1000	79.1000	82.4908	84.2436	79.1000 (216)
Fuel for water heating, kWh/month	274.3230	243.7796	261.7307	235.3156	233.5712	212.0913	208.8047	218.9334	221.7005	236.5365	245.6363	271.1607 (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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-41.8211	-61.4388	-91.6520	-103.5863	-109.7002	-101.3823	-99.9710	-95.4171	-85.7124	-71.0439	-46.5245	-35.5714 (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	-26.0831	-61.2715	-139.8091	-235.1397	-330.5288	-339.6121	-331.7936	-267.8773	-178.6929	-92.1744	-35.9330	-19.9289 (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												2612.6729 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.1000
Water heating fuel used												2863.5837 (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)												237.4410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3002.6653 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	2797.0323 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2612.6729	0.2100	548.6613 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2863.5837	0.2100	601.3526 (264)
Space and water heating			1150.0139 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	0.1344	-126.8546
PV Unit electricity exported	-2058.8444	0.1232	-253.6465
Total			-380.5012 (269)
Total CO2, kg/year			815.7121 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.3400 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2612.6729	1.1300	2952.3204 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2863.5837	1.1300	3235.8496 (278)
Space and water heating			6188.1700 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.4410	1.5338	364.1950 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	1.4967	-1412.6552
PV Unit electricity exported	-2058.8444	0.4521	-930.8086
Total			-2343.4638 (283)
Total Primary energy kWh/year			4339.0020 (286)
Dwelling Primary energy Rate (DPER)			55.0200 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (5)

2. Ventilation rate

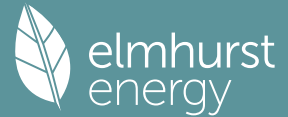
	m3 per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number 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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4502	121.1771	109.4502	113.0986	109.4502	113.0986	109.4502	109.4502	113.0986	109.4502	113.0986	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	(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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	(71)
Water heating gains (Table 5)	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	(72)
Total internal gains	487.4422	499.2508	477.7945	460.6471	436.3709	416.6326	399.8202	400.9789	413.8415	431.4922	458.7542	(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					5.2900	10.6334		0.6300	0.7000	0.7700		17.1909 (74)
East					8.1200	19.6403		0.6300	0.7000	0.7700		48.7388 (76)
West					4.5000	19.6403		0.6300	0.7000	0.7700		27.0104 (80)
Solar gains	92.9402	181.0344	299.8589	445.5782	556.9724	575.8197	545.8228	460.9323	350.9413	214.9369	115.6577	76.6237 (83)
Total gains	580.3824	680.2852	777.6534	906.2253	993.3433	992.4522	945.6430	861.9113	764.7828	646.4291	574.4118	553.3889 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0960	46.2139	46.3300	46.8835	46.9885	47.4837	47.4837	47.5766	47.2917	46.9885	46.7766	46.5570
alpha	4.0731	4.0809	4.0887	4.1256	4.1326	4.1656	4.1656	4.1718	4.1528	4.1326	4.1184	4.1038
util living area	0.9883	0.9770	0.9507	0.8737	0.7337	0.5515	0.4106	0.4657	0.7142	0.9226	0.9785	0.9902 (86)
MIT	19.4096	19.6556	20.0254	20.4943	20.8128	20.9566	20.9899	20.9833	20.8765	20.4297	19.8416	19.3735 (87)
Th 2	19.9435	19.9459	19.9483	19.9594	19.9615	19.9712	19.9712	19.9730	19.9674	19.9615	19.9573	19.9529 (88)
util rest of house	0.9853	0.9713	0.9383	0.8437	0.6780	0.4725	0.3176	0.3671	0.6365	0.8969	0.9721	0.9877 (89)
MIT 2	18.1047	18.4173	18.8812	19.4530	19.8033	19.9447	19.9674	19.9661	19.8800	19.3937	18.6638	18.0652 (90)
Living area fraction	fLA = Living area / (4) =											
MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (92)
Temperature adjustment	0.0000											
adjusted MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9615	0.9253	0.8329	0.6790	0.4843	0.3335	0.3837	0.6435	0.8850	0.9628	0.9820 (94)
Useful gains	567.9963	654.1225	719.5347	754.7820	674.4924	480.6758	315.4159	330.7502	492.1314	572.1151	553.0364	543.4044 (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	1295.3228	1264.4906	1155.4642	974.2594	749.7233	494.7113	317.6663	334.7394	535.6532	812.6704	1070.6024	1288.0762 (97)
Space heating kWh	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98a)
Space heating requirement - total per year (kWh/year)	2595.2817											
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	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2595.2817											
Space heating per m2	(98c) / (4) = 32.9100 (99)											

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

Fraction of space heat from secondary/supplementary system (Table 11)	0.0000 (201)											
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	92.4000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	585.6395	443.9040	351.0081	171.0213	60.5755	0.0000	0.0000	0.0000	0.0000	193.6939	403.2982	599.6058 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	86.1264	85.8290	85.2235	83.9581	82.1285	80.3000	80.3000	80.3000	80.3000	84.1967	85.6258	86.1903 (216)
Fuel for water heating, kWh/month	270.1647	239.7543	256.6843	229.6753	227.9713	208.9218	205.6843	215.6616	218.3874	231.7439	241.6713	267.1072 (219)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7416	18.2442	16.4268	12.0350	9.2962	7.5951	8.4803	11.0230	14.3178	18.7857	21.2184	23.3737 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-36.7904	-51.8008	-74.3722	-83.5291	-89.9991	-83.9791	-82.9298	-78.3115	-70.1684	-59.1704	-40.4180	-31.8144 (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)	-21.0014	-44.1525	-87.7070	-131.6625	-174.0294	-174.8388	-172.7919	-146.3430	-107.3118	-63.1343	-28.0371	-16.6105 (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)												

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(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												2808.7465	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2813.4274	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.5377	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1950.9036	(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												3940.8079	(238)

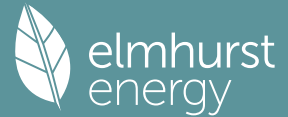
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2808.7465	0.2100	589.8368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.4274	0.2100	590.8198 (264)
Space and water heating			1180.6565 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.5377	0.1443	26.4902 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	0.1346	-105.4386
PV Unit electricity exported	-1167.6203	0.1259	-147.0152
Total			-252.4538 (269)
Total CO2, kg/year			966.6221 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2808.7465	1.1300	3173.8835 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.4274	1.1300	3179.1730 (278)
Space and water heating			6353.0565 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.5377	1.5338	281.5163 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	1.4975	-1172.9677
PV Unit electricity exported	-1167.6203	0.4622	-539.6476
Total			-1712.6153 (283)
Total Primary energy kWh/year			5052.0582 (286)
Target Primary Energy Rate (TPER)			64.0600 (287)

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Property Reference	32 Manor Road 15%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	97 A	DER	10.34	TER	12.26	
Environmental	92 A	% DER < TER				15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1500	5.9205	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1800	13.6584	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1500	5.9205	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	52.0437		(33)

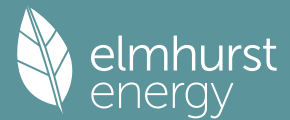
Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1000	0.0250	0.4275
E3 Sill	13.7000	0.0220	0.3014
E4 Jamb	31.7800	0.0170	0.5403
E5 Ground floor (normal)	21.4700	0.0580	1.2453
E6 Intermediate floor within a dwelling	21.7000	0.0010	0.0217
E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832

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E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	56.8691 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Heat transfer coeff	92.8619	92.6264	92.3955	91.3112	91.1083	90.1638	90.1638	89.9889	90.5276	91.1083	91.5187	91.9478 (39)
Average = Sum(39)m / 12 =												91.3102
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1776	1.1746	1.1716	1.1579	1.1553	1.1433	1.1433	1.1411	1.1480	1.1553	1.1605	1.1660 (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												2.4409 (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	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886 (44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615 (45)
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892 (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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
Total internal gains	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361 (73)

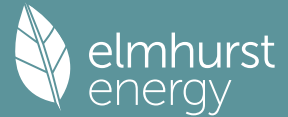
6. Solar gains

[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		0.7600	0.7000	0.7700		25.0114 (74)	
East					9.8000	19.6403		0.7600	0.7000	0.7700		70.9608 (76)	
West					5.4300	19.6403		0.7600	0.7000	0.7700		39.3181 (80)	
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386	(83)
Total gains	695.0859	820.7554	975.6237	1155.0913	1284.4537	1279.2974	1218.6880	1098.9317	956.4136	791.5872	682.8358	656.8747	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9a, Th1 (C)	21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	45.8271	45.9436	46.0584	46.6054	46.7092	47.1984	47.1984	47.2902	47.0088	46.7092	46.4997	46.2827
alpha	4.0551	4.0629	4.0706	4.1070	4.1139	4.1466	4.1466	4.1527	4.1339	4.1139	4.1000	4.0855
util living area	0.9783	0.9582	0.9065	0.7859	0.6136	0.4418	0.3234	0.3726	0.6092	0.8694	0.9623	0.9823 (86)
MIT	19.5718	19.8433	20.2523	20.6754	20.9026	20.9804	20.9958	20.9926	20.9308	20.5726	19.9875	19.5210 (87)
Th 2	19.9380	19.9404	19.9428	19.9538	19.9559	19.9656	19.9656	19.9674	19.9619	19.9559	19.9517	19.9473 (88)
util rest of house	0.9731	0.9486	0.8863	0.7465	0.5569	0.3740	0.2484	0.2909	0.5321	0.8330	0.9519	0.9780 (89)
MIT 2	18.3052	18.6461	19.1475	19.6431	19.8779	19.9542	19.9641	19.9645	19.9158	19.5478	18.8401	18.2477 (90)
Living area fraction	18.3052	18.6461	19.1475	19.6431	19.8779	19.9542	19.9641	19.9645	19.9158	19.5478	18.8401	18.2477 (90)
MIT	18.5246	18.8535	19.3389	19.8219	20.0554	20.1320	20.1428	20.1426	20.0916	19.7253	19.0388	18.4682 (92)
Temperature adjustment	18.3746	18.7035	19.1889	19.6719	19.9054	19.9820	19.9928	19.9926	19.9416	19.5753	18.8888	-0.1500
adjusted MIT	18.3746	18.7035	19.1889	19.6719	19.9054	19.9820	19.9928	19.9926	19.9416	19.5753	18.8888	18.3182 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9623	0.9339	0.8689	0.7348	0.5540	0.3751	0.2504	0.2929	0.5305	0.8173	0.9377	0.9685 (94)
Useful gains	668.8674	766.4685	847.7313	848.8054	711.6095	479.8116	305.1633	321.8699	507.3905	646.9617	640.2862	636.1565 (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	1306.9970	1278.5667	1172.3962	983.5951	747.5802	485.2581	305.9067	323.2904	528.8265	817.7223	1078.9000	1298.1411 (97)
Space heating kWh	474.7684	344.1300	241.5507	97.0486	26.7622	0.0000	0.0000	0.0000	0.0000	127.0458	315.8019	492.5165 (98a)
Space heating requirement - total per year (kWh/year)												2119.6242
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	474.7684	344.1300	241.5507	97.0486	26.7622	0.0000	0.0000	0.0000	0.0000	127.0458	315.8019	492.5165 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2119.6242
Space heating per m2										(98c) / (4) =		26.8783 (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 %)												87.7000 (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	474.7684	344.1300	241.5507	97.0486	26.7622	0.0000	0.0000	0.0000	0.0000	127.0458	315.8019	492.5165 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	541.3551	392.3945	275.4284	110.6598	30.5157	0.0000	0.0000	0.0000	0.0000	144.8641	360.0934	561.5924 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.6722	84.2714	83.3912	81.7850	80.0821	79.1000	79.1000	79.1000	79.1000	82.2819	84.0812	79.1000 (216)
Fuel for water heating, kWh/month	274.8046	244.1857	262.3242	235.7780	233.7968	212.0913	208.8047	218.9334	221.7005	237.1370	246.1110	271.6004 (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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-41.8211	-61.4388	-91.6520	-103.5863	-109.7002	-101.3823	-99.9710	-95.4171	-85.7124	-71.0439	-46.5245	-35.5714 (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)	-26.0831	-61.2715	-139.8091	-235.1397	-330.5288	-339.6121	-331.7936	-267.8773	-178.6929	-92.1744	-35.9330	-19.9289 (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												2416.9033 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.1000
Water heating fuel used												2867.2675 (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)												237.4410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-3002.6653 (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 2604.9466 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2416.9033	3.6400	87.9753 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2867.2675	3.6400	104.3685 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	237.4410	16.4900	39.1540 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	16.4900	-155.6361
PV Unit electricity exported	-2058.8444	5.5900	-115.0894
Total			-270.7255 (252)
Total energy cost			66.9538 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1946 (257)
SAP value		96.8455
SAP rating (Section 12)		97 (258)
SAP band		A

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	2416.9033	0.2100	507.5497 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2867.2675	0.2100	602.1262 (264)
Space and water heating			1109.6759 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	0.1344	-126.8546
PV Unit electricity exported	-2058.8444	0.1232	-253.6465
Total			-380.5012 (269)
Total CO2, kg/year			775.3741 (272)
CO2 emissions per m2			9.8300 (273)
EI value			91.6115
EI rating			92 (274)
EI band			A

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

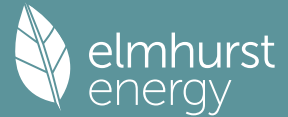
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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)
Air changes per hour	30.0000 / (5) = 0.1654 (8)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (21)

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Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.8000	Jun 3.5000	Jul 3.6000	Aug 3.4000	Sep 3.4000	Oct 3.7000	Nov 3.5000	Dec 4.0000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)
Adj infilt rate													
Effective ac	0.3707	0.3531	0.3531	0.3266	0.3354	0.3090	0.3178	0.3001	0.3001	0.3266	0.3090	0.3531	(22b)
	0.5687	0.5623	0.5623	0.5533	0.5563	0.5477	0.5505	0.5450	0.5450	0.5533	0.5477	0.5623	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
External Door			1.8000	1.0000	1.8000			(26a)
Window			21.6100	1.1450	24.7443			(27)
Heatloss Floor 1			39.4700	0.1500	5.9205	110.0000	4341.7000	(28a)
External Wall 1	99.2900	23.4100	75.8800	0.1800	13.6584	140.0000	10623.2000	(29a)
External Roof 1	39.4700		39.4700	0.1500	5.9205	9.0000	355.2300	(30)
Total net area of external elements Aum(A, m2)			178.2300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	52.0437		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.2700 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1000	0.0250	0.4275
E3 Sill	13.7000	0.0220	0.3014
E4 Jamb	31.7800	0.0170	0.5403
E5 Ground floor (normal)	21.4700	0.0580	1.2453
E6 Intermediate floor within a dwelling	21.7000	0.0010	0.0217
E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832
E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.8254 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 56.8691 (37)

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

(38)m	Jan 34.0409	Feb 33.6585	Mar 33.6585	Apr 33.1198	May 33.2947	Jun 32.7840	Jul 32.9496	Aug 32.6231	Sep 32.6231	Oct 33.1198	Nov 32.7840	Dec 33.6585	(38)
Heat transfer coeff	90.9101	90.5276	90.5276	89.9889	90.1638	89.6531	89.8187	89.4922	89.4922	89.9889	89.6531	90.5276	(39)
Average = Sum(39)m / 12 =												90.0620	

HLP	Jan 1.1528	Feb 1.1480	Mar 1.1480	Apr 1.1411	May 1.1433	Jun 1.1369	Jul 1.1390	Aug 1.1348	Sep 1.1348	Oct 1.1411	Nov 1.1369	Dec 1.1480	(40)
HLP (average)												1.1420	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

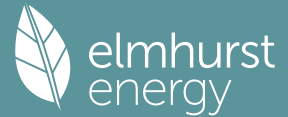
Assumed occupancy													2.4409 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
Average daily hot water use (litres/day)												105.6685	(43)

Daily hot water use	Jan 114.7426	Feb 112.1860	Mar 109.1741	Apr 104.8365	May 101.2266	Jun 97.3807	Jul 96.0816	Aug 99.0826	Sep 102.2221	Oct 106.2365	Nov 110.6337	Dec 114.4886	(44)
Energy conte	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)
Energy content (annual)										Total = Sum(45)m =		1754.7779	
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442	(65)

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

Metabolic gains (Table 5), Watts	Jan 146.4525	Feb 146.4525	Mar 146.4525	Apr 146.4525	May 146.4525	Jun 146.4525	Jul 146.4525	Aug 146.4525	Sep 146.4525	Oct 146.4525	Nov 146.4525	Dec 146.4525	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493 (68)
Pumps, fans	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861 (69)
Losses e.g. evaporation	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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361 (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	12.3661	0.7600	0.7000	0.7700	29.0870 (74)	
East						9.8000	23.0580	0.7600	0.7000	0.7700	83.3090 (76)	
West						5.4300	23.0580	0.7600	0.7000	0.7700	46.1600 (80)	
Solar gains	158.5560	269.3429	445.4736	678.8995	824.5214	911.0430	854.8165	735.5498	563.6908	346.2636	190.7009	125.2125 (83)
Total gains	718.3517	826.5715	984.6022	1185.3832	1298.2240	1352.1586	1278.9854	1163.5264	1009.2521	824.9732	705.1772	670.5486 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.8110	47.0088	47.0088	47.2902	47.1984	47.4673	47.3798	47.5526	47.5526	47.2902	47.4673	47.0088
alpha	4.1207	4.1339	4.1339	4.1527	4.1466	4.1645	4.1587	4.1702	4.1702	4.1527	4.1645	4.1339
util living area	0.9704	0.9476	0.8791	0.7188	0.5154	0.3035	0.1825	0.2151	0.4749	0.8029	0.9461	0.9763 (86)
MIT	19.7808	20.0214	20.4263	20.8019	20.9585	20.9966	20.9997	20.9995	20.9786	20.7412	20.1901	19.7195 (87)
Th 2	19.9579	19.9619	19.9619	19.9674	19.9656	19.9708	19.9691	19.9725	19.9725	19.9674	19.9708	19.9619 (88)
util rest of house	0.9631	0.9353	0.8531	0.6711	0.4525	0.2363	0.1102	0.1363	0.3915	0.7513	0.9310	0.9703 (89)
MIT 2	18.5829	18.8838	19.3705	19.7902	19.9370	19.9696	19.9691	19.9724	19.9616	19.7421	19.1049	18.5093 (90)
Living area fraction	18.7904	19.0808	19.5534	19.9655	20.1139	20.1475	20.1476	20.1503	20.1377	19.9152	19.2929	18.7189 (92)
MIT	18.7904	19.0808	19.5534	19.9655	20.1139	20.1475	20.1476	20.1503	20.1377	19.9152	19.2929	18.7189 (92)
Temperature adjustment	18.6404	18.9308	19.4034	19.8155	19.9639	19.9975	19.9976	20.0003	19.9877	19.7652	19.1429	-0.1500
adjusted MIT	18.6404	18.9308	19.4034	19.8155	19.9639	19.9975	19.9976	20.0003	19.9877	19.7652	19.1429	18.5689 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9506	0.9197	0.8367	0.6635	0.4524	0.2381	0.1122	0.1384	0.3928	0.7398	0.9153	0.9592 (94)
Ext temp.	682.8439	760.2223	823.7919	786.4936	587.3609	321.8951	143.4831	161.0786	396.3886	610.3010	645.4287	643.1926 (95)
Heat loss rate W	5.2000	5.8000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Space heating kWh	1221.8652	1188.7024	1068.5317	865.2867	600.8446	322.5235	143.4974	161.1151	401.6165	707.7781	990.0323	1210.2569 (97)
Space heating requirement - total per year (kWh/year)	401.0318	287.9386	182.0865	56.7310	10.0319	0.0000	0.0000	0.0000	0.0000	72.5230	248.1146	421.8958 (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)	401.0318	287.9386	182.0865	56.7310	10.0319	0.0000	0.0000	0.0000	0.0000	72.5230	248.1146	421.8958 (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) = 21.3081 (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 %)	87.7000 (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
401.0318	287.9386	182.0865	56.7310	10.0319	0.0000	0.0000	0.0000	0.0000	0.0000	72.5230	248.1146	421.8958 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	457.2769	328.3223	207.6242	64.6876	11.4389	0.0000	0.0000	0.0000	0.0000	82.6944	282.9129	481.0671 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Water heating requirement	84.3334	83.8981	82.7878	80.9035	79.4965	79.1000	79.1000	79.1000	79.1000	81.2592	83.5682	79.1000 (216)
Efficiency of water heater (217)m	275.9086	245.2722	264.2362	238.3470	235.5192	212.0913	208.8047	218.9334	221.7005	240.1215	247.6216	272.5849 (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	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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											

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(233a)m	-47.2964	-62.5481	-92.8235	-105.5093	-110.2532	-103.3733	-101.7391	-98.1257	-89.3453	-75.4393	-50.9935	-39.0885	(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	-32.8632	-63.6198	-144.3205	-249.6975	-337.7641	-376.1010	-363.0077	-300.6629	-203.2913	-106.1382	-43.0522	-23.6879	(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												1916.0243	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.1000	
Water heating fuel used												2881.1410	(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)												237.4410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-3220.7414	(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												1899.8649	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1916.0243	5.6000	107.2974	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.1410	5.6000	161.3439	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	237.4410	26.0600	61.8771	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.5353	26.0600	-254.4851	
PV Unit electricity exported	-2244.2061	5.8100	-130.3884	
Total			-384.8735	(252)
Total energy cost			67.0565	(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	1916.0243	0.2100	402.3651	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.1410	0.2100	605.0396	(264)
Space and water heating			1007.4047	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	237.4410	0.1443	34.2701	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.5353	0.1346	-131.4795	
PV Unit electricity exported	-2244.2061	0.1229	-275.7368	
Total			-407.2163	(269)
Total CO2, kg/year			646.3877	(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	1916.0243	1.1300	2165.1075	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.1410	1.1300	3255.6893	(278)
Space and water heating			5420.7968	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	237.4410	1.5338	364.1950	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.5353	1.4976	-1462.4636	
PV Unit electricity exported	-2244.2061	0.4508	-1011.6864	
Total			-2474.1500	(283)
Total Primary energy kWh/year			3440.9426	(286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: A 97
Current environmental impact rating: A 92

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

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

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.8 -£ 30 -166 kg (25.7%)

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

Potential energy efficiency rating: A 97
 Potential environmental impact rating: A 92

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£84	£84	£0
Mains gas	£368	£368	£0
Space heating	£229	£229	£0
Water heating	£161	£161	£0
Lighting	£62	£62	£0
Generated (PV)	-£385	-£385	£0
Total cost of fuels	£67	£67	£0
Total cost of uses	£67	£67	£0
Delivered energy	24 kWh/m²	24 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.6 tonnes	0.6 tonnes	0.0 tonnes
CO2 emissions per m²	8 kg/m²	8 kg/m²	0 kg/m²
Primary energy	44 kWh/m²	44 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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)

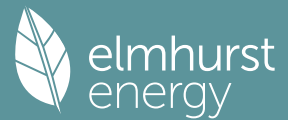
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1654 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4154	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3531 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infiltr rate	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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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Main dwelling	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K		
External Door						1.8000		1.0000		1.8000				(26a)	
Window						21.6100		1.1450		24.7443				(27)	
Heatloss Floor 1						39.4700		0.1500		5.9205	110.0000		4341.7000	(28a)	
External Wall 1		99.2900		23.4100		75.8800		0.1800		13.6584	140.0000		10623.2000	(29a)	
External Roof 1		39.4700				39.4700		0.1500		5.9205	9.0000		355.2300	(30)	
Total net area of external elements Aum(A, m2)						178.2300									(31)
Fabric heat loss, W/K = Sum (A x U)						(26)...(30) + (32) =						52.0437		(33)	
Heat capacity Cm = Sum(A x k)						(28)...(30) + (32) + (32a)...(32e) =						15320.1300		(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K												194.2700		(35)	
List of Thermal Bridges															
K1 Element										Length	Psi-value		Total		
E2 Other lintels (including other steel lintels)										17.1000	0.0250		0.4275		
E3 Sill										13.7000	0.0220		0.3014		
E4 Jamb										31.7800	0.0170		0.5403		
E5 Ground floor (normal)										21.4700	0.0580		1.2453		
E6 Intermediate floor within a dwelling										21.7000	0.0010		0.0217		
E10 Eaves (insulation at ceiling level)										17.1800	0.0570		0.9793		
E12 Gable (insulation at ceiling level)										4.2600	0.0430		0.1832		
E16 Corner (normal)										13.8000	0.0420		0.5796		
E18 Party wall between dwellings										4.6000	0.0410		0.1886		
P1 Party wall - Ground floor										4.2700	0.0440		0.1879		
P2 Party wall - Intermediate floor within a dwelling										4.2700	0.0000		0.0000		
P4 Party wall - Roof (insulation at ceiling level)										4.2700	0.0400		0.1708		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												4.8254	(36)		
Point Thermal bridges												0.0000			
Total fabric heat loss						(33) + (36) + (36a) =						56.8691	(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			
	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787	(38)		
Heat transfer coeff	92.8619	92.6264	92.3955	91.3112	91.1083	90.1638	90.1638	89.9889	90.5276	91.1083	91.5187	91.9478	(39)		
Average = Sum(39)m / 12 =													91.3102		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
HLP (average)	1.1776	1.1746	1.1716	1.1579	1.1553	1.1433	1.1433	1.1411	1.1480	1.1553	1.1605	1.1660	(40)		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31			

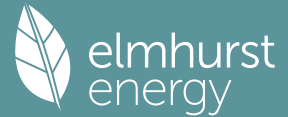
4. Water heating energy requirements (kWh/year)															

Assumed occupancy													2.4409 (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															
	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)		
Hot water usage for other uses															
	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)		
Average daily hot water use (litres/day)													105.6685 (43)		
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886	(44)		
Energy conte	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)		
Energy content (annual)											Total = Sum(45)m =	1754.7779			
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)		
Total heat required for water heating calculated for each month															
	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)		
Electric shower(s)															
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)		
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =													0.0000 (64a)		
Heat gains from water heating, kWh/month															
	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442	(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			
	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	(66)		
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5															
	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464	(67)		
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5															
	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493	(68)		
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5															
	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	(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)															
	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	(71)		
Water heating gains (Table 5)															
	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368	(72)		
Total internal gains															
	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361	(73)		

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[Jan]	Area m2				Solar flux Table 6a W/m2	Specific data or Table 6b	Specific data or Table 6c	FF	Access factor Table 6d			Gains W
North	6.3800				10.6334	0.7600		0.7000	0.7700			25.0114 (74)
East	9.8000				19.6403	0.7600		0.7000	0.7700			70.9608 (76)
West	5.4300				19.6403	0.7600		0.7000	0.7700			39.3181 (80)
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386 (83)
Total gains	695.0859	820.7554	975.6237	1155.0913	1284.4537	1279.2974	1218.6880	1098.9317	956.4136	791.5872	682.8358	656.8747 (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	45.8271	45.9436	46.0584	46.6054	46.7092	47.1984	47.1984	47.2902	47.0088	46.7092	46.4997	46.2827
alpha	4.0551	4.0629	4.0706	4.1070	4.1139	4.1466	4.1466	4.1527	4.1339	4.1139	4.1000	4.0855
util living area	0.9783	0.9582	0.9065	0.7859	0.6136	0.4418	0.3234	0.3726	0.6092	0.8694	0.9623	0.9823 (86)
MIT	19.5718	19.8433	20.2523	20.6754	20.9026	20.9804	20.9958	20.9926	20.9308	20.5726	19.9875	19.5210 (87)
Th 2	19.9380	19.9404	19.9428	19.9538	19.9559	19.9656	19.9656	19.9674	19.9619	19.9559	19.9517	19.9473 (88)
util rest of house	0.9731	0.9486	0.8863	0.7465	0.5569	0.3740	0.2484	0.2909	0.5321	0.8330	0.9519	0.9780 (89)
MIT 2	18.3052	18.6461	19.1475	19.6431	19.8779	19.9542	19.9641	19.9645	19.9158	19.5478	18.8401	18.2477 (90)
Living area fraction	fLA = Living area / (4) = 0.1732 (91)											
MIT	18.5246	18.8535	19.3389	19.8219	20.0554	20.1320	20.1428	20.1426	20.0916	19.7253	19.0388	18.4682 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.3746	18.7035	19.1889	19.6719	19.9054	19.9820	19.9928	19.9926	19.9416	19.5753	18.8888	18.3182 (93)
8. Space heating requirement												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9623	0.9339	0.8689	0.7348	0.5540	0.3751	0.2504	0.2929	0.5305	0.8173	0.9377	0.9685 (94)
Useful gains	668.8674	766.4685	847.7313	848.8054	711.6095	479.8116	305.1633	321.8699	507.3905	646.9617	640.2862	636.1565 (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	1306.9970	1278.5667	1172.3962	983.5951	747.5802	485.2581	305.9067	323.2904	528.8265	817.7223	1078.9000	1298.1411 (97)
Space heating kWh	474.7684	344.1300	241.5507	97.0486	26.7622	0.0000	0.0000	0.0000	0.0000	127.0458	315.8019	492.5165 (98a)
Space heating requirement - total per year (kWh/year)	2119.6242											
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	474.7684	344.1300	241.5507	97.0486	26.7622	0.0000	0.0000	0.0000	0.0000	127.0458	315.8019	492.5165 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	2119.6242											
Space heating per m2	(98c) / (4) = 26.8783 (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 %)												87.7000 (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	474.7684	344.1300	241.5507	97.0486	26.7622	0.0000	0.0000	0.0000	0.0000	127.0458	315.8019	492.5165 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	541.3551	392.3945	275.4284	110.6598	30.5157	0.0000	0.0000	0.0000	0.0000	144.8641	360.0934	561.5924 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.6722	84.2714	83.3912	81.7850	80.0821	79.1000	79.1000	79.1000	79.1000	82.2819	84.0812	79.1000 (216)
Fuel for water heating, kWh/month	274.8046	244.1857	262.3242	235.7780	233.7968	212.0913	208.8047	218.9334	221.7005	237.1370	246.1110	271.6004 (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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-41.8211	-61.4388	-91.6520	-103.5863	-109.7002	-101.3823	-99.9710	-95.4171	-85.7124	-71.0439	-46.5245	-35.5714 (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	-26.0831	-61.2715	-139.8091	-235.1397	-330.5288	-339.6121	-331.7936	-267.8773	-178.6929	-92.1744	-35.9330	-19.9289 (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	2416.9033	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.1000	
Water heating fuel used	2867.2675	(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)	237.4410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-3002.6653	(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	2604.9466	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2416.9033	3.6400	87.9753 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2867.2675	3.6400	104.3685 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	237.4410	16.4900	39.1540 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	16.4900	-155.6361
PV Unit electricity exported	-2058.8444	5.5900	-115.0894
Total			-270.7255 (252)
Total energy cost			66.9538 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	0.1946 (257)
SAP value		96.8455
SAP rating (Section 12)		97 (258)
SAP band		A

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	2416.9033	0.2100	507.5497 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2867.2675	0.2100	602.1262 (264)
Space and water heating			1109.6759 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-943.8209	0.1344	-126.8546
PV Unit electricity exported	-2058.8444	0.1232	-253.6465
Total			-380.5012 (269)
Total CO2, kg/year			775.3741 (272)
CO2 emissions per m2			9.8300 (273)
EI value			91.6115
EI rating			92 (274)
EI band			A

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	181.3780 (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	0.1654 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				5.0000 (17)
Infiltration rate				0.4154 (18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =			0.3531 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000	(22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)
Effective ac	0.3707	0.3531	0.3531	0.3266	0.3354	0.3090	0.3178	0.3001	0.3001	0.3266	0.3090	0.3531	(22b)
	0.5687	0.5623	0.5623	0.5533	0.5563	0.5477	0.5505	0.5450	0.5450	0.5533	0.5477	0.5623	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
External Door			1.8000	1.0000	1.8000			(26a)
Window			21.6100	1.1450	24.7443			(27)
Heatloss Floor 1			39.4700	0.1500	5.9205	110.0000	4341.7000	(28a)
External Wall 1	99.2900	23.4100	75.8800	0.1800	13.6584	140.0000	10623.2000	(29a)
External Roof 1	39.4700		39.4700	0.1500	5.9205	9.0000	355.2300	(30)
Total net area of external elements Aum(A, m2)			178.2300					(31)
Fabric heat loss, W/K = Sum (A x U)					52.0437			(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.2700 (35)

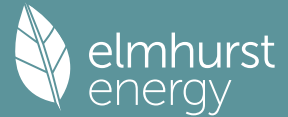
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	17.1000	0.0250	0.4275	
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014	
E3 Sill	31.7800	0.0170	0.5403	
E4 Jamb	21.4700	0.0580	1.2453	
E5 Ground floor (normal)	21.7000	0.0010	0.0217	
E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793	
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832	
E16 Corner (normal)	13.8000	0.0420	0.5796	
E18 Party wall between dwellings	4.6000	0.0410	0.1886	
P1 Party wall - Ground floor	4.2700	0.0440	0.1879	
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss			56.8691	(33) + (36) + (36a) = (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	34.0409	33.6585	33.6585	33.1198	33.2947	32.7840	32.9496	32.6231	32.6231	33.1198	32.7840	33.6585	(38)
Average = Sum(39)m / 12 =	90.9101	90.5276	90.5276	89.9889	90.1638	89.6531	89.8187	89.4922	89.4922	89.9889	89.6531	90.5276	(39)
												90.0620	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1528	1.1480	1.1480	1.1411	1.1433	1.1369	1.1390	1.1348	1.1348	1.1411	1.1369	1.1480	(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													2.4409 (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	
Hot water usage for other uses	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)
Average daily hot water use (litres/day)	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
												105.6685	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886	(44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)
Distribution loss	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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)

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Output from w/h	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
	Total per year (kWh/year) = Sum(64)m =											2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
Total internal gains	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361 (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	12.3661	0.7600	0.7000	0.7700	29.0870 (74)		
East					9.8000	23.0580	0.7600	0.7000	0.7700	83.3090 (76)		
West					5.4300	23.0580	0.7600	0.7000	0.7700	46.1600 (80)		
Solar gains	158.5560	269.3429	445.4736	678.8995	824.5214	911.0430	854.8165	735.5498	563.6908	346.2636	190.7009	125.2125 (83)
Total gains	718.3517	826.5715	984.6022	1185.3832	1298.2240	1352.1586	1278.9854	1163.5264	1009.2521	824.9732	705.1772	670.5486 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.8110	47.0088	47.0088	47.2902	47.1984	47.4673	47.3798	47.5526	47.5526	47.2902	47.4673	47.0088
alpha	4.1207	4.1339	4.1339	4.1527	4.1466	4.1645	4.1587	4.1702	4.1702	4.1527	4.1645	4.1339
util living area	0.9704	0.9476	0.8791	0.7188	0.5154	0.3035	0.1825	0.2151	0.4749	0.8029	0.9461	0.9763 (86)
MIT	19.7808	20.0214	20.4263	20.8019	20.9585	20.9966	20.9997	20.9995	20.9786	20.7412	20.1901	19.7195 (87)
Th 2	19.9579	19.9619	19.9619	19.9674	19.9656	19.9708	19.9691	19.9725	19.9725	19.9674	19.9708	19.9619 (88)
util rest of house	0.9631	0.9353	0.8531	0.6711	0.4525	0.2363	0.1102	0.1363	0.3915	0.7513	0.9310	0.9703 (89)
MIT 2	18.5829	18.8838	19.3705	19.7902	19.9370	19.9696	19.9691	19.9724	19.9616	19.7421	19.1049	18.5093 (90)
Living area fraction	FLA = Living area / (4) =											0.1732 (91)
MIT	18.7904	19.0808	19.5534	19.9655	20.1139	20.1475	20.1476	20.1503	20.1377	19.9152	19.2929	18.7189 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.6404	18.9308	19.4034	19.8155	19.9639	19.9975	19.9976	20.0003	19.9877	19.7652	19.1429	18.5689 (93)

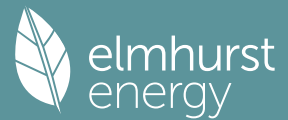
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9506	0.9197	0.8367	0.6635	0.4524	0.2381	0.1122	0.1384	0.3928	0.7398	0.9153	0.9592 (94)
Useful gains	682.8439	760.2223	823.7919	786.4936	587.3609	321.8951	143.4831	161.0786	396.3886	610.3010	645.4287	643.1926 (95)
Ext temp.	5.2000	5.8000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Heat loss rate W	1221.8652	1188.7024	1068.5317	865.2867	600.8446	322.5235	143.4974	161.1151	401.6165	707.7781	990.0323	1210.2569 (97)
Space heating kWh	401.0318	287.9386	182.0865	56.7310	10.0319	0.0000	0.0000	0.0000	0.0000	72.5230	248.1146	421.8958 (98a)
Space heating requirement - total per year (kWh/year)												1680.3533
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	401.0318	287.9386	182.0865	56.7310	10.0319	0.0000	0.0000	0.0000	0.0000	72.5230	248.1146	421.8958 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1680.3533
Space heating per m2												(98c) / (4) = 21.3081 (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 %)												87.7000 (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
	401.0318	287.9386	182.0865	56.7310	10.0319	0.0000	0.0000	0.0000	0.0000	72.5230	248.1146	421.8958 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)												

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457.2769	328.3223	207.6242	64.6876	11.4389	0.0000	0.0000	0.0000	0.0000	82.6944	282.9129	481.0671	(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												
232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)
Efficiency of water heater												
(217)m	84.3334	83.8981	82.7878	80.9035	79.4965	79.1000	79.1000	79.1000	81.2592	83.5682	79.1000	(216)
Fuel for water heating, kWh/month												
275.9086	245.2722	264.2362	238.3470	235.5192	212.0913	208.8047	218.9334	221.7005	240.1215	247.6216	272.5849	(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	(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	(231)
Lighting	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-47.2964	-62.5481	-92.8235	-105.5093	-110.2532	-103.3733	-101.7391	-98.1257	-89.3453	-75.4393	-50.9935	(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	-32.8632	-63.6198	-144.3205	-249.6975	-337.7641	-376.1010	-363.0077	-300.6629	-203.2913	-106.1382	-43.0522	(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											1916.0243	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.1000	
Water heating fuel used											2881.1410	(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)											237.4410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-3220.7414	(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											1899.8649	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1916.0243	5.6000	107.2974	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.1410	5.6000	161.3439	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	237.4410	26.0600	61.8771	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.5353	26.0600	-254.4851	
PV Unit electricity exported	-2244.2061	5.8100	-130.3884	
Total			-384.8735	(252)
Total energy cost			67.0565	(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	1916.0243	0.2100	402.3651	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2881.1410	0.2100	605.0396	(264)
Space and water heating			1007.4047	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	237.4410	0.1443	34.2701	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-976.5353	0.1346	-131.4795	
PV Unit electricity exported	-2244.2061	0.1229	-275.7368	
Total			-407.2163	(269)
Total CO2, kg/year			646.3877	(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	1916.0243	1.1300	2165.1075	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2881.1410	1.1300	3255.6893	(278)
Space and water heating			5420.7968	(279)

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Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.4410	1.5338	364.1950 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-976.5353	1.4976	-1462.4636
PV Unit electricity exported	-2244.2061	0.4508	-1011.6864
Total			-2474.1500 (283)
Total Primary energy kWh/year			3440.9426 (286)

Predicted Energy Assessment



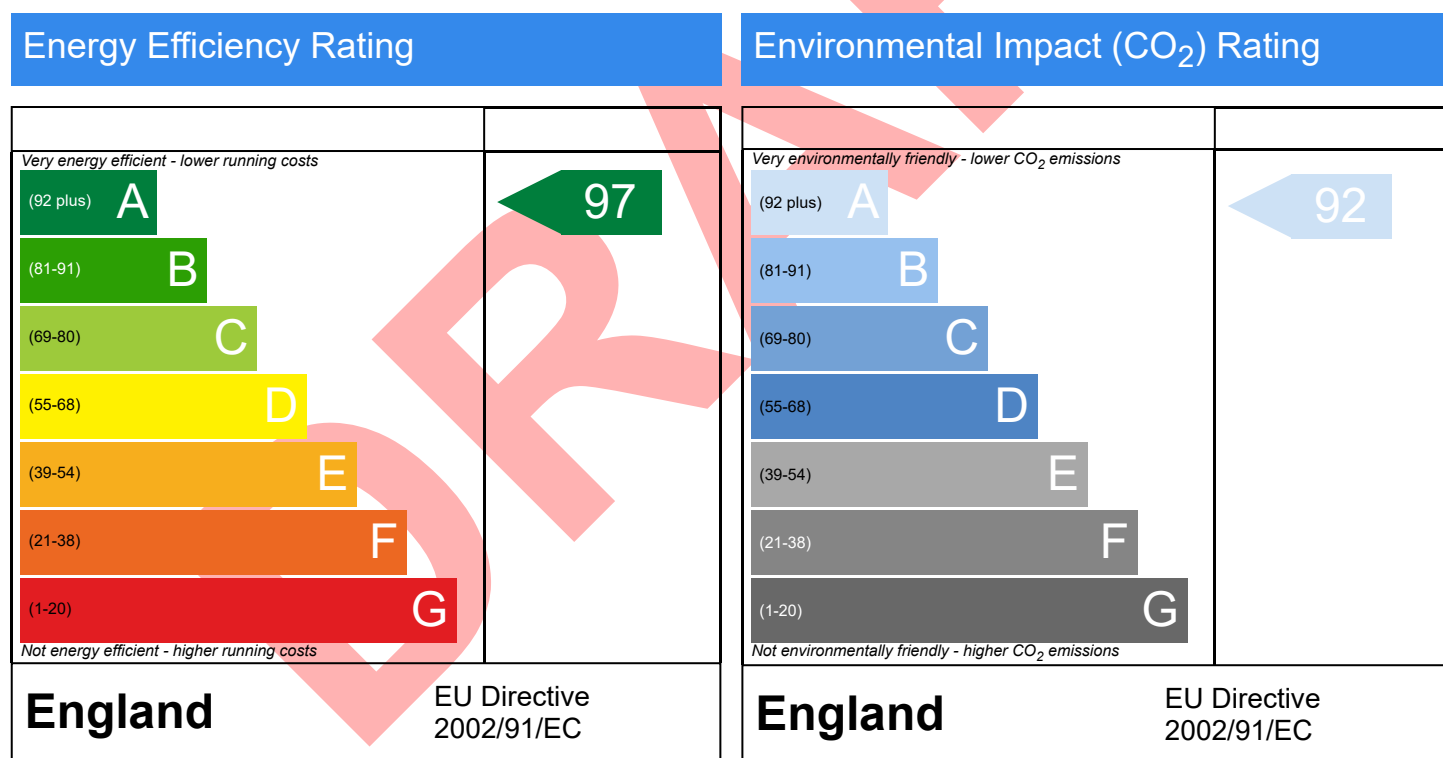
32, Manor Road, Hayes, UB3 2DG

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
21/04/2025
Chris Law
78.86 m²

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

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



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

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

Thermal Bridging

Property Reference	32 Manor Road 15%	Issued on Date	21/04/2025
Assessment Reference	00001	Prop Type Ref	Semi-Detached House
Property	32, Manor Road, Hayes, UB3 2DG		

SAP Rating	97 A	DER	10.34	TER	12.26
Environmental	92 A	% DER < TER			15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81
Compliance Check	See BREL	% DFEE < TFEE			4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	0.025	17.10	0.43	
External wall	E3 Sill	Non Gov Approved Schemes	0.022	13.70	0.30	
External wall	E4 Jamb	Non Gov Approved Schemes	0.017	31.78	0.54	
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.058	21.47	1.25	
External wall	E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	0.001	21.70	0.02	
External wall	E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	0.057	17.18	0.98	
External wall	E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	0.043	4.26	0.18	
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.042	13.80	0.58	
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.041	4.60	0.19	
Party wall	P1 Party wall - Ground floor	Non Gov Approved Schemes	0.044	4.27	0.19	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	4.27	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	0.040	4.27	0.17	

Total: 158.40 W/mK:
Y-Value: 0.03 W/m²K:

Energy Report

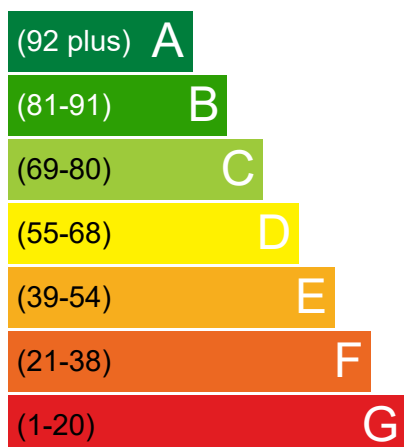
Dwelling Address	32, Manor Road, Hayes, UB3 2DG
Reference	32 Manor Road 15%-00001
Assessment Date	21/04/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	79

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Efficiency Rating

Most energy efficient - lower running costs

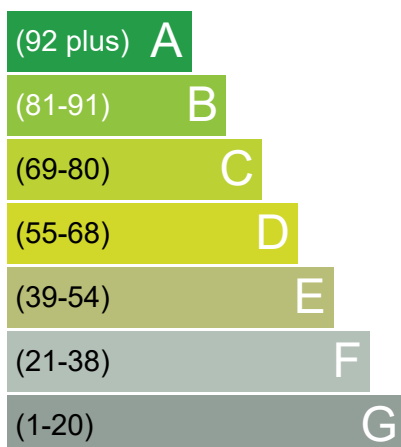


CURRENT POTENTIAL

97 97

Carbon Dioxide (CO2) Emissions Rating

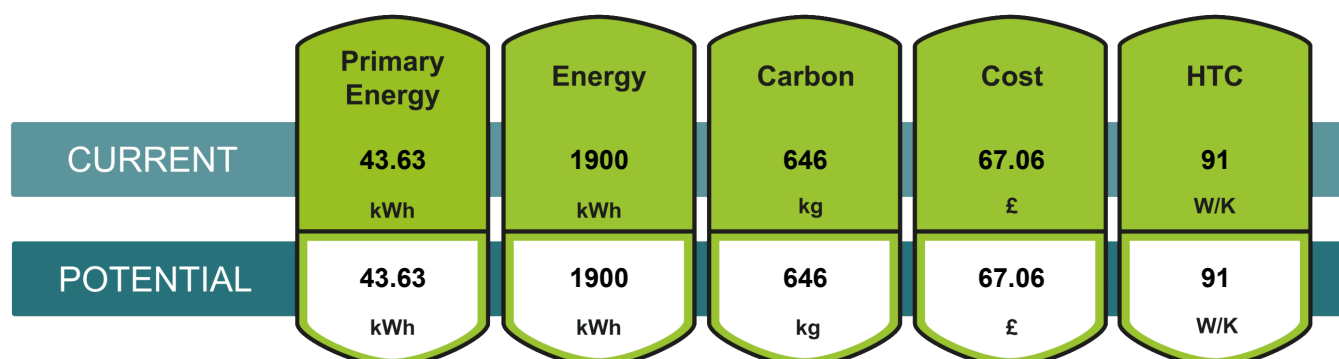
Very environmentally friendly - lower CO2 emissions



CURRENT POTENTIAL

92 92

Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
-----------	------	---------	------	-----------

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.18 W/m ² K	Very Good
Roof	Average thermal transmittance 0.15 W/m ² K	Very Good
Floor	Average thermal transmittance 0.15 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£30	A 98			A 93

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£62	£62	
Heating		£229	£229	
Hot Water		£161	£161	
New Technologies e.g. Impact of PV		-(£385)	-(£385)	
TOTAL		£67	£67	

Estimated energy use and potential savings



Space Heating

1916

kWh per year



Water Heating

2881

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report



Property Reference	32 Manor Road 15%	Issued on Date	21/04/2025
Assessment Reference	00001	Prop Type Ref	Semi-Detached House
Property	32, Manor Road, Hayes, UB3 2DG		

SAP Rating	97 A	DER	10.34	TER	12.26
Environmental	92 A	% DER < TER			15.66
CO ₂ Emissions (t/year)	0.65	DFEE	37.06	TFEE	38.81
Compliance Check	See BREL	% DFEE < TFEE			4.50
% DPER < TPER	14.11	DPER	55.02	TPER	64.06

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name		
House Number	32	
Postcode	UB3 2DG	
Street	Manor Road	
Town	Hayes	
County		

Dwelling Orientation (Please confirm orientation of main entrance door of the dwelling.)

Comments	
----------	--

Terrain Type

Property Type

Comments	
----------	--

Electricity Tariff

Smart electricity meter fitted

Smart gas meter fitted

Comments	
----------	--

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1		
Type	Cavity Wall		
Construction	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure		
U-value	0.18	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	99.29	m²	
Comments			

External Roofs

Dwelling Sign Off Report



Description	External Roof 1		
Type	External Plane Roof		
Construction	Plasterboard, insulated at ceiling level		
U-value	0.15	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	39.47	m²	
Comments			

Heat Loss Floors

Description	Heatloss Floor 1		
Type	Ground Floor - Solid		
Construction	Slab on ground, screed over insulation		
U-value	0.15	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Area	39.47	m²	
Comments			

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
External Door	Manufacturer	Half Glazed Door	Double glazed	0.76		1.00
Window	Manufacturer	Window	Double glazed	0.76		1.20
Comments						

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Front	External Door	External Wall 1	West	1.80
Front	Window	External Wall 1	West	5.43
Side	Window	External Wall 1	North	6.38
Rear	Window	External Wall 1	East	9.80
Comments				

Thermal Bridging

List of Bridges

Bridge Type	Source Type	Length (m)	Psi (W/mK)	Reference
E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	17.10	0.03	

Dwelling Sign Off Report



E3 Sill	Non Gov Approved Schemes	13.70	0.02
E4 Jamb	Non Gov Approved Schemes	31.78	0.02
E5 Ground floor (normal)	Non Gov Approved Schemes	21.47	0.06
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	21.70	0.00
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	17.18	0.06
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	4.26	0.04
E16 Corner (normal)	Non Gov Approved Schemes	13.80	0.04
E18 Party wall between dwellings	Non Gov Approved Schemes	4.60	0.04
P1 Party wall - Ground floor	Non Gov Approved Schemes	4.27	0.04
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	4.27	0.00
P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	4.27	0.04

Y-value

0.027

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes

Designed AP₅₀

5.00

m³/(h.m²) @ 50 Pa

Property Tested?

Yes

Test Method

Blower Door

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Fans, Open Fireplaces, Flues

Number of open chimneys

0

Number of open flues

0

Number of chimneys/flues attached to closed fire

0

Number of flues attached to solid fuel boiler

0

Number of flues attached to other heater

0

Number of blocked chimneys

0

Number of intermittent extract fans

3

Number of passive vents

0

Number of flueless gas fires

0

Comments

Dwelling Sign Off Report

Fixed Cooling System

Comments

Lighting

No Fixed Lighting

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
Lighting 1	80.00	25.00	2000.00	24

Comments

Main Heating 1

Database		
Fuel Type	Mains gas	
Winter Efficiency	87.70	%
Summer Efficiency	79.10	%
Model Name	Flexicom 30cx	
Manufacturer	Vaillant Group	
System Type	Combi boiler	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Time and temperature zone control by arrangement
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2

Dwelling Sign Off Report



Secondary Heating

Water Heating System

Water Heating

Supplementary Immersion

SAP Code

Water use <= 125 l/p/day

Cold Water Source

Number of baths

Comments

Hot Water Cylinder

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit

Export Capable Meter?

Connected To Dwelling

Diverter

Battery Capacity [kWh]

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
4.40	East	45°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed

Date

Building Regulations England Part L (BREL) Compliance Report

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

Date: Mon 21 Apr 2025 19:34:26

Project Information			
Assessed By	Chris Law	Building Type	House, Semi-detached
OCDEA Registration	EES/027443	Assessment Date	2025-04-21

Dwelling Details			
Assessment Type	As designed	Total Floor Area	79 m ²
Site Reference	32 Manor Road 40%	Plot Reference	00001
Address	32 Manor Road, Hayes, UB3 2DG		

Client Details	
Name	Syed Rafi
Company	ZAIDI Building Services Associates
Address	ZBSA, Swindon, SN1 2DJ

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

1a Target emission rate and dwelling emission rate			
Fuel for main heating system	Mains gas		
Target carbon dioxide emission rate	12.26 kgCO ₂ /m ²		
Dwelling carbon dioxide emission rate	7.31 kgCO ₂ /m ²		OK
1b Target primary energy rate and dwelling primary energy			
Target primary energy	64.06 kWh _{PE} /m ²		
Dwelling primary energy	40.68 kWh _{PE} /m ²		OK
1c Target fabric energy efficiency and dwelling fabric energy efficiency			
Target fabric energy efficiency	38.8 kWh/m ²		
Dwelling fabric energy efficiency	33.8 kWh/m ²		OK

2a Fabric U-values				
Element	Maximum permitted average U-Value [W/m ² K]	Dwelling average U-Value [W/m ² K]	Element with highest individual U-Value	
External walls	0.26	0.15	Walls (1) (0.15)	OK
Party walls	0.2	N/A	N/A	N/A
Curtain walls	1.6	N/A	N/A	N/A
Floors	0.18	0.1	Heatloss Floor 1 (0.1)	OK
Roofs	0.16	0.12	Roof (1) (0.12)	OK
Windows, doors, and roof windows	1.6	1.18	Front (1.2)	OK
Rooflights	2.2	N/A	N/A	N/A

2b Envelope elements (better than typically expected values are flagged with a subsequent (!))			
Name	Net area [m ²]	U-Value [W/m ² K]	
Exposed wall: Walls (1)	75.88	0.15	
Ground floor: Heatloss Floor 1, Heatloss Floor 1	39.47	0.1 (!)	
Exposed roof: Roof (1)	39.47	0.12	

2c Openings (better than typically expected values are flagged with a subsequent (!))				
Name	Area [m ²]	Orientation	Frame factor	U-Value [W/m ² K]
Front, External Door	1.8	West	N/A	1 (!)
Front, Window	5.43	West	0.7	1.2
Side, Window	6.38	North	0.7	1.2
Rear, Window	9.8	East	0.7	1.2

2d Thermal bridging (better than typically expected values are flagged with a subsequent (!))				
Building part 1: Thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E2: Other lintels (including other steel lintels)	Not government-approved scheme	0.025 (!)	
External wall	E3: Sill	Not government-approved scheme	0.022 (!)	

Main element	Junction detail	Source	Psi value [W/mK]	Drawing / reference
External wall	E4: Jamb	Not government-approved scheme	0.017 (!)	
External wall	E5: Ground floor (normal)	Not government-approved scheme	0.058	
External wall	E6: Intermediate floor within a dwelling	Not government-approved scheme	0.001 (!)	
External wall	E10: Eaves (insulation at ceiling level)	Not government-approved scheme	0.057	
External wall	E12: Gable (insulation at ceiling level)	Not government-approved scheme	0.043	
External wall	E16: Corner (normal)	Not government-approved scheme	0.042	
External wall	E18: Party wall between dwellings	Not government-approved scheme	0.041	
Party wall	P1: Ground floor	Not government-approved scheme	0.044	
Party wall	P2: Intermediate floor within a dwelling	SAP table default	0 (!)	
Party wall	P4: Roof (insulation at ceiling level)	Not government-approved scheme	0.04	

3 Air permeability (better than typically expected values are flagged with a subsequent (!))

Maximum permitted air permeability at 50Pa	8 m ³ /hm ²		
Dwelling air permeability at 50Pa	5 m ³ /hm ² , Design value		OK
Air permeability test certificate reference			

4 Space heating

Main heating system 1: Boiler with radiators or underfloor heating - Mains gas	
Efficiency	87.7%
Emitter type	Radiators
Flow temperature	
System type	Combi boiler
Manufacturer	Vaillant Group
Model	Flexicom 30cx
Commissioning	
Secondary heating system: N/A	
Fuel	N/A
Efficiency	N/A
Commissioning	

5 Hot water

Cylinder/store - type: N/A	
Capacity	N/A
Declared heat loss	N/A
Primary pipework insulated	N/A
Manufacturer	
Model	
Commissioning	
Waste water heat recovery system 1 - type: N/A	
Efficiency	
Manufacturer	
Model	

6 Controls

Main heating 1 - type: Time and temperature zone control by arrangement of plumbing and electrical services	
Function	
Ecodesign class	
Manufacturer	
Model	
Water heating - type: N/A	
Manufacturer	
Model	

7 Lighting		
Minimum permitted light source efficacy	75 lm/W	
Lowest light source efficacy	80 lm/W	OK
External lights control	N/A	
8 Mechanical ventilation		
System type: N/A		
Maximum permitted specific fan power	N/A	
Specific fan power	N/A	N/A
Minimum permitted heat recovery efficiency	N/A	
Heat recovery efficiency	N/A	N/A
Manufacturer/Model		
Commissioning		
9 Local generation		
Technology type: Photovoltaic system (1)		
Peak power	6.5 kWp	
Orientation	East	
Pitch	45°	
Overshading	None or very little	
Manufacturer		
MCS certificate		
10 Heat networks		
N/A		
11 Supporting documentary evidence		
N/A		
12 Declarations		
a. Assessor Declaration		
This declaration by the assessor is confirmation that the contents of this BREL Compliance Report are a true and accurate reflection based upon the design information submitted for this dwelling for the purpose of carrying out the "As designed" assessment, and that the supporting documentary evidence (SAP Conventions, Appendix 1 (documentary evidence) schedules the minimum documentary evidence required) has been reviewed in the course of preparing this BREL Compliance Report.		
Signed:	Assessor ID:	
Name:		
	Date:	
b. Client Declaration		
N/A		

Summary for Input Data



Property Reference	32 Manor Road 40%		Issued on Date	21/04/2025
Assessment Reference	00001	Prop Type Ref		
Property	32, Manor Road, Hayes, UB3 2DG			

SAP Rating	102 A	DER	7.31	TER	12.26
Environmental	94 A	% DER < TER			40.38
CO ₂ Emissions (t/year)	0.4	DFEE	33.84	TFEE	38.81
Compliance Check	See BREL	% DFEE < TFEE			12.79
% DPER < TPER	36.49	DPER	40.68	TPER	64.06

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	West
Property Tenure	1
Transaction Type	6
Terrain Type	Suburban
1.0 Property Type	House, Semi-Detached
Which Floor	0
2.0 Number of Storeys	2
3.0 Date Built	2025
3.0 Property Age Band	L
4.0 Sheltered Sides	2
5.0 Sunlight/Shade	Average or unknown
6.0 Thermal Mass Parameter	Precise calculation
Thermal Mass	194.27 kJ/m ² K
7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	21.70 m	39.39 m ²	2.30 m

8.0 Living Area	13.66 m ²
-----------------	----------------------

9.0 External Walls	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Res	Shelter	Openings	Area Calculation Type
	External Wall 1	Cavity Wall	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure	0.15	140.00	99.29	75.88	0.00	None	23.41	Enter Gross Area

10.0 External Roofs	Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area(m ²)	Nett Area (m ²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.12	9.00	39.47	39.47	None	0.00	Enter Gross Area	0.00

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m ² K)	Shelter Code	Shelter Factor	Kappa (kJ/m ² K)	Area (m ²)
	Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Slab on ground, screed over insulation	0.10	None	0.00	110.00	39.47

12.0 Opening Types	Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m ² K)
	External Door	Manufacturer	Half Glazed Door	Double glazed			0.76		0.70	1.00
	Window	Manufacturer	Window	Double glazed			0.76		0.70	1.20

13.0 Openings	Name	Opening Type	Location	Orientation	Area (m ²)	Pitch
	Front	External Door	External Wall 1	West	1.80	0
	Front	Window	External Wall 1	West	5.43	0

Summary for Input Data

Side Rear	Window Window	External Wall 1 External Wall 1	North East	6.38 9.80	0 0
--------------	------------------	------------------------------------	---------------	--------------	--------

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	17.10	0.03	0.03	No
E3 Sill	Non Gov Approved Schemes	13.70	0.02	0.02	No
E4 Jamb	Non Gov Approved Schemes	31.78	0.02	0.02	No
E5 Ground floor (normal)	Non Gov Approved Schemes	21.47	0.06	0.06	No
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	21.70	0.00	0.00	No
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	17.18	0.06	0.06	No
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	4.26	0.04	0.04	No
E16 Corner (normal)	Non Gov Approved Schemes	13.80	0.04	0.04	No
E18 Party wall between dwellings	Non Gov Approved Schemes	4.60	0.04	0.04	No
P1 Party wall - Ground floor	Non Gov Approved Schemes	4.27	0.04	0.04	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	4.27	0.00	0.00	No
P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	4.27	0.04	0.04	No

Y-value

0.03

W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

0

Number of open flues

0

Number of chimneys/flues attached to closed fire

0

Number of flues attached to solid fuel boiler

0

Number of flues attached to other heater

0

Number of blocked chimneys

0

Number of intermittent extract fans

3

Number of passive vents

0

Number of flueless gas fires

0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀

5.00

m³/(h.m²) @ 50 Pa

Property Tested?

Yes

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
Lighting 1	80.00	25.00	2000.00	24

24.0 Main Heating 1

Database

Percentage of Heat

100.00

%

Database Ref. No.

15024

Fuel Type

Mains gas

SAP Code

0

In Winter

87.70

In Summer

79.10

Model Name

Flexicom 30cx

Manufacturer

Vaillant Group

System Type

Combi boiler

Controls SAP Code

2110

Summary for Input Data

Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Flue Type	Balanced
Fan Assisted Flue	Yes
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Radiators
Flow Temperature	Unknown
Boiler Interlock	Yes
Combi boiler type	Standard Combi

25.0 Main Heating 2	None
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26.0 Heat Networks	None
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27.0 Secondary Heating	None
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28.0 Water Heating	
Water Heating	Main Heating 1
SAP Code	901
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	1
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.3 Waste Water Heat Recovery System	
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29.0 Hot Water Cylinder	None
Cylinder Stat	No
Cylinder In Heated Space	No
Independent Time Control	No
In Airing Cupboard	No

31.0 Thermal Store	None
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32.0 Photovoltaic Unit	One Dwelling
Export Capable Meter?	Yes
Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	0.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
6.50	East	45°	None Or Little	No	No	1.00		

34.0 Small-scale Hydro	None
Electricity Generated	0.00
Apportioned	0.00 kWh/Year

Summary for Input Data



Connected to dwelling's electricity meter

Yes

Electricity Generation

Annual

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Oct

Nov

Dec

Recommendations

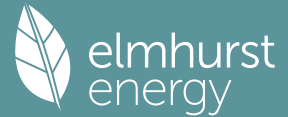
Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating			A 103	A 96
			0	0
			0	0

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Property Reference	32 Manor Road 40%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	102 A	DER	7.31	TER	12.26	
Environmental	94 A	% DER < TER				40.38
CO ₂ Emissions (t/year)	0.4	DFEE	33.84	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				12.79
% DPER < TPER	36.49	DPER	40.68	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

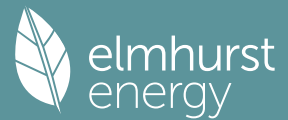
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1000	3.9470	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1500	11.3820	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1200	4.7364	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6097		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014
E3 Sill	31.7800	0.0170	0.5403
E4 Jamb	21.4700	0.0580	1.2453
E5 Ground floor (normal)	21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling	17.1800	0.0570	0.9793
E10 Eaves (insulation at ceiling level)	4.2600	0.0430	0.1832
E12 Gable (insulation at ceiling level)			

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E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		51.4351 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	87.4279	87.1924	86.9615	85.8772	85.6743	84.7298	84.7298	84.5549	85.0936	85.6743	86.0847	86.5138 (39)
												85.8762
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1086	1.1057	1.1027	1.0890	1.0864	1.0744	1.0744	1.0722	1.0790	1.0864	1.0916	1.0971 (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												2.4409 (42)
Hot water usage for mixer showers												0.0000 (42a)
Hot water usage for baths	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886 (44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615 (45)
Distribution loss (46)m = 0.15 x (45)m												1754.7779
Water storage loss:	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892 (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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
12Total per year (kWh/year)												2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4725	121.2017	109.4725	113.1216	109.4725	113.1216	109.4725	109.4725	113.1216	109.4725	113.1216	109.4725 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Pumps, fans	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
	487.4644	499.2754	477.8167	460.6701	436.3931	416.6555	399.8424	401.0012	413.8645	431.5145	458.7771	476.7874 (73)

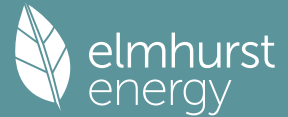
6. Solar gains

[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		0.7600		0.7000		0.7700		25.0114 (74)
East				9.8000	19.6403		0.7600		0.7000		0.7700		70.9608 (76)
West				5.4300	19.6403		0.7600		0.7000		0.7700		39.3181 (80)
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386	(83)
Total gains	622.7546	762.8022	914.3118	1109.2778	1247.1442	1254.8374	1194.3615	1071.9564	924.7168	744.3921	627.1366	588.3261	(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	48.6754	48.8069	48.9365	49.5544	49.6718	50.2254	50.2254	50.3293	50.0107	49.6718	49.4349	49.1898
alpha	4.2450	4.2538	4.2624	4.3036	4.3115	4.3484	4.3484	4.3553	4.3340	4.3115	4.2957	4.2793
util living area	0.9844	0.9645	0.9144	0.7840	0.6020	0.4257	0.3108	0.3600	0.5994	0.8768	0.9693	0.9875 (86)
MIT	19.5894	19.8866	20.2914	20.7166	20.9231	20.9864	20.9973	20.9949	20.9449	20.6011	20.0159	19.5433 (87)
Th 2	19.9938	19.9962	19.9986	20.0098	20.0119	20.0218	20.0218	20.0236	20.0180	20.0119	20.0077	20.0032 (88)
util rest of house	0.9806	0.9562	0.8958	0.7458	0.5480	0.3631	0.2424	0.2850	0.5261	0.8427	0.9608	0.9844 (89)
MIT 2	18.3667	18.7413	19.2394	19.7377	19.9502	20.0138	20.0208	20.0216	19.9811	19.6274	18.9166	18.3148 (90)
Living area fraction									FLA = Living area / (4) =			0.1732 (91)
MIT	18.5785	18.9397	19.4216	19.9073	20.1187	20.1823	20.1899	20.1902	20.1481	19.7960	19.1071	18.5276 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4285	18.7897	19.2716	19.7573	19.9687	20.0323	20.0399	20.0402	19.9981	19.6460	18.9571	18.3776 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9721	0.9432	0.8796	0.7351	0.5455	0.3638	0.2436	0.2862	0.5245	0.8277	0.9485	0.9771 (94)
Useful gains	605.4090	719.4632	804.2211	815.4467	680.3113	456.5374	290.9849	306.8363	485.0031	616.1445	594.8502	574.8494 (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	1235.2241	1211.0717	1110.6399	932.3918	708.4187	460.2749	291.4632	307.7948	501.8883	775.0119	1020.7115	1226.5581 (97)
Space heating kWh	468.5825	330.3609	227.9756	84.2005	20.9119	0.0000	0.0000	0.0000	0.0000	118.1974	306.6201	484.8713 (98a)
Space heating requirement - total per year (kWh/year)												2041.7202
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	468.5825	330.3609	227.9756	84.2005	20.9119	0.0000	0.0000	0.0000	0.0000	118.1974	306.6201	484.8713 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2041.7202
Space heating per m2										(98c) / (4) =		25.8904 (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 %)												87.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	468.5825	330.3609	227.9756	84.2005	20.9119	0.0000	0.0000	0.0000	0.0000	118.1974	306.6201	484.8713 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	534.3016	376.6943	259.9494	96.0097	23.8449	0.0000	0.0000	0.0000	0.0000	134.7747	349.6238	552.8749 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.6464	84.1869	83.2669	81.5300	79.8871	79.1000	79.1000	79.1000	79.1000	82.1386	84.0192	79.1000 (216)
Fuel for water heating, kWh/month	274.8883	244.4308	262.7159	236.5155	234.3676	212.0913	208.8047	218.9334	221.7005	237.5507	246.2926	271.6976 (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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-55.5146	-77.9128	-110.3630	-117.8213	-119.2632	-108.2775	-106.9384	-104.9457	-98.7534	-87.3527	-60.5755	-47.6356 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-44.7985	-103.3638	-231.5681	-382.5694	-531.0750	-543.1915	-530.8956	-431.7391	-291.8453	-153.7652	-61.2367	-34.3536 (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												2328.0732 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.1000
Water heating fuel used												2869.9888 (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)												237.4410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4435.7556 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1085.7475 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2328.0732	0.2100	488.8954 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2869.9888	0.2100	602.6977 (264)
Space and water heating			1091.5930 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	0.1355	-148.4484
PV Unit electricity exported	-3340.4018	0.1236	-412.9975
Total			-561.4459 (269)
Total CO2, kg/year			576.3464 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.3100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2328.0732	1.1300	2630.7228 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2869.9888	1.1300	3243.0874 (278)
Space and water heating			5873.8102 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.4410	1.5338	364.1950 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	1.5009	-1644.0653
PV Unit electricity exported	-3340.4018	0.4537	-1515.6642
Total			-3159.7296 (283)
Total Primary energy kWh/year			3208.3764 (286)
Dwelling Primary energy Rate (DPER)			40.6800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			1.8000	1.0000	1.8000			(26a)
TER Opening Type			17.9100	1.1450	20.5076			(27)
Heatloss Floor 1			39.4700	0.1300	5.1311			(28a)
External Wall 1	99.2900	19.7100	79.5800	0.1800	14.3244			(29a)
External Roof 1	39.4700		39.4700	0.1100	4.3417			(30)
Total net area of external elements Aum(A, m2)			178.2300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.1048		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.2700 (35)

List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				17.1000	0.0500	0.8550		
E3 Sill				13.7000	0.0500	0.6850		
E4 Jamb				31.7800	0.0500	1.5890		
E5 Ground floor (normal)				21.4700	0.1600	3.4352		
E6 Intermediate floor within a dwelling				21.7000	0.0000	0.0000		
E10 Eaves (insulation at ceiling level)				17.1800	0.0600	1.0308		
E12 Gable (insulation at ceiling level)				4.2600	0.0600	0.2556		
E16 Corner (normal)				13.8000	0.0900	1.2420		
E18 Party wall between dwellings				4.6000	0.0600	0.2760		
P1 Party wall - Ground floor				4.2700	0.0800	0.3416		
P2 Party wall - Intermediate floor within a dwelling				4.2700	0.0000	0.0000		
P4 Party wall - Roof (insulation at ceiling level)				4.2700	0.1200	0.5124		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2226	(36)
Point Thermal Bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	56.3274	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787	(38)
Average = Sum(39)m / 12 =	92.3202	92.0847	91.8538	90.7695	90.5666	89.6221	89.6221	89.4473	89.9859	90.5666	90.9770	91.4061	(39)
												90.7685	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1707	1.1677	1.1648	1.1510	1.1484	1.1365	1.1365	1.1343	1.1411	1.1484	1.1537	1.1591	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

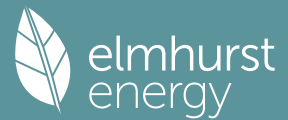
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4409	(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														
	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616		(42b)
Hot water usage for other uses														
	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270		(42c)
Average daily hot water use (litres/day)													105.6685	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886		(44)
Energy conte	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615		(45)
Energy content (annual)													1754.7779	
Distribution loss (46)m = 0.15 x (45)m														
	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892		(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589		(61)
Total heat required for water heating calculated for each month														
	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204		(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														
	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204		(64)
12Total per year (kWh/year)													2351.0219	(64)
Electric shower(s)													2351	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		(64a)
Heat gains from water heating, kWh/month														
	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442		(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		
	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437		(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	109.4502	121.1771	109.4502	113.0986	109.4502	113.0986	109.4502	109.4502	113.0986	109.4502	113.0986	109.4502		(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650		(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044		(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)														
	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350		(71)
Water heating gains (Table 5)														
	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368		(72)
Total internal gains														
	487.4422	499.2508	477.7945	460.6471	436.3709	416.6326	399.8202	400.9789	413.8415	431.4922	458.7542	476.7652		(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					5.2900	10.6334		0.6300	0.7000	0.7700		17.1909 (74)
East					8.1200	19.6403		0.6300	0.7000	0.7700		48.7388 (76)
West					4.5000	19.6403		0.6300	0.7000	0.7700		27.0104 (80)
Solar gains	92.9402	181.0344	299.8589	445.5782	556.9724	575.8197	545.8228	460.9323	350.9413	214.9369	115.6577	76.6237 (83)
Total gains	580.3824	680.2852	777.6534	906.2253	993.3433	992.4522	945.6430	861.9113	764.7828	646.4291	574.4118	553.3889 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0960	46.2139	46.3300	46.8835	46.9885	47.4837	47.4837	47.5766	47.2917	46.9885	46.7766	46.5570
alpha	4.0731	4.0809	4.0887	4.1256	4.1326	4.1656	4.1656	4.1718	4.1528	4.1326	4.1184	4.1038
util living area	0.9883	0.9770	0.9507	0.8737	0.7337	0.5515	0.4106	0.4657	0.7142	0.9226	0.9785	0.9902 (86)
MIT	19.4096	19.6556	20.0254	20.4943	20.8128	20.9566	20.9899	20.9833	20.8765	20.4297	19.8416	19.3735 (87)
Th 2	19.9435	19.9459	19.9483	19.9594	19.9615	19.9712	19.9712	19.9730	19.9674	19.9615	19.9573	19.9529 (88)
util rest of house	0.9853	0.9713	0.9383	0.8437	0.6780	0.4725	0.3176	0.3671	0.6365	0.8969	0.9721	0.9877 (89)
MIT 2	18.1047	18.4173	18.8812	19.4530	19.8033	19.9447	19.9674	19.9661	19.8800	19.3937	18.6638	18.0652 (90)
Living area fraction										fLA = Living area / (4) =		0.1732 (91)
MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9615	0.9253	0.8329	0.6790	0.4843	0.3335	0.3837	0.6435	0.8850	0.9628	0.9820 (94)
Useful gains	567.9963	654.1225	719.5347	754.7820	674.4924	480.6758	315.4159	330.7502	492.1314	572.1151	553.0364	543.4044 (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	1295.3228	1264.4906	1155.4642	974.2594	749.7233	494.7113	317.6663	334.7394	535.6532	812.6704	1070.6024	1288.0762 (97)
Space heating kWh	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98a)
Space heating requirement - total per year (kWh/year)												2595.2817
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	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.2817
Space heating per m2										(98c) / (4) =		32.9100 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	585.6395	443.9040	351.0081	171.0213	60.5755	0.0000	0.0000	0.0000	0.0000	193.6939	403.2982	599.6058 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	86.1264	85.8290	85.2235	83.9581	82.1285	80.3000	80.3000	80.3000	80.3000	84.1967	85.6258	86.1903 (216)
Fuel for water heating, kWh/month	270.1647	239.7543	256.6843	229.6753	227.9713	208.9218	205.6843	215.6616	218.3874	231.7439	241.6713	267.1072 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7416	18.2442	16.4268	12.0350	9.2962	7.5951	8.4803	11.0230	14.3178	18.7857	21.2184	23.3737 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.7904	-51.8008	-74.3722	-83.5291	-89.9991	-83.9791	-82.9298	-78.3115	-70.1684	-59.1704	-40.4180	-31.8144 (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	-21.0014	-44.1525	-87.7070	-131.6625	-174.0294	-174.8388	-172.7919	-146.3430	-107.3118	-63.1343	-28.0371	-16.6105 (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)												

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(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												2808.7465	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2813.4274	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.5377	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1950.9036	(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												3940.8079	(238)

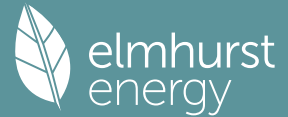
12a. Carbon dioxide emissions - Individual heating systems including micro-CHP

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2808.7465	0.2100	589.8368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.4274	0.2100	590.8198 (264)
Space and water heating			1180.6565 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.5377	0.1443	26.4902 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	0.1346	-105.4386
PV Unit electricity exported	-1167.6203	0.1259	-147.0152
Total			-252.4538 (269)
Total CO2, kg/year			966.6221 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2808.7465	1.1300	3173.8835 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.4274	1.1300	3179.1730 (278)
Space and water heating			6353.0565 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.5377	1.5338	281.5163 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	1.4975	-1172.9677
PV Unit electricity exported	-1167.6203	0.4622	-539.6476
Total			-1712.6153 (283)
Total Primary energy kWh/year			5052.0582 (286)
Target Primary Energy Rate (TPER)			64.0600 (287)

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Property Reference	32 Manor Road 40%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	102 A	DER	7.31	TER	12.26	
Environmental	94 A	% DER < TER				40.38
CO ₂ Emissions (t/year)	0.4	DFEE	33.84	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				12.79
% DPER < TPER	36.49	DPER	40.68	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (5)

2. Ventilation rate

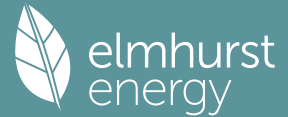
	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1000	3.9470	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1500	11.3820	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1200	4.7364	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.6097		(33)
Heat capacity Cm = Sum(A x k)			(28)...(30) + (32) + (32a)...(32e) =			15320.1300 (34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m ² K							194.2700 (35)
List of Thermal Bridges							
K1 Element				Length	Psi-value	Total	
E2 Other lintels (including other steel lintels)				17.1000	0.0250	0.4275	
E3 Sill				13.7000	0.0220	0.3014	
E4 Jamb				31.7800	0.0170	0.5403	
E5 Ground floor (normal)				21.4700	0.0580	1.2453	
E6 Intermediate floor within a dwelling				21.7000	0.0010	0.0217	

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E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832
E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges			0.0000
Total fabric heat loss		(33) + (36) + (36a) =	51.4351 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	87.4279	87.1924	86.9615	85.8772	85.6743	84.7298	84.7298	84.5549	85.0936	85.6743	86.0847	86.5138 (39)
												85.8762
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1086	1.1057	1.1027	1.0890	1.0864	1.0744	1.0744	1.0722	1.0790	1.0864	1.0916	1.0971 (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												2.4409 (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	28.1378	27.7199	27.1314	26.0464	25.2339	24.3330	23.8464	24.4308	25.0670	26.0310	27.1384	28.0426 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												62.1127 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	67.7648	65.9059	63.8764	61.3504	59.0970	56.7551	56.2685	58.2938	60.3711	62.7760	65.3244	67.6696 (44)
Energy content (annual)	107.3228	93.8491	98.1757	83.9857	79.5559	69.7870	68.0519	72.1799	74.4436	85.1865	93.0666	105.9543 (45)
Distribution loss (46)m = 0.15 x (45)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (46)
Water storage loss:												
Total storage loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (56)
If cylinder contains dedicated solar storage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (57)
Primary loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (59)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (61)
Total heat required for water heating calculated for each month	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612 (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	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612 (64)
12Total per year (kWh/year)												876.8252 (64)
Electric shower(s)	52.1704	46.4843	50.7590	48.4387	49.3477	47.0729	48.6420	49.3477	48.4387	50.7590	49.8046	52.1704 (64a)
Heat gains from water heating, kWh/month	35.8487	31.5640	33.5521	29.9566	29.2425	26.5980	26.6215	27.6752	27.9289	30.7919	32.2278	35.5579 (65)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												593.4353 (64a)

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

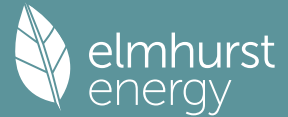
Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4725	121.2017	109.4725	113.1216	109.4725	113.1216	109.4725	109.4725	113.1216	109.4725	113.1216	109.4725 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	48.1837	46.9702	45.0969	41.6064	39.3045	36.9416	35.7816	37.1978	38.7902	41.3869	44.7608	47.7929 (72)
Total internal gains	434.3108	447.0787	427.8007	415.8768	394.6739	381.6254	367.2399	366.4038	377.3208	388.3509	410.6258	424.3435 (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		0.7600	0.7000	0.7700		25.0114 (74)				
East				9.8000	19.6403		0.7600	0.7000	0.7700		70.9608 (76)				
West				5.4300	19.6403		0.7600	0.7000	0.7700		39.3181 (80)				
Solar gains				135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386 (83)
Total gains				569.6010	710.6055	864.2957	1064.4845	1205.4249	1219.8072	1161.7589	1037.3590	888.1731	701.2286	578.9853	535.8821 (84)

7. Mean internal temperature (heating season)

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Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)	
Utilisation factor for gains for living area, nil,m (see Table 9a)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	48.6754	48.8069	48.9365	49.5544	49.6718	50.2254	50.2254	50.3293	50.0107	49.6718	49.4349	49.1898	
alpha	4.2450	4.2538	4.2624	4.3036	4.3115	4.3484	4.3484	4.3553	4.3340	4.3115	4.2957	4.2793	
util living area	0.9887	0.9719	0.9271	0.8015	0.6187	0.4372	0.3193	0.3717	0.6192	0.8946	0.9767	0.9911 (86)	
MIT	19.5064	19.8116	20.2335	20.6891	20.9147	20.9849	20.9970	20.9943	20.9377	20.5587	19.9450	19.4600 (87)	
Th 2	19.9938	19.9962	19.9986	20.0098	20.0119	20.0218	20.0218	20.0236	20.0180	20.0119	20.0077	20.0032 (88)	
util rest of house	0.9859	0.9652	0.9106	0.7646	0.5641	0.3732	0.2491	0.2943	0.5449	0.8637	0.9699	0.9889 (89)	
MIT 2	18.6440	18.9457	19.3536	19.7753	19.9582	20.0148	20.0209	20.0218	19.9851	19.6760	19.0889	18.6053 (90)	
Living area fraction									fLA = Living area / (4) =				0.1732 (91)
MIT	18.7933	19.0957	19.5060	19.9336	20.1239	20.1829	20.1900	20.1902	20.1501	19.8289	19.2372	18.7533 (92)	
Temperature adjustment												0.0000	
adjusted MIT	18.7933	19.0957	19.5060	19.9336	20.1239	20.1829	20.1900	20.1902	20.1501	19.8289	19.2372	18.7533 (93)	

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9812	0.9575	0.9010	0.7615	0.5706	0.3839	0.2613	0.3077	0.5554	0.8570	0.9631	0.9850 (94)
Useful gains	558.9145	680.4110	778.7548	810.5609	687.7674	468.2983	303.5151	319.1525	493.2909	600.9593	557.6038	527.8369 (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	1267.1224	1237.7547	1131.0227	947.5318	721.7127	473.0368	304.1772	320.4842	514.8273	790.6829	1044.8298	1259.0627 (97)
Space heating kWh	526.9067	374.5350	262.0873	98.6191	25.2553	0.0000	0.0000	0.0000	0.0000	141.1543	350.8028	544.0320 (98a)
Space heating requirement - total per year (kWh/year)												2323.3924
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	526.9067	374.5350	262.0873	98.6191	25.2553	0.0000	0.0000	0.0000	0.0000	141.1543	350.8028	544.0320 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2323.3924
Space heating per m2										(98c) / (4) =		29.4622 (99)

8c. Space cooling requirement

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	796.4604	627.0007	642.6175	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.9595	0.9789	0.9659	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	764.1716	613.7561	620.7167	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1383.7571	1318.0409	1174.7736	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	446.1016	523.9879	412.2183	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			1.0000 (105)
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (106)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	111.5254	130.9970	103.0546	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												345.5770 (107)
Energy for space heating												29.4622 (99)
Energy for space cooling												4.3822 (108)
Total												33.8444 (109)
Fabric Energy Efficiency (DFEE)												33.8 (109)

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

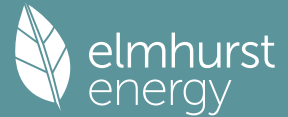
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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)
Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) = 0.1654 (8)

Full SAP Calculation Printout



Pressure test												Yes
Pressure Test Method												Blower Door
Measured/design AP50												5.0000 (17)
Infiltration rate												0.4154 (18)
Number of sides sheltered												2 (19)
Shelter factor												(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor												(21) = (18) x (20) = 0.3531 (21)
Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind factor	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Adj infilt rate	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
If exhaust air heat pump using Appendix N, (23b) = (23a) x Fmv (equation (N5)), otherwise (23b) = (23a)												0.0000 (23b)
If balanced with heat recovery: efficiency in % allowing for in-use factor (from Table 4h) =												0.0000 (23c)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K
Main dwelling							
TER Semi-glazed door			1.8000	1.0000	1.8000		(26a)
TER Opening Type			17.9100	1.1450	20.5076		(27)
Heatloss Floor 1			39.4700	0.1300	5.1311		(28a)
External Wall 1	99.2900	19.7100	79.5800	0.1800	14.3244		(29a)
External Roof 1	39.4700		39.4700	0.1100	4.3417		(30)
Total net area of external elements Aum(A, m2)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) = 46.1048		(33)

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

List of Thermal Bridges												194.2700 (35)
K1 Element												
E2 Other lintels (including other steel lintels)												
E3 Sill												
E4 Jamb												
E5 Ground floor (normal)												
E6 Intermediate floor within a dwelling												
E10 Eaves (insulation at ceiling level)												
E12 Gable (insulation at ceiling level)												
E16 Corner (normal)												
E18 Party wall between dwellings												
P1 Party wall - Ground floor												
P2 Party wall - Intermediate floor within a dwelling												
P4 Party wall - Roof (insulation at ceiling level)												
Thermal bridges (Sum(L x Psi) calculated using Appendix K)												10.2226 (36)
Point Thermal bridges												(36a) = 0.0000
Total fabric heat loss												(33) + (36) + (36a) = 56.3274 (37)

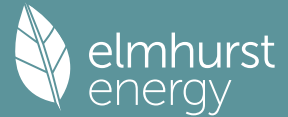
Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)

(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	92.3202	92.0847	91.8538	90.7695	90.5666	89.6221	89.6221	89.4473	89.9859	90.5666	90.9770	91.4061 (39)
												90.7685
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1707	1.1677	1.1648	1.1510	1.1484	1.1365	1.1365	1.1343	1.1411	1.1484	1.1537	1.1591 (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													2.4409 (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	28.1378	27.7199	27.1314	26.0464	25.2339	24.3330	23.8464	24.4308	25.0670	26.0310	27.1384	28.0426	(42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
Average daily hot water use (litres/day)													62.1127 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy content (annual)	67.7648	65.9059	63.8764	61.3504	59.0970	56.7551	56.2685	58.2938	60.3711	62.7760	65.3244	67.6696	(44)
Distribution loss (46)m = 0.15 x (45)m	107.3228	93.8491	98.1757	83.9857	79.5559	69.7870	68.0519	72.1799	74.4436	85.1865	93.0666	105.9543	(45)
										Total = Sum (45)m =		1031.5591	
Water 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	(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	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(59)
Total heat required for water heating calculated for each month													(61)
WWHRS	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612	(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													(63d)
	91.2244	79.7718	83.4494	71.3878	67.6225	59.3190	57.8441	61.3530	63.2770	72.4085	79.1066	90.0612	(64)
12Total per year (kWh/year)									Total per year (kWh/year) = Sum(64)m =				(64)
Electric shower(s)	52.1704	46.4843	50.7590	48.4387	49.3477	47.0729	48.6420	49.3477	48.4387	50.7590	49.8046	52.1704	(64a)
													593.4353 (64a)
Heat gains from water heating, kWh/month	35.8487	31.5640	33.5521	29.9566	29.2425	26.5980	26.6215	27.6752	27.9289	30.7919	32.2278	35.5579	(65)

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

Metabolic gains (Table 5), Watts												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	109.4502	121.1771	109.4502	113.0986	109.4502	113.0986	109.4502	109.4502	113.0986	109.4502	113.0986	109.4502 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	48.1837	46.9702	45.0969	41.6064	39.3045	36.9416	35.7816	37.1978	38.7902	41.3869	44.7608	47.7929 (72)
Total internal gains	434.2885	447.0541	427.7784	415.8538	394.6516	381.6024	367.2176	366.3816	377.2978	388.3287	410.6029	424.3212 (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	5.2900		10.6334		0.6300		0.7000		0.7700		17.1909 (74)	
East	8.1200		19.6403		0.6300		0.7000		0.7700		48.7388 (76)	
West	4.5000		19.6403		0.6300		0.7000		0.7700		27.0104 (80)	
Solar gains	92.9402	181.0344	299.8589	445.5782	556.9724	575.8197	545.8228	460.9323	350.9413	214.9369	115.6577	76.6237 (83)
Total gains	527.2288	628.0885	727.6374	861.4320	951.6240	957.4221	913.0404	827.3139	728.2391	603.2656	526.2605	500.9450 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0960	46.2139	46.3300	46.8835	46.9885	47.4837	47.4837	47.5766	47.2917	46.9885	46.7766	46.5570
alpha	4.0731	4.0809	4.0887	4.1256	4.1326	4.1656	4.1656	4.1718	4.1528	4.1326	4.1184	4.1038
util living area	0.9916	0.9825	0.9598	0.8888	0.7532	0.5685	0.4244	0.4834	0.7369	0.9365	0.9840	0.9932 (86)
MIT	19.3263	19.5774	19.9581	20.4512	20.7928	20.9515	20.9886	20.9809	20.8607	20.3778	19.7688	19.2904 (87)
Th 2	19.9435	19.9459	19.9483	19.9594	19.9615	19.9712	19.9712	19.9730	19.9674	19.9615	19.9573	19.9529 (88)
util rest of house	0.9895	0.9779	0.9494	0.8612	0.6985	0.4881	0.3287	0.3818	0.6602	0.9144	0.9791	0.9914 (89)
MIT 2	18.4281	18.6782	19.0527	19.5271	19.8236	19.9479	19.9678	19.9668	19.8894	19.4725	18.8782	18.3995 (90)
Living area fraction	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	0.1732 (91)
MIT	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	18.5538 (92)
Temperature adjustment	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	0.0000
adjusted MIT	18.5837	18.8340	19.2096	19.6872	19.9915	20.1217	20.1446	20.1424	20.0576	19.6293	19.0325	18.5538 (93)

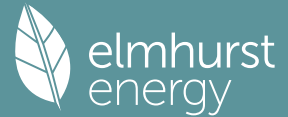
8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9855	0.9716	0.9401	0.8528	0.7002	0.5004	0.3451	0.3990	0.6676	0.9056	0.9732	0.9880 (94)
Useful gains	519.5938	610.2394	684.0333	734.5911	666.3440	479.0492	315.1177	330.1345	486.1564	546.3004	512.1705	494.9457 (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	1318.6758	1283.1045	1167.4226	979.1459	750.9328	494.8709	317.6775	334.7506	536.1042	817.7551	1085.5831	1312.0249 (97)
Space heating kWh	594.5170	452.1653	359.6416	176.0794	62.9341	0.0000	0.0000	0.0000	0.0000	201.9623	412.8570	607.9069 (98a)
Space heating requirement - total per year (kWh/year)												2868.0638
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	594.5170	452.1653	359.6416	176.0794	62.9341	0.0000	0.0000	0.0000	0.0000	201.9623	412.8570	607.9069 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2868.0638
Space heating per m ²										(98c) / (4) =		36.3691 (99)

8c. Space cooling requirement

Calculated for June, July and August. See Table 10b												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ext. temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000
Heat loss rate W	0.0000	0.0000	0.0000	0.0000	0.0000	842.4482	663.2039	679.7991	0.0000	0.0000	0.0000	0.0000 (100)
Utilisation	0.0000	0.0000	0.0000	0.0000	0.0000	0.8911	0.9361	0.9091	0.0000	0.0000	0.0000	0.0000 (101)
Useful loss	0.0000	0.0000	0.0000	0.0000	0.0000	750.7234	620.8137	617.9985	0.0000	0.0000	0.0000	0.0000 (102)
Total gains	0.0000	0.0000	0.0000	0.0000	0.0000	1077.0981	1027.3549	929.2895	0.0000	0.0000	0.0000	0.0000 (103)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	234.9898	302.4666	231.6006	0.0000	0.0000	0.0000	0.0000 (104)
Cooled fraction									fc = cooled area / (4) =			
Intermittency factor (Table 10b)	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500 (105)
Space cooling kWh	0.0000	0.0000	0.0000	0.0000	0.0000	58.7475	75.6166	57.9001	0.0000	0.0000	0.0000	0.0000 (107)
Space cooling requirement												192.2642 (107)
Energy for space heating												36.3691 (99)
Energy for space cooling												2.4380 (108)
Total												38.8071 (109)
Fabric Energy Efficiency (TFEE)												38.8 (109)

Full SAP Calculation Printout



Property Reference	32 Manor Road 40%				Issued on Date	21/04/2025
Assessment Reference	00001		Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG					
SAP Rating	102 A	DER	7.31	TER	12.26	
Environmental	94 A	% DER < TER				40.38
CO ₂ Emissions (t/year)	0.4	DFEE	33.84	TFEE	38.81	
Compliance Check	See BREL	% DFEE < TFEE				12.79
% DPER < TPER	36.49	DPER	40.68	TPER	64.06	
Assessor Details	Mr. Chris Law				Assessor ID	AX42-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

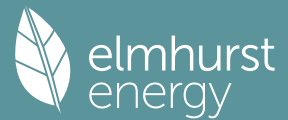
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1000	3.9470	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1500	11.3820	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1200	4.7364	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		46.6097		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014
E3 Sill	31.7800	0.0170	0.5403
E4 Jamb	21.4700	0.0580	1.2453
E5 Ground floor (normal)	21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling	17.1800	0.0570	0.9793
E10 Eaves (insulation at ceiling level)	4.2600	0.0430	0.1832
E12 Gable (insulation at ceiling level)			

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E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges		(36a) =	0.0000
Total fabric heat loss	(33) + (36) + (36a) =		51.4351 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Average = Sum(39)m / 12 =	87.4279	87.1924	86.9615	85.8772	85.6743	84.7298	84.7298	84.5549	85.0936	85.6743	86.0847	86.5138 (39)
												85.8762
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1086	1.1057	1.1027	1.0890	1.0864	1.0744	1.0744	1.0722	1.0790	1.0864	1.0916	1.0971 (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												2.4409 (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	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886 (44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615 (45)
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892 (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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
12Total per year (kWh/year)												2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437 (66)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4725	121.2017	109.4725	113.1216	109.4725	113.1216	109.4725	109.4725	113.1216	109.4725	113.1216	109.4725 (67)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650 (68)
Pumps, fans	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
	487.4644	499.2754	477.8167	460.6701	436.3931	416.6555	399.8424	401.0012	413.8645	431.5145	458.7771	476.7874 (73)

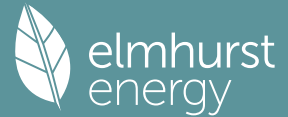
6. Solar gains

[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		0.7600		0.7000		0.7700		25.0114 (74)
East				9.8000	19.6403		0.7600		0.7000		0.7700		70.9608 (76)
West				5.4300	19.6403		0.7600		0.7000		0.7700		39.3181 (80)
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386	(83)
Total gains	622.7546	762.8022	914.3118	1109.2778	1247.1442	1254.8374	1194.3615	1071.9564	924.7168	744.3921	627.1366	588.3261	(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	48.6754	48.8069	48.9365	49.5544	49.6718	50.2254	50.2254	50.3293	50.0107	49.6718	49.4349	49.1898
alpha	4.2450	4.2538	4.2624	4.3036	4.3115	4.3484	4.3484	4.3553	4.3340	4.3115	4.2957	4.2793
util living area	0.9844	0.9645	0.9144	0.7840	0.6020	0.4257	0.3108	0.3600	0.5994	0.8768	0.9693	0.9875 (86)
MIT	19.5894	19.8866	20.2914	20.7166	20.9231	20.9864	20.9973	20.9949	20.9449	20.6011	20.0159	19.5433 (87)
Th 2	19.9938	19.9962	19.9986	20.0098	20.0119	20.0218	20.0218	20.0236	20.0180	20.0119	20.0077	20.0032 (88)
util rest of house	0.9806	0.9562	0.8958	0.7458	0.5480	0.3631	0.2424	0.2850	0.5261	0.8427	0.9608	0.9844 (89)
MIT 2	18.3667	18.7413	19.2394	19.7377	19.9502	20.0138	20.0208	20.0216	19.9811	19.6274	18.9166	18.3148 (90)
Living area fraction									FLA = Living area / (4) =			0.1732 (91)
MIT	18.5785	18.9397	19.4216	19.9073	20.1187	20.1823	20.1899	20.1902	20.1481	19.7960	19.1071	18.5276 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.4285	18.7897	19.2716	19.7573	19.9687	20.0323	20.0399	20.0402	19.9981	19.6460	18.9571	18.3776 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9721	0.9432	0.8796	0.7351	0.5455	0.3638	0.2436	0.2862	0.5245	0.8277	0.9485	0.9771 (94)
Useful gains	605.4090	719.4632	804.2211	815.4467	680.3113	456.5374	290.9849	306.8363	485.0031	616.1445	594.8502	574.8494 (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	1235.2241	1211.0717	1110.6399	932.3918	708.4187	460.2749	291.4632	307.7948	501.8883	775.0119	1020.7115	1226.5581 (97)
Space heating kWh	468.5825	330.3609	227.9756	84.2005	20.9119	0.0000	0.0000	0.0000	0.0000	118.1974	306.6201	484.8713 (98a)
Space heating requirement - total per year (kWh/year)												2041.7202
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	468.5825	330.3609	227.9756	84.2005	20.9119	0.0000	0.0000	0.0000	0.0000	118.1974	306.6201	484.8713 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2041.7202
Space heating per m2										(98c) / (4) =		25.8904 (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 %)												87.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	468.5825	330.3609	227.9756	84.2005	20.9119	0.0000	0.0000	0.0000	0.0000	118.1974	306.6201	484.8713 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	534.3016	376.6943	259.9494	96.0097	23.8449	0.0000	0.0000	0.0000	0.0000	134.7747	349.6238	552.8749 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.6464	84.1869	83.2669	81.5300	79.8871	79.1000	79.1000	79.1000	79.1000	82.1386	84.0192	79.1000 (216)
Fuel for water heating, kWh/month	274.8883	244.4308	262.7159	236.5155	234.3676	212.0913	208.8047	218.9334	221.7005	237.5507	246.2926	271.6976 (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	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-55.5146	-77.9128	-110.3630	-117.8213	-119.2632	-108.2775	-106.9384	-104.9457	-98.7534	-87.3527	-60.5755	-47.6356 (233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)												
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)												
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)												
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235c)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233b)m	-44.7985	-103.3638	-231.5681	-382.5694	-531.0750	-543.1915	-530.8956	-431.7391	-291.8453	-153.7652	-61.2367	-34.3536 (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												2328.0732 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.1000
Water heating fuel used												2869.9888 (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)												237.4410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4435.7556 (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												

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Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	1085.7475 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2328.0732	0.2100	488.8954 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2869.9888	0.2100	602.6977 (264)
Space and water heating			1091.5930 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	0.1355	-148.4484
PV Unit electricity exported	-3340.4018	0.1236	-412.9975
Total			-561.4459 (269)
Total CO2, kg/year			576.3464 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			7.3100 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2328.0732	1.1300	2630.7228 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2869.9888	1.1300	3243.0874 (278)
Space and water heating			5873.8102 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.4410	1.5338	364.1950 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	1.5009	-1644.0653
PV Unit electricity exported	-3340.4018	0.4537	-1515.6642
Total			-3159.7296 (283)
Total Primary energy kWh/year			3208.3764 (286)
Dwelling Primary energy Rate (DPER)			40.6800 (287)

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

3. Heat losses and heat loss parameter

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Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
TER Semi-glazed door			1.8000	1.0000	1.8000			(26a)
TER Opening Type			17.9100	1.1450	20.5076			(27)
Heatloss Floor 1			39.4700	0.1300	5.1311			(28a)
External Wall 1	99.2900	19.7100	79.5800	0.1800	14.3244			(29a)
External Roof 1	39.4700		39.4700	0.1100	4.3417			(30)
Total net area of external elements Aum(A, m2)			178.2300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.1048		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.2700 (35)

List of Thermal Bridges								
K1 Element				Length	Psi-value	Total		
E2 Other lintels (including other steel lintels)				17.1000	0.0500	0.8550		
E3 Sill				13.7000	0.0500	0.6850		
E4 Jamb				31.7800	0.0500	1.5890		
E5 Ground floor (normal)				21.4700	0.1600	3.4352		
E6 Intermediate floor within a dwelling				21.7000	0.0000	0.0000		
E10 Eaves (insulation at ceiling level)				17.1800	0.0600	1.0308		
E12 Gable (insulation at ceiling level)				4.2600	0.0600	0.2556		
E16 Corner (normal)				13.8000	0.0900	1.2420		
E18 Party wall between dwellings				4.6000	0.0600	0.2760		
P1 Party wall - Ground floor				4.2700	0.0800	0.3416		
P2 Party wall - Intermediate floor within a dwelling				4.2700	0.0000	0.0000		
P4 Party wall - Roof (insulation at ceiling level)				4.2700	0.1200	0.5124		
Thermal bridges (Sum(L x Psi) calculated using Appendix K)							10.2226	(36)
Point Thermal Bridges							0.0000	
Total fabric heat loss						(33) + (36) + (36a) =	56.3274	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787	(38)
Average = Sum(39)m / 12 =	92.3202	92.0847	91.8538	90.7695	90.5666	89.6221	89.6221	89.4473	89.9859	90.5666	90.9770	91.4061	(39)
												90.7685	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.1707	1.1677	1.1648	1.1510	1.1484	1.1365	1.1365	1.1343	1.1411	1.1484	1.1537	1.1591	(40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

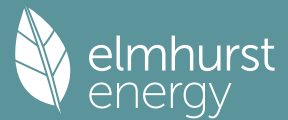
4. Water heating energy requirements (kWh/year)

Assumed occupancy													2.4409	(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)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886	(44)	
Energy conte	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)	
Energy content (annual)														
Distribution loss (46)m = 0.15 x (45)m														
Water storage loss:														
Total storage loss														
If cylinder contains dedicated solar storage														
Primary loss														(57)
Combi loss														(59)
Total heat required for water heating calculated for each month														(61)
WWHRS														(62)
PV diverter														(63a)
Solar input														(63b)
FGHRS														(63d)
Output from w/h														
12Total per year (kWh/year)														
Electric shower(s)														
Heat gains from water heating, kWh/month														

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

Metabolic gains (Table 5), Watts														
(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	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	122.0437	(66)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	109.4502	121.1771	109.4502	113.0986	109.4502	113.0986	109.4502	109.4502	113.0986	109.4502	113.0986	109.4502	(67)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	217.0415	219.2937	213.6182	201.5357	186.2838	171.9491	162.3726	160.1204	165.7959	177.8784	193.1303	207.4650	(68)	
Pumps, fans	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	35.2044	(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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	(71)	
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368	(72)	
	487.4422	499.2508	477.7945	460.6471	436.3709	416.6326	399.8202	400.9789	413.8415	431.4922	458.7542	476.7652	(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					5.2900	10.6334		0.6300	0.7000	0.7700		17.1909 (74)
East					8.1200	19.6403		0.6300	0.7000	0.7700		48.7388 (76)
West					4.5000	19.6403		0.6300	0.7000	0.7700		27.0104 (80)
Solar gains	92.9402	181.0344	299.8589	445.5782	556.9724	575.8197	545.8228	460.9323	350.9413	214.9369	115.6577	76.6237 (83)
Total gains	580.3824	680.2852	777.6534	906.2253	993.3433	992.4522	945.6430	861.9113	764.7828	646.4291	574.4118	553.3889 (84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	46.0960	46.2139	46.3300	46.8835	46.9885	47.4837	47.4837	47.5766	47.2917	46.9885	46.7766	46.5570
alpha	4.0731	4.0809	4.0887	4.1256	4.1326	4.1656	4.1656	4.1718	4.1528	4.1326	4.1184	4.1038
util living area	0.9883	0.9770	0.9507	0.8737	0.7337	0.5515	0.4106	0.4657	0.7142	0.9226	0.9785	0.9902 (86)
MIT	19.4096	19.6556	20.0254	20.4943	20.8128	20.9566	20.9899	20.9833	20.8765	20.4297	19.8416	19.3735 (87)
Th 2	19.9435	19.9459	19.9483	19.9594	19.9615	19.9712	19.9712	19.9730	19.9674	19.9615	19.9573	19.9529 (88)
util rest of house	0.9853	0.9713	0.9383	0.8437	0.6780	0.4725	0.3176	0.3671	0.6365	0.8969	0.9721	0.9877 (89)
MIT 2	18.1047	18.4173	18.8812	19.4530	19.8033	19.9447	19.9674	19.9661	19.8800	19.3937	18.6638	18.0652 (90)
Living area fraction										fLA = Living area / (4) =		0.1732 (91)
MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (92)
Temperature adjustment												0.0000
adjusted MIT	18.3308	18.6318	19.0794	19.6333	19.9781	20.1200	20.1445	20.1423	20.0526	19.5732	18.8678	18.2918 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9787	0.9615	0.9253	0.8329	0.6790	0.4843	0.3335	0.3837	0.6435	0.8850	0.9628	0.9820 (94)
Useful gains	567.9963	654.1225	719.5347	754.7820	674.4924	480.6758	315.4159	330.7502	492.1314	572.1151	553.0364	543.4044 (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	1295.3228	1264.4906	1155.4642	974.2594	749.7233	494.7113	317.6663	334.7394	535.6532	812.6704	1070.6024	1288.0762 (97)
Space heating kWh	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98a)
Space heating requirement - total per year (kWh/year)												2595.2817
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	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												2595.2817
Space heating per m2										(98c) / (4) =		32.9100 (99)

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

Fraction of space heat from secondary/supplementary system (Table 11)												0.0000 (201)
Fraction of space heat from main system(s)												1.0000 (202)
Efficiency of main space heating system 1 (in %)												92.4000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating requirement	541.1309	410.1673	324.3315	158.0237	55.9718	0.0000	0.0000	0.0000	0.0000	178.9732	372.6476	554.0358 (98)
Space heating efficiency (main heating system 1)	92.4000	92.4000	92.4000	92.4000	92.4000	0.0000	0.0000	0.0000	0.0000	92.4000	92.4000	92.4000 (210)
Space heating fuel (main heating system)	585.6395	443.9040	351.0081	171.0213	60.5755	0.0000	0.0000	0.0000	0.0000	193.6939	403.2982	599.6058 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	86.1264	85.8290	85.2235	83.9581	82.1285	80.3000	80.3000	80.3000	80.3000	84.1967	85.6258	86.1903 (216)
Fuel for water heating, kWh/month	270.1647	239.7543	256.6843	229.6753	227.9713	208.9218	205.6843	215.6616	218.3874	231.7439	241.6713	267.1072 (219)
Space cooling fuel requirement (221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	22.7416	18.2442	16.4268	12.0350	9.2962	7.5951	8.4803	11.0230	14.3178	18.7857	21.2184	23.3737 (232)
Electricity generated by PVs (Appendix M) (negative quantity) (233a)m	-36.7904	-51.8008	-74.3722	-83.5291	-89.9991	-83.9791	-82.9298	-78.3115	-70.1684	-59.1704	-40.4180	-31.8144 (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	-21.0014	-44.1525	-87.7070	-131.6625	-174.0294	-174.8388	-172.7919	-146.3430	-107.3118	-63.1343	-28.0371	-16.6105 (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)												

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(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												2808.7465	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												80.3000	
Water heating fuel used												2813.4274	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												183.5377	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-1950.9036	(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												3940.8079	(238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	2808.7465	0.2100	589.8368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2813.4274	0.2100	590.8198 (264)
Space and water heating			1180.6565 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	183.5377	0.1443	26.4902 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	0.1346	-105.4386
PV Unit electricity exported	-1167.6203	0.1259	-147.0152
Total			-252.4538 (269)
Total CO2, kg/year			966.6221 (272)
EPC Target Carbon Dioxide Emission Rate (TER)			12.2600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	2808.7465	1.1300	3173.8835 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2813.4274	1.1300	3179.1730 (278)
Space and water heating			6353.0565 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	183.5377	1.5338	281.5163 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-783.2833	1.4975	-1172.9677
PV Unit electricity exported	-1167.6203	0.4622	-539.6476
Total			-1712.6153 (283)
Total Primary energy kWh/year			5052.0582 (286)
Target Primary Energy Rate (TPER)			64.0600 (287)

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Property Reference	32 Manor Road 40%				Issued on Date	21/04/2025	
Assessment Reference	00001			Prop Type Ref			
Property	32, Manor Road, Hayes, UB3 2DG						
SAP Rating	102 A		DER	7.31		TER	12.26
Environmental	94 A		% DER < TER				40.38
CO ₂ Emissions (t/year)	0.4		DFEE	33.84		TFEE	38.81
Compliance Check	See BREL		% DFEE < TFEE				12.79
% DPER < TPER	36.49		DPER	40.68		TPER	64.06
Assessor Details	Mr. Chris Law					Assessor ID	AX42-0001
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (25)

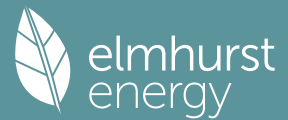
3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
External Door			1.8000	1.0000	1.8000		(26a)
Window			21.6100	1.1450	24.7443		(27)
Heatloss Floor 1			39.4700	0.1000	3.9470	110.0000	4341.7000 (28a)
External Wall 1	99.2900	23.4100	75.8800	0.1500	11.3820	140.0000	10623.2000 (29a)
External Roof 1	39.4700		39.4700	0.1200	4.7364	9.0000	355.2300 (30)
Total net area of external elements Aum(A, m ²)			178.2300				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	46.6097		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 194.2700 (35)

List of Thermal Bridges	Length	Psi-value	Total
K1 Element	17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014
E3 Sill	31.7800	0.0170	0.5403
E4 Jamb	21.4700	0.0580	1.2453
E5 Ground floor (normal)	21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling	17.1800	0.0570	0.9793
E10 Eaves (insulation at ceiling level)	4.2600	0.0430	0.1832
E12 Gable (insulation at ceiling level)			

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E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254 (36)
Point Thermal bridges			(36a) = 0.0000
Total fabric heat loss		(33) + (36) + (36a) =	51.4351 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787 (38)
Heat transfer coeff	87.4279	87.1924	86.9615	85.8772	85.6743	84.7298	84.7298	84.5549	85.0936	85.6743	86.0847	86.5138 (39)
Average = Sum(39)m / 12 =												85.8762
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	1.1086	1.1057	1.1027	1.0890	1.0864	1.0744	1.0744	1.0722	1.0790	1.0864	1.0916	1.0971 (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												2.4409 (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	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616 (42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270 (42c)
Average daily hot water use (litres/day)												105.6685 (43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886 (44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615 (45)
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892 (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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589 (61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (65)

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

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
Total internal gains	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361 (73)

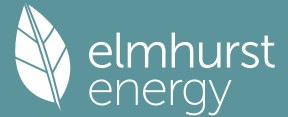
6. Solar gains

[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		0.7600	0.7000	0.7700		25.0114 (74)	
East					9.8000	19.6403		0.7600	0.7000	0.7700		70.9608 (76)	
West					5.4300	19.6403		0.7600	0.7000	0.7700		39.3181 (80)	
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386	(83)
Total gains	695.0859	820.7554	975.6237	1155.0913	1284.4537	1279.2974	1218.6880	1098.9317	956.4136	791.5872	682.8358	656.8747	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9a, Th1 (C)	21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	

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	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.6754	48.8069	48.9365	49.5544	49.6718	50.2254	50.2254	50.3293	50.0107	49.6718	49.4349	49.1898
alpha	4.2450	4.2538	4.2624	4.3036	4.3115	4.3484	4.3484	4.3553	4.3340	4.3115	4.2957	4.2793
util living area	0.9771	0.9550	0.8977	0.7662	0.5877	0.4180	0.3047	0.3514	0.5830	0.8564	0.9593	0.9814 (86)
MIT	19.6996	19.9668	20.3577	20.7423	20.9298	20.9873	20.9975	20.9954	20.9505	20.6434	20.0948	19.6496 (87)
Th 2	19.9938	19.9962	19.9986	20.0098	20.0119	20.0218	20.0218	20.0236	20.0180	20.0119	20.0077	20.0032 (88)
util rest of house	0.9717	0.9449	0.8766	0.7269	0.5341	0.3564	0.2375	0.2780	0.5105	0.8192	0.9485	0.9770 (89)
MIT 2	18.5050	18.8399	19.3169	19.7642	19.9559	20.0144	20.0208	20.0218	19.9851	19.6728	19.0134	18.4489 (90)
Living area fraction	18.5050	18.8399	19.3169	19.7642	19.9559	20.0144	20.0208	20.0218	19.9851	19.6728	19.0134	18.4489 (90)
MIT	18.7119	19.0351	19.4972	19.9336	20.1246	20.1829	20.1900	20.1904	20.1523	19.8409	19.2007	18.6569 (92)
Temperature adjustment	18.5619	18.8851	19.3472	19.7836	19.9746	20.0329	20.0400	20.0404	20.0023	19.6909	19.0507	-0.1500
adjusted MIT	18.5619	18.8851	19.3472	19.7836	19.9746	20.0329	20.0400	20.0404	20.0023	19.6909	19.0507	18.5069 (93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Utilisation	0.9612	0.9307	0.8605	0.7172	0.5320	0.3571	0.2388	0.2793	0.5093	0.8051	0.9347	0.9677 (94)
Useful gains	668.0838	763.8366	839.5299	828.3859	683.3385	456.8531	291.0307	306.9459	487.1358	637.2979	638.2730	635.6386 (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	1246.8917	1219.3951	1117.2086	934.6559	708.9225	460.3281	291.4718	307.8148	502.2489	778.8560	1028.7762	1237.7457 (97)
Space heating kWh	430.6331	306.1353	206.5929	76.5144	19.0345	0.0000	0.0000	0.0000	0.0000	105.3193	281.1623	447.9677 (98a)
Space heating requirement - total per year (kWh/year)												1873.3594
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	430.6331	306.1353	206.5929	76.5144	19.0345	0.0000	0.0000	0.0000	0.0000	105.3193	281.1623	447.9677 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1873.3594
Space heating per m2										(98c) / (4) =		23.7555 (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 %)												87.7000 (206)
Efficiency of main space heating system 2 (in %)												0.0000 (207)
Efficiency of secondary/supplementary heating system, %												0.0000 (208)
Space heating requirement	430.6331	306.1353	206.5929	76.5144	19.0345	0.0000	0.0000	0.0000	0.0000	105.3193	281.1623	447.9677 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	491.0297	349.0710	235.5677	87.2456	21.7041	0.0000	0.0000	0.0000	0.0000	120.0904	320.5956	510.7955 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Efficiency of water heater (217)m	84.4781	84.0276	83.0559	81.3666	79.8223	79.1000	79.1000	79.1000	79.1000	81.9159	83.8357	79.1000 (216)
Fuel for water heating, kWh/month	275.4359	244.8942	263.3835	236.9903	234.5576	212.0913	208.8047	218.9334	221.7005	238.1965	246.8317	84.5784 (217)
Space cooling fuel requirement												
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041 (231)
Lighting	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Electricity generated by PVs (Appendix M) (negative quantity)	-55.5146	-77.9128	-110.3630	-117.8213	-119.2632	-108.2775	-106.9384	-104.9457	-98.7534	-87.3527	-60.5755	-47.6356 (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)	-44.7985	-103.3638	-231.5681	-382.5694	-531.0750	-543.1915	-530.8956	-431.7391	-291.8453	-153.7652	-61.2367	-34.3536 (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												2136.0996 (211)
Space heating fuel - main system 2												0.0000 (213)
Space heating fuel - secondary												0.0000 (215)
Efficiency of water heater												79.1000
Water heating fuel used												2874.0171 (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)												237.4410 (232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation												-4435.7556 (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 897.8022 (238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2136.0996	3.6400	77.7540 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2874.0171	3.6400	104.6142 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	237.4410	16.4900	39.1540 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	16.4900	-180.6238
PV Unit electricity exported	-3340.4018	5.5900	-186.7285
Total			-367.3523 (252)
Total energy cost			-39.6486 (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] = -0.1152 (257)
SAP value 101.8680
SAP rating (Section 12) 102 (258)
SAP band A

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	2136.0996	0.2100	448.5809 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2874.0171	0.2100	603.5436 (264)
Space and water heating			1052.1245 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	0.1355	-148.4484
PV Unit electricity exported	-3340.4018	0.1236	-412.9975
Total			-561.4459 (269)
Total CO2, kg/year			536.8779 (272)
CO2 emissions per m2			6.8100 (273)
EI value			94.1917
EI rating			94 (274)
EI band			A

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

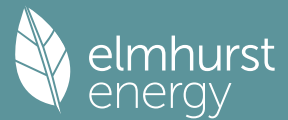
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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) = 0.1654 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	5.0000 (17)
Infiltration rate	0.4154 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.3531 (21)

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Wind speed	Jan 4.2000	Feb 4.0000	Mar 4.0000	Apr 3.7000	May 3.8000	Jun 3.5000	Jul 3.6000	Aug 3.4000	Sep 3.4000	Oct 3.7000	Nov 3.5000	Dec 4.0000	(22)
Wind factor	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)
Adj infilt rate													
Effective ac	0.3707	0.3531	0.3531	0.3266	0.3354	0.3090	0.3178	0.3001	0.3001	0.3266	0.3090	0.3531	(22b)
	0.5687	0.5623	0.5623	0.5533	0.5563	0.5477	0.5505	0.5450	0.5450	0.5533	0.5477	0.5623	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
External Door			1.8000	1.0000	1.8000			(26a)
Window			21.6100	1.1450	24.7443			(27)
Heatloss Floor 1			39.4700	0.1000	3.9470	110.0000	4341.7000	(28a)
External Wall 1	99.2900	23.4100	75.8800	0.1500	11.3820	140.0000	10623.2000	(29a)
External Roof 1	39.4700		39.4700	0.1200	4.7364	9.0000	355.2300	(30)
Total net area of external elements Aum(A, m2)			178.2300					(31)
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =	46.6097		(33)

Heat capacity Cm = Sum(A x k) (28)...(30) + (32) + (32a)...(32e) = 15320.1300 (34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K 194.2700 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	17.1000	0.0250	0.4275
E3 Sill	13.7000	0.0220	0.3014
E4 Jamb	31.7800	0.0170	0.5403
E5 Ground floor (normal)	21.4700	0.0580	1.2453
E6 Intermediate floor within a dwelling	21.7000	0.0010	0.0217
E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832
E16 Corner (normal)	13.8000	0.0420	0.5796
E18 Party wall between dwellings	4.6000	0.0410	0.1886
P1 Party wall - Ground floor	4.2700	0.0440	0.1879
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708

Thermal bridges (Sum(L x Psi) calculated using Appendix K) 4.8254 (36)
Point Thermal bridges (36a) = 0.0000
Total fabric heat loss (33) + (36) + (36a) = 51.4351 (37)

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

(38)m	Jan 34.0409	Feb 33.6585	Mar 33.6585	Apr 33.1198	May 33.2947	Jun 32.7840	Jul 32.9496	Aug 32.6231	Sep 32.6231	Oct 33.1198	Nov 32.7840	Dec 33.6585	(38)
Heat transfer coeff	85.4761	85.0936	85.0936	84.5549	84.7298	84.2191	84.3847	84.0582	84.0582	84.5549	84.2191	85.0936	(39)
Average = Sum(39)m / 12 =												84.6280	

HLP	Jan 1.0839	Feb 1.0790	Mar 1.0790	Apr 1.0722	May 1.0744	Jun 1.0680	Jul 1.0701	Aug 1.0659	Sep 1.0659	Oct 1.0722	Nov 1.0680	Dec 1.0790	(40)
HLP (average)												1.0731	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

4. Water heating energy requirements (kWh/year)

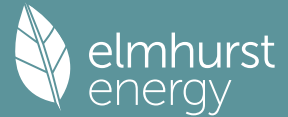
Assumed occupancy													2.4409 (42)
Hot water usage for mixer showers	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)
Hot water usage for baths	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)
Hot water usage for other uses	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
Average daily hot water use (litres/day)												105.6685	(43)

Daily hot water use	Jan 114.7426	Feb 112.1860	Mar 109.1741	Apr 104.8365	May 101.2266	Jun 97.3807	Jul 96.0816	Aug 99.0826	Sep 102.2221	Oct 106.2365	Nov 110.6337	Dec 114.4886	(44)
Energy conte	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)
Energy content (annual)										Total = Sum(45)m =		1754.7779	
Distribution loss (46)m = 0.15 x (45)m	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442	(65)

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

Metabolic gains (Table 5), Watts	Jan 146.4525	Feb 146.4525	Mar 146.4525	Apr 146.4525	May 146.4525	Jun 146.4525	Jul 146.4525	Aug 146.4525	Sep 146.4525	Oct 146.4525	Nov 146.4525	Dec 146.4525	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													

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Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493 (68)
Pumps, fans	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Total internal gains	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361 (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	12.3661	0.7600	0.7000			0.7700	29.0870 (74)	
East					9.8000	23.0580	0.7600	0.7000			0.7700	83.3090 (76)	
West					5.4300	23.0580	0.7600	0.7000			0.7700	46.1600 (80)	
Solar gains	158.5560	269.3429	445.4736	678.8995	824.5214	911.0430	854.8165	735.5498	563.6908	346.2636	190.7009	125.2125	(83)
Total gains	718.3517	826.5715	984.6022	1185.3832	1298.2240	1352.1586	1278.9854	1163.5264	1009.2521	824.9732	705.1772	670.5486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)	21.0000 (85)											
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.7869	50.0107	50.0107	50.3293	50.2254	50.5300	50.4308	50.6267	50.6267	50.3293	50.5300	50.0107
alpha	4.3191	4.3340	4.3340	4.3553	4.3484	4.3687	4.3621	4.3751	4.3751	4.3553	4.3687	4.3340
util living area	0.9683	0.9429	0.8669	0.6949	0.4897	0.2856	0.1715	0.2021	0.4498	0.7839	0.9411	0.9748 (86)
MIT	19.9032	20.1383	20.5194	20.8498	20.9720	20.9980	20.9999	20.9997	20.9859	20.7939	20.2895	19.8419 (87)
Th 2	20.0140	20.0180	20.0180	20.0236	20.0218	20.0271	20.0254	20.0288	20.0288	20.0236	20.0271	20.0180 (88)
util rest of house	0.9607	0.9301	0.8401	0.6484	0.4318	0.2256	0.1072	0.1321	0.3739	0.7322	0.9253	0.9686 (89)
MIT 2	18.7760	19.0691	19.5241	19.8899	20.0024	20.0263	20.0253	20.0287	20.0215	19.8451	19.2680	18.7027 (90)
Living area fraction	18.9712	19.2543	19.6965	20.0562	20.1703	20.1946	20.1941	20.1969	20.1886	20.0095	19.4449	18.9000 (92)
MIT	18.9712	19.2543	19.6965	20.0562	20.1703	20.1946	20.1941	20.1969	20.1886	20.0095	19.4449	18.9000 (92)
Temperature adjustment	18.8212	19.1043	19.5465	19.9062	20.0203	20.0446	20.0441	20.0469	20.0386	19.8595	19.2949	-0.1500
adjusted MIT	18.8212	19.1043	19.5465	19.9062	20.0203	20.0446	20.0441	20.0469	20.0386	19.8595	19.2949	18.7500 (93)

8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Useful gains	0.9485	0.9151	0.8253	0.6424	0.4317	0.2267	0.1085	0.1334	0.3747	0.7225	0.9103	0.9577 (94)
Ext temp.	681.3386	756.3968	812.5648	761.5308	560.4257	306.5832	138.7334	155.2285	378.1246	596.0730	641.8920	642.1955 (95)
Heat loss rate W	5.2000	5.8000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Space heating kWh	1164.2884	1132.1114	1016.5734	820.7038	569.4133	306.9481	138.7411	155.2485	381.5064	673.0124	942.8277	1153.0205 (97)
Space heating requirement - total per year (kWh/year)	359.3147	252.4802	151.7824	42.6045	6.6867	0.0000	0.0000	0.0000	0.0000	57.2429	216.6737	380.0538 (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)	359.3147	252.4802	151.7824	42.6045	6.6867	0.0000	0.0000	0.0000	0.0000	57.2429	216.6737	380.0538 (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	(98c) / (4) = 18.6005 (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 %)	87.7000 (206)											
Efficiency of main space heating system 2 (in %)	0.0000 (207)											
Efficiency of secondary/supplementary heating system, %	0.0000 (208)											
Space heating requirement	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Space heating efficiency (main heating system 1)	359.3147	252.4802	151.7824	42.6045	6.6867	0.0000	0.0000	0.0000	0.0000	57.2429	216.6737	380.0538 (98)
Space heating fuel (main heating system)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating efficiency (main heating system 2)	409.7089	287.8908	173.0701	48.5799	7.6246	0.0000	0.0000	0.0000	0.0000	65.2713	247.0623	433.3567 (211)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (212)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (215)
Water heating	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Water heating requirement	84.1059	83.6177	82.4103	80.5290	79.3684	79.1000	79.1000	79.1000	79.1000	80.8994	83.2770	79.1000 (216)
Efficiency of water heater (217)m	276.6549	246.0949	265.4466	239.4553	235.8992	212.0913	208.8047	218.9334	221.7005	241.1892	248.4875	84.2447 (217)
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 (219)
Space cooling fuel requirement (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 (221)
Pumps and Fa	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											

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(233a)m	-62.1913	-79.1465	-111.4891	-119.2400	-119.5341	-108.8507	-107.4914	-106.3826	-101.5866	-91.8089	-65.8141	-52.0128	(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	-56.2262	-107.2378	-238.8373	-405.4973	-542.3097	-599.4635	-579.0664	-482.7369	-330.7175	-176.4306	-73.1170	-40.7251	(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												1672.5645	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.1000	
Water heating fuel used												2888.0333	(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)												237.4410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												-4757.9134	(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												126.1254	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1672.5645	5.6000	93.6636	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.0333	5.6000	161.7299	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	237.4410	26.0600	61.8771	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1125.5481	26.0600	-293.3178	
PV Unit electricity exported	-3632.3653	5.8100	-211.0404	
Total			-504.3583	(252)
Total energy cost			-65.6761	(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	1672.5645	0.2100	351.2385	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.0333	0.2100	606.4870	(264)
Space and water heating			957.7255	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	237.4410	0.1443	34.2701	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1125.5481	0.1358	-152.8924	
PV Unit electricity exported	-3632.3653	0.1233	-448.0088	
Total			-600.9012	(269)
Total CO2, kg/year			403.0237	(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	1672.5645	1.1300	1889.9978	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.0333	1.1300	3263.4776	(278)
Space and water heating			5153.4755	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	237.4410	1.5338	364.1950	(282)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1125.5481	1.5021	-1690.6920	
PV Unit electricity exported	-3632.3653	0.4526	-1643.8623	
Total			-3334.5544	(283)
Total Primary energy kWh/year			2313.2169	(286)

SAP 10 EPC IMPROVEMENTS

00001

Current energy efficiency rating: A 102
Current environmental impact rating: A 94

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

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

Measures omitted - SAP change or cost saving too small:
 N Solar water heating + 0.8 -£ 31 -166 kg (41.3%)

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

Potential energy efficiency rating: A 102
 Potential environmental impact rating: A 94

Fuel prices for cost data on this page from database revision number 568 TEST (31 Mar 2025)
 Recommendation texts revision number 6.1 (11 Jun 2019)

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

	Current	Potential	Saving
Electricity	£84	£84	£0
Mains gas	£354	£354	£0
Space heating	£215	£215	£0
Water heating	£162	£162	£0
Lighting	£62	£62	£0
Generated (PV)	-£504	-£504	£0
Total cost of fuels	-£66	-£66	£0
Total cost of uses	-£65	-£65	£0
Delivered energy	2 kWh/m²	2 kWh/m²	0 kWh/m²
Carbon dioxide emissions	0.4 tonnes	0.4 tonnes	0.0 tonnes
CO2 emissions per m²	5 kg/m²	5 kg/m²	0 kg/m²
Primary energy	29 kWh/m²	29 kWh/m²	0 kWh/m²

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

1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n) =	181.3780 (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)

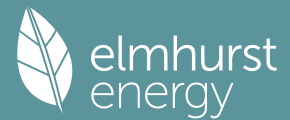
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	30.0000 / (5) =	0.1654 (8)
Pressure test	Yes	
Pressure Test Method	Blower Door	
Measured/design AP50	5.0000	(17)
Infiltration rate	0.4154	(18)
Number of sides sheltered	2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =	0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =	0.3531 (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	0.4502	0.4414	0.4325	0.3884	0.3796	0.3354	0.3354	0.3266	0.3531	0.3796	0.3972	0.4149 (22b)
Effective ac	0.6013	0.5974	0.5935	0.5754	0.5720	0.5563	0.5563	0.5533	0.5623	0.5720	0.5789	0.5861 (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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Main dwelling	m2		m2		m2		W/m2K		W/K		kJ/m2K		kJ/K	
External Door					1.8000		1.0000		1.8000				(26a)	
Window					21.6100		1.1450		24.7443				(27)	
Heatloss Floor 1					39.4700		0.1000		3.9470		110.0000		(28a)	
External Wall 1	99.2900	23.4100			75.8800		0.1500		11.3820		140.0000		(29a)	
External Roof 1	39.4700				39.4700		0.1200		4.7364		9.0000		(30)	
Total net area of external elements Aum(A, m2)					178.2300								(31)	
Fabric heat loss, W/K = Sum (A x U)					(26)...(30) + (32) =		46.6097						(33)	
Heat capacity Cm = Sum(A x k)							(28)...(30) + (32) + (32a)...(32e) =		15320.1300				(34)	
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K											194.2700		(35)	
List of Thermal Bridges														
												Length	Psi-value	Total
K1 Element												17.1000	0.0250	0.4275
E2 Other lintels (including other steel lintels)												13.7000	0.0220	0.3014
E3 Sill												31.7800	0.0170	0.5403
E4 Jamb												21.4700	0.0580	1.2453
E5 Ground floor (normal)												21.7000	0.0010	0.0217
E6 Intermediate floor within a dwelling												17.1800	0.0570	0.9793
E10 Eaves (insulation at ceiling level)												4.2600	0.0430	0.1832
E12 Gable (insulation at ceiling level)												13.8000	0.0420	0.5796
E16 Corner (normal)												4.6000	0.0410	0.1886
E18 Party wall between dwellings												4.2700	0.0440	0.1879
P1 Party wall - Ground floor												4.2700	0.0000	0.0000
P2 Party wall - Intermediate floor within a dwelling												4.2700	0.0400	0.1708
P4 Party wall - Roof (insulation at ceiling level)														
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														4.8254 (36)
Point Thermal bridges														0.0000
Total fabric heat loss												(33) + (36) + (36a) =		51.4351 (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		
	35.9928	35.7573	35.5264	34.4420	34.2392	33.2947	33.2947	33.1198	33.6585	34.2392	34.6496	35.0787	(38)	
Heat transfer coeff	87.4279	87.1924	86.9615	85.8772	85.6743	84.7298	84.7298	84.5549	85.0936	85.6743	86.0847	86.5138	(39)	
Average = Sum(39)m / 12 =												85.8762		
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	1.1086	1.1057	1.1027	1.0890	1.0864	1.0744	1.0744	1.0722	1.0790	1.0864	1.0916	1.0971	(40)	
HLP (average)												1.0890		
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31		

4. Water heating energy requirements (kWh/year)														

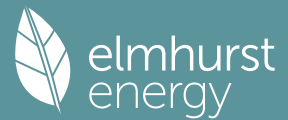
Assumed occupancy												2.4409 (42)		
Hot water usage for mixer showers														
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(42a)	
Hot water usage for baths														
	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)	
Hot water usage for other uses														
	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)	
Average daily hot water use (litres/day)												105.6685 (43)		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
Daily hot water use	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886	(44)	
Energy conte	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)	
Energy content (annual)											Total = Sum(45)m =	1754.7779		
Distribution loss (46)m = 0.15 x (45)m														
	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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														
	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)	
Total heat required for water heating calculated for each month														
	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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														
	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)	
Electric shower(s)												Total per year (kWh/year) = Sum(64)m =	2351.0219	(64)
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)	
Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =												0.0000	(64a)	
Heat gains from water heating, kWh/month														
	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442	(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		
	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	(66)	
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5														
	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464	(67)	
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5														
	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493	(68)	
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5														
	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	(69)	
Pumps, fans														
	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)	
Losses e.g. evaporation (negative values) (Table 5)														
	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	(71)	
Water heating gains (Table 5)														
	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368	(72)	
Total internal gains														
	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361	(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	FF	Access factor Table 6d			Gains W
North	6.3800				10.6334	0.7600		0.7000	0.7700			25.0114 (74)
East	9.8000				19.6403	0.7600		0.7000	0.7700			70.9608 (76)
West	5.4300				19.6403	0.7600		0.7000	0.7700			39.3181 (80)
Solar gains	135.2902	263.5268	436.4950	648.6076	810.7511	838.1818	794.5191	670.9552	510.8523	312.8776	168.3595	111.5386 (83)
Total gains	695.0859	820.7554	975.6237	1155.0913	1284.4537	1279.2974	1218.6880	1098.9317	956.4136	791.5872	682.8358	656.8747 (84)
7. Mean internal temperature (heating season)												
Temperature during heating periods in the living area from Table 9, Th1 (C)												
Utilisation factor for gains for living area, nil,m (see Table 9a)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	48.6754	48.8069	48.9365	49.5544	49.6718	50.2254	50.2254	50.3293	50.0107	49.6718	49.4349	49.1898
alpha	4.2450	4.2538	4.2624	4.3036	4.3115	4.3484	4.3484	4.3553	4.3340	4.3115	4.2957	4.2793
util living area	0.9771	0.9550	0.8977	0.7662	0.5877	0.4180	0.3047	0.3514	0.5830	0.8564	0.9593	0.9814 (86)
MIT	19.6996	19.9668	20.3577	20.7423	20.9298	20.9873	20.9975	20.9954	20.9505	20.6434	20.0948	19.6496 (87)
Th 2	19.9938	19.9962	19.9986	20.0098	20.0119	20.0218	20.0218	20.0236	20.0180	20.0119	20.0077	20.0032 (88)
util rest of house	0.9717	0.9449	0.8766	0.7269	0.5341	0.3564	0.2375	0.2780	0.5105	0.8192	0.9485	0.9770 (89)
MIT 2	18.5050	18.8399	19.3169	19.7642	19.9559	20.0144	20.0208	20.0218	19.9851	19.6728	19.0134	18.4489 (90)
Living area fraction	fLA = Living area / (4) = 0.1732 (91)											
MIT	18.7119	19.0351	19.4972	19.9336	20.1246	20.1829	20.1900	20.1904	20.1523	19.8409	19.2007	18.6569 (92)
Temperature adjustment	-0.1500											
adjusted MIT	18.5619	18.8851	19.3472	19.7836	19.9746	20.0329	20.0400	20.0404	20.0023	19.6909	19.0507	18.5069 (93)
8. Space heating requirement												
Utilisation	0.9612	0.9307	0.8605	0.7172	0.5320	0.3571	0.2388	0.2793	0.5093	0.8051	0.9347	0.9677 (94)
Useful gains	668.0838	763.8366	839.5299	828.3859	683.3385	456.8531	291.0307	306.9459	487.1358	637.2979	638.2730	635.6386 (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	1246.8917	1219.3951	1117.2086	934.6559	708.9225	460.3281	291.4718	307.8148	502.2489	778.8560	1028.7762	1237.7457 (97)
Space heating kWh	430.6331	306.1353	206.5929	76.5144	19.0345	0.0000	0.0000	0.0000	0.0000	105.3193	281.1623	447.9677 (98a)
Space heating requirement - total per year (kWh/year)	1873.3594											
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	430.6331	306.1353	206.5929	76.5144	19.0345	0.0000	0.0000	0.0000	0.0000	105.3193	281.1623	447.9677 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)	1873.3594											
Space heating per m2	(98c) / (4) = 23.7555 (99)											
9a. Energy requirements - Individual heating systems, including micro-CHP												
Fraction of space heat from secondary/supplementary system (Table 11)												
Fraction of space heat from main system(s)	1.0000 (202)											
Efficiency of main space heating system 1 (in %)	87.7000 (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	430.6331	306.1353	206.5929	76.5144	19.0345	0.0000	0.0000	0.0000	0.0000	105.3193	281.1623	447.9677 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)	491.0297	349.0710	235.5677	87.2456	21.7041	0.0000	0.0000	0.0000	0.0000	120.0904	320.5956	510.7955 (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	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
Water heating requirement	84.4781	84.0276	83.0559	81.3666	79.8223	79.1000	79.1000	79.1000	79.1000	81.9159	83.8357	79.1000 (216)
Efficiency of water heater (217)m	275.4359	244.8942	263.3835	236.9903	234.5576	212.0913	208.8047	218.9334	221.7005	238.1965	246.8317	84.5784 (217)
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	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041 (231)
Pumps and Fa	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	30.2383 (232)
Lighting	Electricity generated by PVs (Appendix M) (negative quantity)											
Electricity generated by PVs (Appendix M) (negative quantity)	-55.5146	-77.9128	-110.3630	-117.8213	-119.2632	-108.2775	-106.9384	-104.9457	-98.7534	-87.3527	-60.5755	-47.6356 (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)	-44.7985	-103.3638	-231.5681	-382.5694	-531.0750	-543.1915	-530.8956	-431.7391	-291.8453	-153.7652	-61.2367	-34.3536 (233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (235d)
Annual totals kWh/year												

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Space heating fuel - main system 1	2136.0996	(211)
Space heating fuel - main system 2	0.0000	(213)
Space heating fuel - secondary	0.0000	(215)
Efficiency of water heater	79.1000	
Water heating fuel used	2874.0171	(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)	237.4410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)		
PV generation	-4435.7556	(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	897.8022	(238)

10a. Fuel costs - using Table 12 prices

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year
Space heating - main system 1	2136.0996	3.6400	77.7540 (240)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	2874.0171	3.6400	104.6142 (247)
Energy for instantaneous electric shower(s)	0.0000	16.4900	0.0000 (247a)
Pumps, fans and electric keep-hot	86.0000	16.4900	14.1814 (249)
Energy for lighting	237.4410	16.4900	39.1540 (250)
Additional standing charges			92.0000 (251)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	16.4900	-180.6238
PV Unit electricity exported	-3340.4018	5.5900	-186.7285
Total			-367.3523 (252)
Total energy cost			-39.6486 (255)

11a. SAP rating - Individual heating systems

Energy cost deflator (Table 12):		0.3600 (256)
Energy cost factor (ECF)	$[(255) \times (256)] / [(4) + 45.0] =$	-0.1152 (257)
SAP value		101.8680
SAP rating (Section 12)		102 (258)
SAP band		A

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	2136.0996	0.2100	448.5809 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	2874.0171	0.2100	603.5436 (264)
Space and water heating			1052.1245 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	237.4410	0.1443	34.2701 (268)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1095.3538	0.1355	-148.4484
PV Unit electricity exported	-3340.4018	0.1236	-412.9975
Total			-561.4459 (269)
Total CO2, kg/year			536.8779 (272)
CO2 emissions per m2			6.8100 (273)
EI value			94.1917
EI rating			94 (274)
EI band			A

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

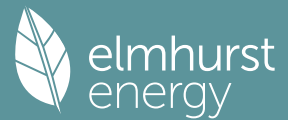
1. Overall dwelling characteristics

	Area (m2)	Storey height (m)	Volume (m3)
Main dwelling			
Ground floor	39.4700 (1b)	x 2.3000 (2b)	= 90.7810 (1b) - (3b)
First floor	39.3900 (1c)	x 2.3000 (2c)	= 90.5970 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)... (1n)	78.8600		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)... (3n) =	181.3780 (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	0.1654 (8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50				5.0000 (17)
Infiltration rate				0.4154 (18)
Number of sides sheltered			2	(19)
Shelter factor	(20) = 1 - [0.075 x (19)] =			0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) =			0.3531 (21)

Wind speed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Wind factor	4.2000	4.0000	4.0000	3.7000	3.8000	3.5000	3.6000	3.4000	3.4000	3.7000	3.5000	4.0000	(22)
Adj infilt rate	1.0500	1.0000	1.0000	0.9250	0.9500	0.8750	0.9000	0.8500	0.8500	0.9250	0.8750	1.0000	(22a)
Effective ac	0.3707	0.3531	0.3531	0.3266	0.3354	0.3090	0.3178	0.3001	0.3001	0.3266	0.3090	0.3531	(22b)
	0.5687	0.5623	0.5623	0.5533	0.5563	0.5477	0.5505	0.5450	0.5450	0.5533	0.5477	0.5623	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
External Door			1.8000	1.0000	1.8000			(26a)
Window			21.6100	1.1450	24.7443			(27)
Heatloss Floor 1			39.4700	0.1000	3.9470	110.0000	4341.7000	(28a)
External Wall 1	99.2900	23.4100	75.8800	0.1500	11.3820	140.0000	10623.2000	(29a)
External Roof 1	39.4700		39.4700	0.1200	4.7364	9.0000	355.2300	(30)
Total net area of external elements Aum(A, m2)			178.2300					(31)
Fabric heat loss, W/K = Sum (A x U)					46.6097			(32)

Heat capacity Cm = Sum(A x k)	(28)...(30) + (32) + (32a)...(32e) =	15320.1300	(34)
Thermal mass parameter (TMP = Cm / TFA) in kJ/m2K		194.2700	(35)

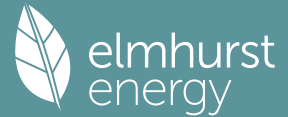
List of Thermal Bridges	Length	Psi-value	Total	
K1 Element	17.1000	0.0250	0.4275	
E2 Other lintels (including other steel lintels)	13.7000	0.0220	0.3014	
E3 Sill	31.7800	0.0170	0.5403	
E4 Jamb	21.4700	0.0580	1.2453	
E5 Ground floor (normal)	21.7000	0.0010	0.0217	
E10 Eaves (insulation at ceiling level)	17.1800	0.0570	0.9793	
E12 Gable (insulation at ceiling level)	4.2600	0.0430	0.1832	
E16 Corner (normal)	13.8000	0.0420	0.5796	
E18 Party wall between dwellings	4.6000	0.0410	0.1886	
P1 Party wall - Ground floor	4.2700	0.0440	0.1879	
P2 Party wall - Intermediate floor within a dwelling	4.2700	0.0000	0.0000	
P4 Party wall - Roof (insulation at ceiling level)	4.2700	0.0400	0.1708	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)			4.8254	(36)
Point Thermal bridges			0.0000	(36a)
Total fabric heat loss	(33) + (36) + (36a) =		51.4351	(37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)													
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Heat transfer coeff	34.0409	33.6585	33.6585	33.1198	33.2947	32.7840	32.9496	32.6231	32.6231	33.1198	32.7840	33.6585	(38)
Average = Sum(39)m / 12 =	85.4761	85.0936	85.0936	84.5549	84.7298	84.2191	84.3847	84.0582	84.0582	84.5549	84.2191	85.0936	(39)
												84.6280	
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP (average)	1.0839	1.0790	1.0790	1.0722	1.0744	1.0680	1.0701	1.0659	1.0659	1.0722	1.0680	1.0790	(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													2.4409 (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	
Hot water usage for other uses	75.1156	74.0000	72.4290	69.5325	67.3635	64.9586	63.6595	65.2195	66.9180	69.4914	72.4476	74.8616	(42b)
Average daily hot water use (litres/day)	39.6270	38.1860	36.7450	35.3041	33.8631	32.4221	32.4221	33.8631	35.3041	36.7450	38.1860	39.6270	(42c)
												105.6685	(43)
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Energy conte	114.7426	112.1860	109.1741	104.8365	101.2266	97.3807	96.0816	99.0826	102.2221	106.2365	110.6337	114.4886	(44)
Energy content (annual)	181.7242	159.7514	167.7965	143.5159	136.2705	119.7409	116.2024	122.6849	126.0500	144.1619	157.6179	179.2615	(45)
Distribution loss	27.2586	23.9627	25.1695	21.5274	20.4406	17.9611	17.4304	18.4027	18.9075	21.6243	23.6427	26.8892	(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	50.9589	46.0274	50.9589	49.3151	50.9589	48.0233	48.9621	50.4914	49.3151	50.9589	49.3151	50.9589	(61)
Total heat required for water heating calculated for each month	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(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)

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Output from w/h	232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204 (64)
	Total per year (kWh/year) = Sum(64)m =											2351.0219 (64)
Electric shower(s)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (64a)
	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =											0.0000 (64a)
Heat gains from water heating, kWh/month	73.1630	64.6242	68.5321	60.0478	58.0497	51.8197	50.8778	53.4156	54.2404	60.6735	64.7367	72.3442 (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
	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525	146.4525 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	33.6122	29.8541	24.2790	18.3807	13.7398	11.5997	12.5339	16.2921	21.8672	27.7654	32.4063	34.5464 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	323.9425	327.3040	318.8331	300.7996	278.0355	256.6404	242.3472	238.9857	247.4566	265.4901	288.2542	309.6493 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861	52.0861 (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)	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350	-97.6350 (71)
Water heating gains (Table 5)	98.3374	96.1669	92.1130	83.3998	78.0237	71.9718	68.3842	71.7951	75.3339	81.5505	89.9121	97.2368 (72)
Total internal gains	559.7957	557.2286	539.1286	506.4837	473.7026	441.1155	424.1689	427.9765	445.5613	478.7096	514.4763	545.3361 (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	12.3661	0.7600		0.7000		0.7700		29.0870 (74)	
East				9.8000	23.0580	0.7600		0.7000		0.7700		83.3090 (76)	
West				5.4300	23.0580	0.7600		0.7000		0.7700		46.1600 (80)	
Solar gains	158.5560	269.3429	445.4736	678.8995	824.5214	911.0430	854.8165	735.5498	563.6908	346.2636	190.7009	125.2125	(83)
Total gains	718.3517	826.5715	984.6022	1185.3832	1298.2240	1352.1586	1278.9854	1163.5264	1009.2521	824.9732	705.1772	670.5486	(84)

7. Mean internal temperature (heating season)

Temperature during heating periods in the living area from Table 9, Th1 (C)												21.0000 (85)
Utilisation factor for gains for living area, nil,m (see Table 9a)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
tau	49.7869	50.0107	50.0107	50.3293	50.2254	50.5300	50.4308	50.6267	50.6267	50.3293	50.5300	50.0107
alpha	4.3191	4.3340	4.3340	4.3553	4.3484	4.3687	4.3621	4.3751	4.3751	4.3553	4.3687	4.3340
util living area	0.9683	0.9429	0.8669	0.6949	0.4897	0.2856	0.1715	0.2021	0.4498	0.7839	0.9411	0.9748 (86)
MIT	19.9032	20.1383	20.5194	20.8498	20.9720	20.9980	20.9999	20.9997	20.9859	20.7939	20.2895	19.8419 (87)
Th 2	20.0140	20.0180	20.0180	20.0236	20.0218	20.0271	20.0254	20.0288	20.0288	20.0236	20.0271	20.0180 (88)
util rest of house	0.9607	0.9301	0.8401	0.6484	0.4318	0.2256	0.1072	0.1321	0.3739	0.7322	0.9253	0.9686 (89)
MIT 2	18.7760	19.0691	19.5241	19.8899	20.0024	20.0263	20.0253	20.0287	20.0215	19.8451	19.2680	18.7027 (90)
Living area fraction										FLA = Living area / (4) =		0.1732 (91)
MIT	18.9712	19.2543	19.6965	20.0562	20.1703	20.1946	20.1941	20.1969	20.1886	20.0095	19.4449	18.9000 (92)
Temperature adjustment												-0.1500
adjusted MIT	18.8212	19.1043	19.5465	19.9062	20.0203	20.0446	20.0441	20.0469	20.0386	19.8595	19.2949	18.7500 (93)

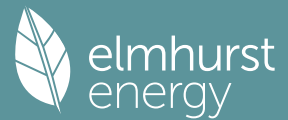
8. Space heating requirement

Utilisation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	0.9485	0.9151	0.8253	0.6424	0.4317	0.2267	0.1085	0.1334	0.3747	0.7225	0.9103	0.9577 (94)
Useful gains	681.3386	756.3968	812.5648	761.5308	560.4257	306.5832	138.7334	155.2285	378.1246	596.0730	641.8920	642.1955 (95)
Ext temp.	5.2000	5.8000	7.6000	10.2000	13.3000	16.4000	18.4000	18.2000	15.5000	11.9000	8.1000	5.2000 (96)
Heat loss rate W	1164.2884	1132.1114	1016.5734	820.7038	569.4133	306.9481	138.7411	155.2485	381.5064	673.0124	942.8277	1153.0205 (97)
Space heating kWh	359.3147	252.4802	151.7824	42.6045	6.6867	0.0000	0.0000	0.0000	0.0000	57.2429	216.6737	380.0538 (98a)
Space heating requirement - total per year (kWh/year)												1466.8390
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	359.3147	252.4802	151.7824	42.6045	6.6867	0.0000	0.0000	0.0000	0.0000	57.2429	216.6737	380.0538 (98c)
Space heating requirement after solar contribution - total per year (kWh/year)												1466.8390
Space heating per m2										(98c) / (4) =		18.6005 (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 %)												87.7000 (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
	359.3147	252.4802	151.7824	42.6045	6.6867	0.0000	0.0000	0.0000	0.0000	57.2429	216.6737	380.0538 (98)
Space heating efficiency (main heating system 1)	87.7000	87.7000	87.7000	87.7000	87.7000	0.0000	0.0000	0.0000	0.0000	87.7000	87.7000	87.7000 (210)
Space heating fuel (main heating system)												

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409.7089	287.8908	173.0701	48.5799	7.6246	0.0000	0.0000	0.0000	0.0000	65.2713	247.0623	433.3567	(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												
232.6831	205.7788	218.7554	192.8310	187.2294	167.7642	165.1645	173.1763	175.3651	195.1208	206.9330	230.2204	(64)
Efficiency of water heater												
(217)m	84.1059	83.6177	82.4103	80.5290	79.3684	79.1000	79.1000	79.1000	79.1000	80.8994	79.1000	(216)
Fuel for water heating, kWh/month												(217)
276.6549	246.0949	265.4466	239.4553	235.8992	212.0913	208.8047	218.9334	221.7005	241.1892	248.4875	273.2758	(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	(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	(231)
Lighting	29.4206	23.6023	21.2512	15.5696	12.0264	9.8257	10.9709	14.2604	18.5228	24.3029	27.4501	(232)
Electricity generated by PVs (Appendix M) (negative quantity)												
(233a)m	-62.1913	-79.1465	-111.4891	-119.2400	-119.5341	-108.8507	-107.4914	-106.3826	-101.5866	-91.8089	-65.8141	(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	-56.2262	-107.2378	-238.8373	-405.4973	-542.3097	-599.4635	-579.0664	-482.7369	-330.7175	-176.4306	-73.1170	(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											1672.5645	(211)
Space heating fuel - main system 2											0.0000	(213)
Space heating fuel - secondary											0.0000	(215)
Efficiency of water heater											79.1000	
Water heating fuel used											2888.0333	(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)											237.4410	(232)
Energy saving/generation technologies (Appendices M ,N and Q)												
PV generation											-4757.9134	(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											126.1254	(238)

10a. Fuel costs - using BEDF prices (568)

	Fuel kWh/year	Fuel price p/kWh	Fuel cost £/year	
Space heating - main system 1	1672.5645	5.6000	93.6636	(240)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.0333	5.6000	161.7299	(247)
Energy for instantaneous electric shower(s)	0.0000	26.0600	0.0000	(247a)
Pumps, fans and electric keep-hot	86.0000	26.0600	22.4116	(249)
Energy for lighting	237.4410	26.0600	61.8771	(250)
Additional standing charges			99.0000	(251)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1125.5481	26.0600	-293.3178	
PV Unit electricity exported	-3632.3653	5.8100	-211.0404	
Total			-504.3583	(252)
Total energy cost			-65.6761	(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	1672.5645	0.2100	351.2385	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	2888.0333	0.2100	606.4870	(264)
Space and water heating			957.7255	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	237.4410	0.1443	34.2701	(268)
Energy saving/generation technologies				
PV Unit electricity used in dwelling	-1125.5481	0.1358	-152.8924	
PV Unit electricity exported	-3632.3653	0.1233	-448.0088	
Total			-600.9012	(269)
Total CO2, kg/year			403.0237	(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	1672.5645	1.1300	1889.9978	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	2888.0333	1.1300	3263.4776	(278)
Space and water heating			5153.4755	(279)

Full SAP Calculation Printout



Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	237.4410	1.5338	364.1950 (282)
Energy saving/generation technologies			
PV Unit electricity used in dwelling	-1125.5481	1.5021	-1690.6920
PV Unit electricity exported	-3632.3653	0.4526	-1643.8623
Total			-3334.5544 (283)
Total Primary energy kWh/year			2313.2169 (286)

Predicted Energy Assessment



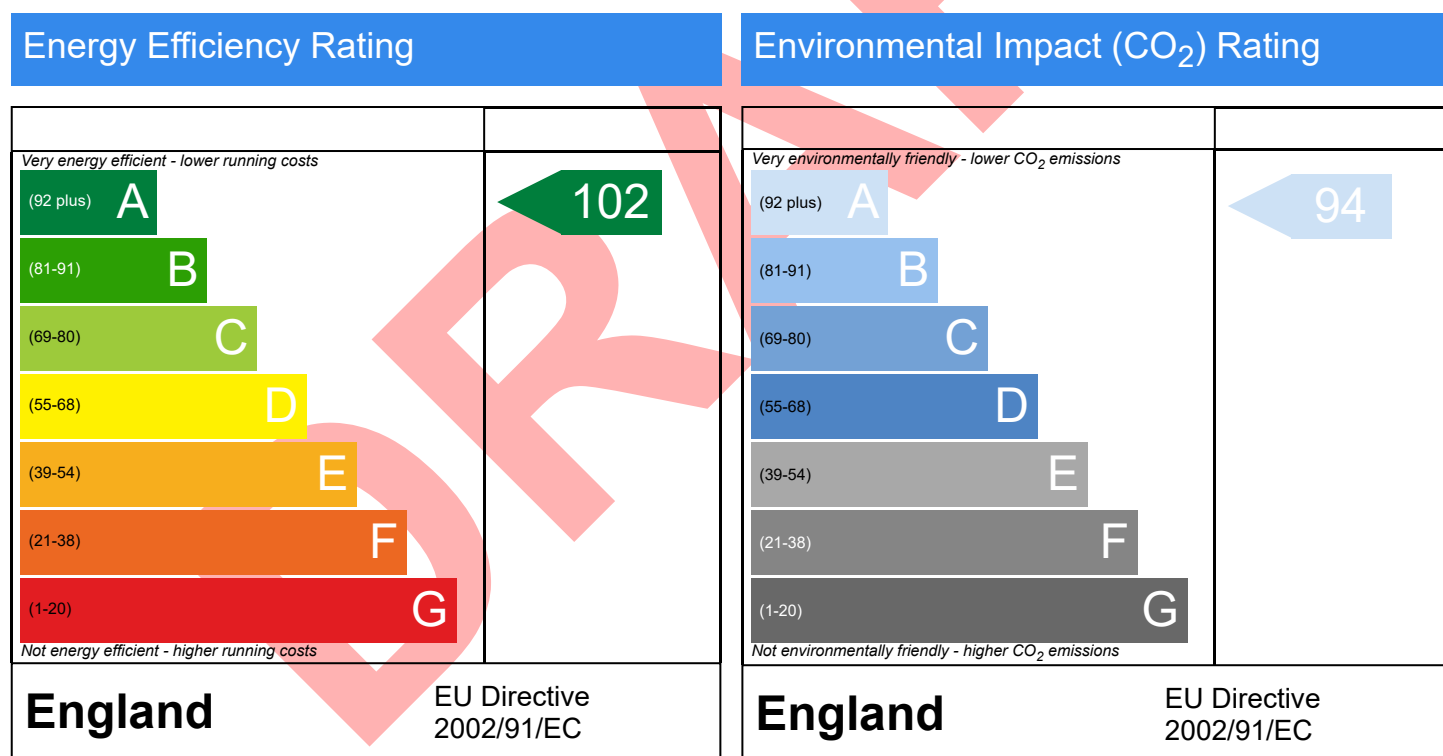
32, Manor Road, Hayes, UB3 2DG

Dwelling type:
Date of assessment:
Produced by:
Total floor area:
DRRN:

House, Semi-Detached
21/04/2025
Chris Law
78.86 m²

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

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



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

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

Thermal Bridging

Property Reference	32 Manor Road 40%	Issued on Date	21/04/2025
Assessment Reference	00001	Prop Type Ref	Semi-Detached House
Property	32, Manor Road, Hayes, UB3 2DG		

SAP Rating	102 A	DER	7.31	TER	12.26
Environmental	94 A	% DER < TER			40.38
CO ₂ Emissions (t/year)	0.4	DFEE	33.84	TFEE	38.81
Compliance Check	See BREL	% DFEE < TFEE			12.79
% DPER < TPER	36.49	DPER	40.68	TPER	64.06

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

	Junction details	Source Type	Psi (W/mK)	Length (m)	Result	Reference
External wall	E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	0.025	17.10	0.43	
External wall	E3 Sill	Non Gov Approved Schemes	0.022	13.70	0.30	
External wall	E4 Jamb	Non Gov Approved Schemes	0.017	31.78	0.54	
External wall	E5 Ground floor (normal)	Non Gov Approved Schemes	0.058	21.47	1.25	
External wall	E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	0.001	21.70	0.02	
External wall	E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	0.057	17.18	0.98	
External wall	E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	0.043	4.26	0.18	
External wall	E16 Corner (normal)	Non Gov Approved Schemes	0.042	13.80	0.58	
External wall	E18 Party wall between dwellings	Non Gov Approved Schemes	0.041	4.60	0.19	
Party wall	P1 Party wall - Ground floor	Non Gov Approved Schemes	0.044	4.27	0.19	
Party wall	P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	0.000	4.27	0.00	
Party wall	P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	0.040	4.27	0.17	

Total: 158.40 W/mK:
Y-Value: 0.03 W/m²K:

Energy Report



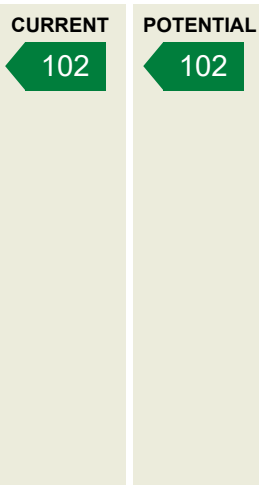
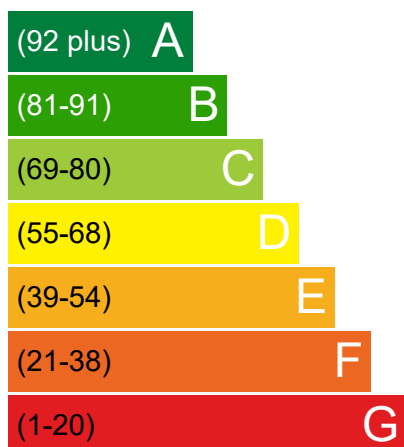
Dwelling Address	32, Manor Road, Hayes, UB3 2DG
Reference	32 Manor Road 40%-00001
Assessment Date	21/04/2025
Submission Date	
Property Type	House, Semi-Detached
Total Floor Area	79

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

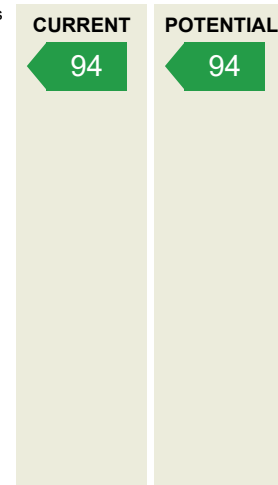
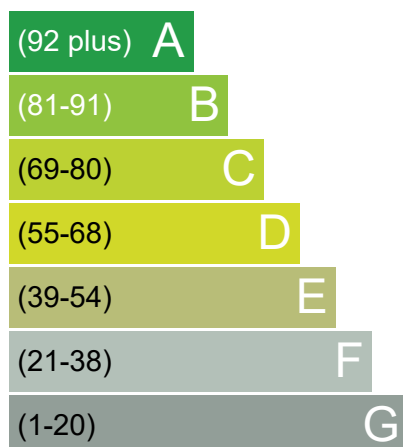
Energy Efficiency Rating

Most energy efficient - lower running costs

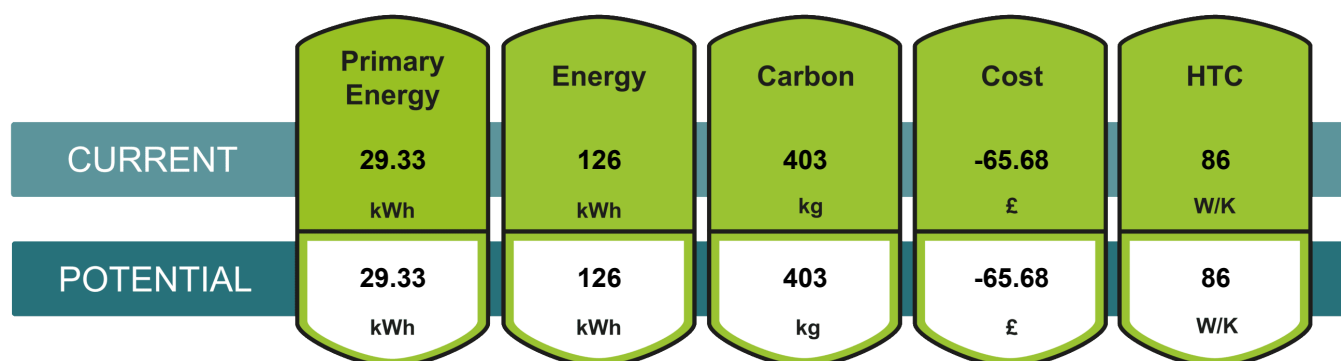


Carbon Dioxide (CO2) Emissions Rating

Very environmentally friendly - lower CO2 emissions



Additional ratings for your home



Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good
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Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.15 W/m ² K	Very Good
Roof	Average thermal transmittance 0.12 W/m ² K	Very Good
Floor	Average thermal transmittance 0.1 W/m ² K	Very Good
Windows	High performance glazing	Very Good
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Time and temperature zone control	Very Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	Air permeability [AP50] = 5.0 m ³ /h.m ² (assumed)	Good

Recommendations

The recommended measures provided below will help to improve the energy efficiency of the dwelling. To reach the dwelling's potential energy rating all of the recommended measures shown below would need to be installed. Having these measures installed individually or in any other order may give a different result when compared with the cumulative potential rating.

Recommended measures	Cumulative savings (per year)	Cumulative rating	Typical costs	Incremental savings (per year)	Cumulative CO2 rating
Solar water heating	£31	A 103			A 96

The typical cost is based on average installation prices across the country so may not be representative of the actual costs in your area.

Estimated energy costs of the dwelling

The table below shows the estimated running costs of the space and water heating and lighting within the dwelling. It does not include the energy used from household appliances. The estimated annual costs after potential improvements indicates the total energy cost if all recommended measures named above were installed.

		Estimated annual costs	Estimated annual costs after potential improvements	Potential future savings
Lighting		£62	£62	
Heating		£215	£215	
Hot Water		£162	£162	
New Technologies e.g. Impact of PV		-(£504)	-(£504)	
TOTAL		-(£66)	-(£66)	

Estimated energy use and potential savings



Space Heating

1673

kWh per year



Water Heating

2888

kWh per year

About this document

Created by:
Company/Trading name:
Phone number:
Email address:

Disclaimer

This Energy Report should not under any circumstances be treated as a Condition Survey and cannot be used to indicate that any element of the dwelling (e.g. heating system) is working correctly.
This Energy Report must not be used in situations where an Energy Performance Certificate (EPC) is required.
This Energy Report is generated from a set of data inputs which may not reflect the actual dimensions, services or construction of the dwelling.
The calculation used to generate this report reflects the SAP Methodology current at the time of report generation.

Glossary terms for additional metrics

Primary Energy	The measure of the energy required for lighting, heating and hot water in a property. This includes the efficiency of the property's heating system, power station efficiency for electricity and the energy used to produce the fuel and deliver it to the property.
Energy Used	The estimated amount of fuel energy for lighting, heating and hot water for the property. The estimate is based on typical usage which is likely to be different to actual consumption.
Carbon (CO ₂)	The current emissions based on the energy estimates.
Cost	The estimated cost of energy. The cost of each unit of fuel is based on an industry standard which is likely to be different to those the occupier actually pays.
Heat Transfer Coefficient	Heat flow through the property envelope where internal and external temperatures are different.

Dwelling Sign Off Report



Property Reference	32 Manor Road 40%	Issued on Date	21/04/2025
Assessment Reference	00001	Prop Type Ref	Semi-Detached House
Property	32, Manor Road, Hayes, UB3 2DG		

SAP Rating	102 A	DER	7.31	TER	12.26
Environmental	94 A	% DER < TER			40.38
CO ₂ Emissions (t/year)	0.40	DFEE	33.84	TFEE	38.81
Compliance Check	See BREL	% DFEE < TFEE			12.79
% DPER < TPER	36.49	DPER	40.68	TPER	64.06

Assessor Details	Mr. Chris Law	Assessor ID	AX42-0001
Client			

This report should be used for a client to confirm key assessment details for production of Energy Performance Certificates and should be retained as documentary evidence. It cannot be used in lieu of a BREL/BRWL/Compliance report for demonstrating Building Regulation compliance.

Section 1: Dwelling Information

Dwelling Address (Please confirm final postal address and post code of the dwelling.)

House Name		
House Number	32	
Postcode	UB3 2DG	
Street	Manor Road	
Town	Hayes	
County		

Dwelling Orientation (Please confirm orientation of main entrance door of the dwelling.)

Comments	
----------	--

Terrain Type

Property Type

Comments	
----------	--

Electricity Tariff

Smart electricity meter fitted

Smart gas meter fitted

Comments	
----------	--

Section 2: Dwelling Construction Details

External Walls

Description	External Wall 1		
Type	Cavity Wall		
Construction	Cavity wall; dense plaster, lightweight aggregate block, filled cavity, any outside structure		
U-value	0.15	W/m ² K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	99.29	m ²	
Comments			

External Roofs

Dwelling Sign Off Report



Description	External Roof 1		
Type	External Plane Roof		
Construction	Plasterboard, insulated at ceiling level		
U-value	0.12	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Gross Area	39.47	m²	
Comments			

Heat Loss Floors

Description	Heatloss Floor 1		
Type	Ground Floor - Solid		
Construction	Slab on ground, screed over insulation		
U-value	0.10	W/m²K	U-value calculations should be provided to verify the u-value entered into the Assessment
Area	39.47	m²	
Comments			

Opening Types

Description	Data Source	Type	Glazing	G-value	Frame Type	U-Value (W/m²K)
External Door	Manufacturer	Half Glazed Door	Double glazed	0.76		1.00
Window	Manufacturer	Window	Double glazed	0.76		1.20
Comments						

Openings

Name	Opening Type	Location	Orientation	Area (m²)
Front	External Door	External Wall 1	West	1.80
Front	Window	External Wall 1	West	5.43
Side	Window	External Wall 1	North	6.38
Rear	Window	External Wall 1	East	9.80
Comments				

Thermal Bridging

List of Bridges

Bridge Type	Source Type	Length (m)	Psi (W/mK)	Reference
E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	17.10	0.03	

Dwelling Sign Off Report



E3 Sill	Non Gov Approved Schemes	13.70	0.02
E4 Jamb	Non Gov Approved Schemes	31.78	0.02
E5 Ground floor (normal)	Non Gov Approved Schemes	21.47	0.06
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	21.70	0.00
E10 Eaves (insulation at ceiling level)	Non Gov Approved Schemes	17.18	0.06
E12 Gable (insulation at ceiling level)	Non Gov Approved Schemes	4.26	0.04
E16 Corner (normal)	Non Gov Approved Schemes	13.80	0.04
E18 Party wall between dwellings	Non Gov Approved Schemes	4.60	0.04
P1 Party wall - Ground floor	Non Gov Approved Schemes	4.27	0.04
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	4.27	0.00
P4 Party wall - Roof (insulation at ceiling level)	Non Gov Approved Schemes	4.27	0.04

Y-value

Comments

Where specific construction details have been used documentary evidence should be provided to the SAP assessor, usually in the form of signed checklists.

Pressure Testing

Yes
 Designed AP₅₀ m³/(h.m²) @ 50 Pa
 Property Tested?
 Test Method

Where an air pressure test has been carried out a copy of the test certificate should be forwarded to the SAP assessor.

Comments

Section 3: Dwelling Systems

Fans, Open Fireplaces, Flues

Number of open chimneys
 Number of open flues
 Number of chimneys/flues attached to closed fire
 Number of flues attached to solid fuel boiler
 Number of flues attached to other heater
 Number of blocked chimneys
 Number of intermittent extract fans
 Number of passive vents
 Number of flueless gas fires

Comments

Dwelling Sign Off Report

Fixed Cooling System

Comments

Lighting

No Fixed Lighting

Name	Efficacy (lm/W)	Power (W)	Capacity (lm)	Count
Lighting 1	80.00	25.00	2000.00	24

Comments

Main Heating 1

Database		
Fuel Type	Mains gas	
Winter Efficiency	87.70	%
Summer Efficiency	79.10	%
Model Name	Flexicom 30cx	
Manufacturer	Vaillant Group	
System Type	Combi boiler	
Flue Type	Balanced	
Fan Assisted Flue	Yes	
Heat Emitter	Radiators	
Flow Temperature	Unknown	
Flow Temperature Value		

Comments

Heating Controls

Description	Time and temperature zone control by arrangement
Boiler Interlock	Yes
Delayed Start Stat	Yes
PCDF Control Description	

Comments

Main Heating 2

Dwelling Sign Off Report



Secondary Heating

Water Heating System

Water Heating

Supplementary Immersion

SAP Code

Water use <= 125 l/p/day

Cold Water Source

Number of baths

Comments

Hot Water Cylinder

Comments

Waste Water Heat Recovery System

Comments

Section 4: Dwelling Renewable Energy

Photovoltaic Unit

Export Capable Meter?

Connected To Dwelling

Diverter

Battery Capacity [kWh]

PV Cells kWp	Orientation	Elevation	Overshading	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
6.50	East	45°	None Or Little	No	1.00		

Comments

Section 5: Declaration

I confirm to the best of my knowledge the details provided in this report are an accurate representation of how the dwelling has been constructed.

Signed

Date