FES GROUP

CONSTRUCTION COMPLIANCE, SUSTAINABILITY & ACOUSTICS

Energy Statement

Energy and Carbon Reduction

Ruthin Road, Wrexham

Reference Number: 008780

Date: November 2023

Issue: 4

PLANNING

DESIGN

ON-CONSTRUCTION

EXISTING BUILDINGS

thefesgroup.com

Project name: Ruthin Road, Wrexham

Ref: 008780

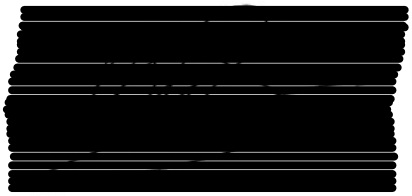
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Issue Number: 4

Author:	Initial review by:	Secondary review by:
		
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Summary of changes:

Rev A – Re worded heat pump section (page 11) to advise that an alternative strategy may be proposed for other plots.

Rev B – Re worded heat pump section (page 11).

Rev C – Report amended following comments from Joe on 13/11/23.

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Company Profile

Established in 2007 as a family firm, we set out to create a sustainable, resilient business, establishing a happy and positive working environment for both clients and colleagues. It was important for us to offer adaptable and growing solutions for the areas of the construction industry that would benefit from them the most.

Creating an environment that was a pleasure to work in for both colleagues and clients was, and remains, incredibly important to us. Building our future on the foundations of honest relationships, flexibility and efficiency means that we value every client's success as though it were our own.

We have grown to become a trusted construction compliance partner. We continue to grow, to offer packages of sustainability, environmental and acoustic services, with the long-term aim of making our clients' lives easier, so they can focus on the jobs that they enjoy.

Today, the business works with a wide spectrum of clients from household name plc firms, one-off builds and everything in between. Our client list includes many of the nation's major house builders and contractors, as well as universities and public sector organisations. The team also lends their know-how to many architectural practices, M&E consultants and planners.

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Introduction

This report has been prepared by the FES Group on behalf of Redrow Homes to accompany the planning application for the proposed development known as Ruthin Road, Wrexham.

The development proposals will see the construction of 1,520 new dwellings, consisting of detached, semi detached and terraces.

This report reviews the proposed energy and carbon reduction strategy advanced by Redrow Homes within the context of local and national planning policy. The report in particular considers and evaluates the measures incorporated into the design of the development to reduce the predicted CO_2 consumption of the site over 2021 Building Regulations under SAP10.

The following documents were considered when formulating the report:

- National Planning Policy Framework 2021 – The NPPF strengthens the emphasis on sustainable development and encourages Local Authorities to adopt standards consistent with the Government's zero carbon building policy and other nationally described standards.
- Building Regulations Part L 2021– Approved Document L 2021 Conservation of Fuel and Power in new dwellings sets minimum energy efficiency and fabric efficiency standards for all new domestic buildings.
- Policy RE1 of the Wrexham Local Development Plan 2013-2028

The council require developers of the Key Strategic Sites and major sites (100 dwellings or more or development exceeding 1000m2) to incorporate schemes which generate energy from renewable and low carbon technologies unless it is demonstrated that it would not be financially or technically viable to do so. This includes opportunities to minimise carbon emissions associated with the heating, colling and power systems for new development.

An independent energy assessment investigating the financial viability and technical feasibility of incorporating such schemes will be required to support applications.

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Sustainable Design

The building fabric, the building services and the management of a building broadly determine the energy use of a building. In understanding this, design teams can take measures to advance sustainable design from the earliest stages of a development. However sustainability is not limited to issues concerning energy consumption. Material selection, the protection of local environments, addressing flood risk and the health and wellbeing of future occupants are all issues requiring consideration. Addressing all these issues in an integrated and intelligent manner will result in truly sustainable developments.

Material Selection

Significant amounts of energy and natural resources are consumed in the production, transportation and disposal of building materials. Two issues are of significant importance in the procurement of materials: the environmental impact of materials and the sourcing of materials. Redrow Homes is dedicated to taking pro-active measures to addressing these issues.

	BRE Green Guide Rating
External Wall	A+
Ground Floor	B
Intermediate Floor	C
Roof	A+
Internal Walls	A
Windows	A

Table 1- Green Guide Rating of Specification

The developer will choose materials which have a lesser environmental impact. This will be implemented during the procurement process. Suppliers will be obliged to produce Environmental Management System certificates covering the sourcing and production of materials. Timber or timber composite products will be sourced from responsible sources. Suppliers will be obliged to provide full Chain of Custody Certificates right through the supply chain; from the initial timber yard, manufacturing process, transformation and distribution. Secure certificates must be produced by valid accrediting bodies – FSC, PEFC, CSA, SFI & MTCC.

Flood Risk

The Flood and Water Management Act 2010, directs developers to avoid, reduce and delay the discharge of rainfall to public sewers and watercourses through the use of Sustainable Urban Drainage Systems (SUDS) with the aim of protecting watercourses and reducing the risk of localised flooding and pollution.

This obligation is taken seriously:

Where possible, impermeable surfaces are kept to a minimum, thus allowing for maximum infiltration (e.g. permeable paving)



Pollution during Construction

The contractor will be required, under the terms of their contract, to minimise dust, fumes, discharges and any other form of pollution on site, in line with best practice policies:

- The Control of Dust and Emissions from Construction & Demolition: Best Practice Guidance.

The sustainable management and monitoring of waste generated during the construction of a development is a major concern to local and national planners.

Furthermore the site will allow the successful segregation of waste on site in line with Best Practice policies. However the contractor will be obliged to adopt many of the principles of the waste hierarchy:

- Accurate specifications of materials and volumes.
- Recycling and re-use of waste on site.
- Arrange take back schemes with suppliers.
- Instruct a licensed waste contractor to segregate site waste for recycling.



Health and Wellbeing

In achieving ever stricter levels of energy efficiency, it is important that designers do not lose sight of the fact that they are building homes that people can live in and not just occupy. This is an integral part of sustainability, and a hugely important consideration if the population (and the market place) is to tolerate the sustainability agenda. While it is quite difficult to measure or even quantify health and wellbeing, the following measures are a sample of the efforts made by Redrow Homes to address this issue: The proposed properties will have sufficient living /dining space. While this is obviously a marketing consideration, it does fall within this category.

The principal living rooms have sufficient glazing to allow natural light to penetrate into the rooms. Numerous studies have shown this to be beneficial to the general health and happiness of occupants. Daylighting calculations can be undertaken to demonstrate that living rooms, dining rooms, kitchen and home offices receive adequate daylighting.

- The property will benefit from a garden or private space for recreation however this may not apply to flats. This will take the form of secure rear gardens to each property.
- The property has dedicated internal recycling facilities and accessible external storage in line with the local council waste and recycling collection scheme.

Water Efficiency

The average person consumes some 150 litres per day; this represents an annual increase of 1% since the 1930s. Despite the United Kingdom's wet and temperate climate, climate change will most probably result in an increase in the occurrence of drought orders and hosepipe bans. With this in mind, it is not difficult to appreciate that within the next few decades the UK (particularly the South East) will face regular water shortages.

In response to this water efficiency has gained equal billing, alongside energy efficiency. The following are the principle policy drivers.

- The Approved Document G (2015) restricts new build dwellings to a maximum consumption of 125 litres per person per day. The Water Efficiency Calculator of New Dwellings also includes an allowance for external water use.
- The Code for Sustainable Homes was first introduced in April 2007. While now disbanded, Included within the Code was mandatory water efficiency standards. Homes constructed to Code for Sustainable Homes Level 3 and 4 must achieve a maximum internal water consumption of 105 litres per person per day. Dwellings constructed to Code Levels 5 and 6 must achieve an internal water consumption of 80 litres per person per day.
- Part L 2021 and SAP10 will take account of Part G and water consumption in the calculation of the forecasted energy demand of a dwelling.



The below table details the recommended sanitary ware fittings to be adopted by Redrow Homes to meet with the requirement to achieve 125 Litres per person per day as required by Building Regulations Part G 2015.

Installation Type	Unit of Measurement	Capacity/Flow Rate	Use Factor	Fixed Use	Litres Per Person Per Day
WC (Dual Flush)	Full Flush (litres)	6	**1.46**	**0.00**	5.84
	Part Flush (litres)	2.6	**2.96**	**0.00**	7.70
Taps (excluding kitchen tap)	Flow rate (litres/minute)	6	**1.58**	**1.58**	11.06
Baths (where shower present)	Capacity to overflow (litres)	180	**0.11**	**0.00**	19.80
Showers (where bath present)	Flow rate (litres/minute)	9	**4.37**	**0.00**	39.33
Kitchen sink tap	Flow rate (litres/minute)	6	**0.44**	**10.36**	13.00
Washing Machine	Litres/kg dry load	8.17	**2.1**	**0.00**	17.16
Dishwasher	Litres/place setting	1.25	**3.60**	**0.00**	4.50
				Total	**118.38**

Contribution from Greywater (litres/person/day)	0
Contribution from Rainwater (litres/person/day)	0
Total Internal Water Consumption	**118.36**
Normalisation Factor	0.91
Water Consumption with Normalisation Factor	107.743
External Use	5.00
Part G Water Consumption	**112.73**

Table 2 – Water Consumption

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Renewable Technologies

There are a number of recognised renewable technologies which have the potential to reduce the energy consumption of a dwelling. However given the nature of the development, we judge that the following technologies are worthy of consideration;

- Solar thermal panels.
- Biomass
- Photovoltaic panels.
- Air source heat pumps.
- Combined Heat & Power
- Wind Power

Solar Thermal

Solar thermal panels use radiant solar energy to heat water for domestic consumption. The system works successfully across the UK as they can work in diffuse weather conditions. In comparison to other technologies it is considered a reliable and proven technology. The system works most efficiently when the panel or evacuated tube is mounted on a 10-60° pitch facing due south, though other combinations do work successfully. During late spring to early autumn months, the system can be expected to meet some 70-90% of a dwellings domestic hot water needs.

Most systems in the UK are two panel systems, typically 4 sq m in size and accompanied with a 180-250 litre cylinder with a dedicated solar storage capacity of 65-110 litres. The typical installation costs for solar thermal vary, especially when large volumes are considered. However a rough estimate is £3500 per plot.

Occupants can expect annual savings in the region of £50-85 per year, which is relatively modest. Solar thermal panels do not qualify for feed in tariffs, however it is expected that solar thermal systems will benefit from the Renewable Heat Incentive. A 20-25 year payback can be expected, dependent on usage and dwelling type.

Taking into consideration the proposed development, the site layout and orientation a two panel systems is recommended for consideration.



Biomass

Biomass boilers offer an environmentally sound, heating solution. Heating is generated by burning biomass, such as wood pellets or logs. This will emit the same amount of CO2 as is absorbed while the plants were growing, therefore, the biomass is classed as carbon neutral.

Unfortunately, such a provision for this development is both unfeasible and out of proportion to the requirement.



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Photovoltaic

Photovoltaic panels convert sunlight into electricity for use within a dwelling. PV panels use cells to convert light into electricity. A PV cell usually consists of 1 or 2 layers of a semi-conducting material such as silicon. The greater the intensity of sunlight, the more electricity is generated. PV systems can come in different forms. The most aesthetically pleasing are PV tiles which resemble roof tiles. However the most popular are modules which can either sit on the roof or be integrated into it. The technology is most efficient when oriented due south. However panels orientated south of east or west are suitable. Generally panels orientated away from due south require a greater surface area to generate a set amount of energy.



Air Source Heat Pumps

Air source heat pumps extract heat from the outside air. The heat is absorbed into a fluid, which is pumped through a heat exchanger. Low grade heat is then extracted by the refrigeration system and after passing through the compressor is concentrated into a higher temperature. This energy is then used to heat water for space and hot water use within the dwelling. While heat pumps use national grid electricity, and so are not a renewable resource, they utilise a heat source which is naturally renewed in our environment and so are considered a low carbon technology.

Heat pumps have stated CoPs in the region of 2-4, though test results outside of the laboratory have produced mixed results. Typically the heat pump is located on an external wall. It is generally accepted that 1kW in heat pump size will provide enough heating for 20m2 of floor space.

Calculations have been based on ASHPs to all plots, but alternative renewable energy solutions could also be used.



Combined Heat and Power (CHP)

Combined heat and power utilises the waste energy in the generation of electricity to provide space heating and hot water to a development. In conventional means of power generation copious amounts of energy is wasted in the form of heat. The utilisation of this waste heat can see efficiencies of CHP systems typically exceed 90%.

Combined heat and power is not a renewable technology but instead is a DECC recognised low carbon technology which qualified for the Low Carbon Building Programme. To qualify as a renewable technology the use of biomass pellet or bio-diesel would be required. At the present time biomass CHP is very much in its infancy in the UK. Furthermore it is imagined there will be significant problems in locating a sustainable and local source of pellet. Without such a source the reliability of such a system and the net carbon benefit of pellet sourced from a distance are questionable. As a result we do not recommend CHP for consideration on this development.



Wind Power

The principle of harnessing wind power is well established in the UK with access to over 40% of the total European wind resource. Until recently, developments have been concentrated within coastal regions; however technological advances mean that wind power is viable in many urban locations.

Wind turbines are a means of capturing the power within a moving air mass (wind) and converting it into electricity. As yet there is no simple and practical method of incorporating wind generated electricity to sites containing a number of buildings, or requiring high energy usage.

Furthermore, the urban location also means that it would prove difficult to harness sufficient wind energy to meet the needs of the development. The high density of urban areas obstructs air patterns and reduces the efficiency of the turbine. The size of the turbine required is also likely to detract unacceptably from the local area and generate a significant amount of noise, both of which prejudice local residential amenity.

For these reasons, together with the high installation costs, potential noise pollution and high likelihood of not achieving planning approval we are not proposing to employ wind turbines on this site.



Energy Strategy

The Context

The proposed works fall under the scope of Approved Document L 2021. The Approved Document sets minimum fabric energy efficiency standards and a maximum CO2 emission rate for residential buildings. To place the proposed energy strategy into its correct regulatory context it is worthwhile summarising the minimum standards included in the Approved Document.

Element	Part L 2021 Minimum Standard
External Walls	0.26W/m2K
Roof	0.16W/m2K
Floor	0.20W/m2K
Glazing & Doors	1.80W/m2K
Air Test	8.00m3/h.m2 at 50Pa

Table 3 – Minimum Fabric Efficiency Standards

Proposed Strategy

The National Planning Policy Framework requires that all development proposals are in line with the Government's zero carbon buildings programme.

The figures and calculations detailed in this report have been taken from SAP10 (2021 Building Regulations).

In response to this guidance, and recent shifts within the industry, Redrow Homes proposes the adoption of a strategy which addresses the core policy goals of sustainable construction:-

- Reduced CO2 emissions to combat the causes of climate change.
- Reduced energy consumption to address legitimate concerns of energy security.

By reducing the energy requirement of the building, the sustainable credentials of each development are enhanced and are not validated by simply bolting on expensive renewable equipment. By focusing on fabric performance and the provision of efficient heating systems each dwelling is intrinsically "green".

Before the potential of various technologies can be assessed, it is first necessary to calculate the base line energy consumption of the development and hence the target reduction.

The proposed dwellings were modelled in SAP10 to determine the energy consumption and corresponding CO2 emissions of the development. Standard Assessment Procedure, or SAP, is the Government's approved methodology for the calculation of energy consumption and CO2 emissions for new build dwellings.

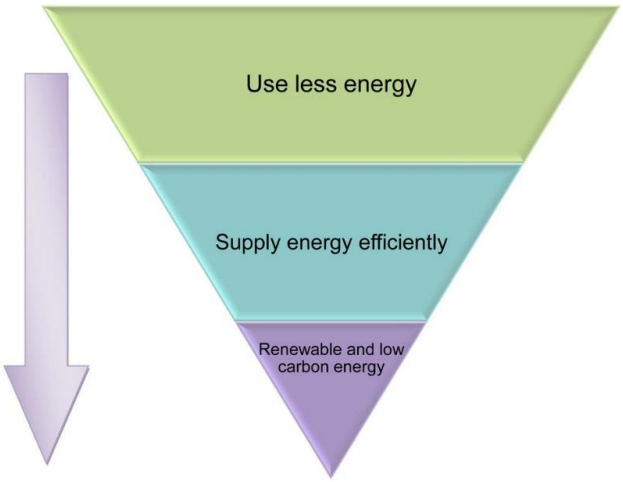
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In line with best practice the proposed energy strategy for Ruthin Road, Wrexham will adhere to the principles of the Energy Hierarchy;

- Be Lean – reduce the need for energy.
- Be Clean – supply and use energy in the most efficient manner.
- Be Green – supply energy from renewable sources.



Adhering to the principles of the Energy Hierarchy has a number of benefits. The principle benefits are;

- By reducing the energy requirement of each dwelling the renewable requirement shrinks in proportion. This has obvious cost benefits.
- The sustainable credentials of each development are enhanced and are not validated by simply bolting on expensive renewable equipment. By focusing on the fabric performance and the provision of efficient heating systems each dwelling is intrinsically "green".

Be Lean.

Redrow Homes have confirmed Lean measures equal to a 4.64% reduction in fabric heat loss across the building envelope. This greatly reduces the need for energy within a dwelling.

Be Clean.

Redrow Homes have confirmed Clean measures which include time, temperature & zone controls to allow the user to maximise the control to ensure efficient use of the main heating system. 100% Low Energy Lighting to be installed alongside natural ventilation and trickle ventilation.

Be Green.

Redrow Homes have confirmed Green measures where air source heat pumps will be installed along with EV charging points to promote the use of electric/hybrid vehicles.

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Establishing a Baseline

To adequately ascertain the potential of Redrow Homes preferred strategy, a baseline energy consumption associated with the development must be calculated. As such the development was modelled in SAP10 to determine the current CO^2 emission and associated energy requirement prior to the incorporation of improved fabric efficiencies and renewable technologies. The table below summarises the results calculated.

House Type	No	Baseline Emission Rate (kg/year)	Baseline Energy Rate (kWh/year)
HT - Shaftesbury - Det	110	138,615.49	723,417.55
HT - Avon - Mid	150	103,859.73	542,347.98
HT - Avon - Semi/End	120	92,931.96	486,625.54
HT - Bakewell - Semi	160	140,568.74	736,395.97
HT - Chester - Det	100	116,305.72	603,431.99
HT - Dart - Mid	100	92,686.74	482,356.86
HT - Dart - Semi/End	150	123,597.63	651,471.12
HT - Hampstead - Det	180	279,291.67	1,458,075.92
HT - Harrogate - Det	80	110,093.09	576,108.24
HT - Ledsham - Det	120	179,452.92	942,244.56
HT - Oxford - Det	100	125,785.59	658,545.72
HT - Richmond - Det	150	255,722.67	1,352,711.64
Total	**1,520**	**1,758,911.94**	**9,213,733.09**

Table 4 – Baseline Energy Consumption & CO^2

The calculations summarised in the table above confirm Ruthin Road, Wrexham has a baseline site wide energy requirement of 9,213,733.09 kWh/year and an associated CO2 emission rate of 1,758,911.94 kgCO2/year.

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Fabric and Building Services Specification

Redrow Homes proposes a series of fabric and building service enhancements that exceeds the minimum requirements of Part L 2021. By placing a significant emphasis on the performance of the fabric of each property, reductions in energy and carbon will be achieved. The following table details the anticipated fabric efficiency and building services standards to be incorporated into the design. These measures constitute the lean efforts.

Element	Part L 2021	Enhanced Specification
Wall	0.26W/m²K	0.21W/m²K
Roof	0.16W/m²K	0.09/0.16W/m²K
Floor	0.20W/m²K	0.11W/m²K
Glazing & Doors	1.80W/m²K	1.10/1.20W/m²K
Air Test	8.00m3/h.m² at 50Pa	5.00m3/h.m² at 50Pa
Renewables (PV)	40% of Floor Area / 6.50	None
Waste Water Heat Recovery	N/A	None

Table 5 – Enhanced Specification Summary & Comparison

The U-values above show that the minimum requirements of Part L have been exceeded.

In addition to the summary above the following additional measures will be incorporated into the design, constituting the **clean** measures to reduce energy consumption;

- Redrow Homes have adopted a set of bespoke thermal bridging details which is being implemented on the site. These reduce thermal bridging throughout junctions and penetrations through the building fabric.
- Efficient independent heating systems will be provided with a programmer, room thermostats and thermostatic radiator values. These will allow the eventual occupants to exercise control over their heating system and thus reduce energy consumption.
- Energy efficient lamps will be installed in each light fitting
- Water consumption is now included in the calculation of a property's energy consumption. Thus each property will adhere to the requirements of Approved Document G– maximum internal water consumption of 125 litres per person per day.

It is clear that the proposed strategy places a great importance on the efficiency of a buildings thermal envelope and internal building services. This emphasis is to be encouraged. It recognises that it is inherently more sustainable to invest resources in reducing a property's long term energy consumption in contrast to short term generation benefits.

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Reduced Emission Rate & Energy Requirement

To determine the benefits of the proposed specification, the development was again modelled in SAP10. The table below summarises the results calculated.

House Type	No	Enhanced Emission Rate (kg/year)	Enhanced Energy Rate (kWh/year)
HT - Shaftesbury - Det	110	51,333.74	533,324.53
HT - Avon - Mid	150	39,027.75	411,582.06
HT - Avon - Semi/End	120	34,381.15	361,736.74
HT - Bakewell - Semi	160	50,767.02	533,547.17
HT - Chester - Det	100	45,087.68	474,701.54
HT - Dart - Mid	100	34,723.08	364,684.20
HT - Dart - Semi/End	150	49,328.82	510,374.16
HT - Hampstead - Det	180	107,443.69	1,116,857.05
HT - Harrogate - Det	80	42,851.97	445,045.04
HT - Ledsham - Det	120	65,057.52	675,166.32
HT - Oxford - Det	100	47,604.27	494,508.84
HT - Richmond - Det	150	105,576.14	1,089,746.28
Total	**1,520**	**673,182.84**	**7,011,273.92**

Table 6 – Reduced Emission Rate & Energy Requirement

The calculations summarised in the table above confirm Ruthin Road, Wrexham has a reduced energy requirement of 7,011,273.92 kWh/year and an associated emission rate of 673,182.84 kgCO2/year. These are respectively 61.73% and 23.90% reductions over the baseline calculated previously.

In order to comply with the planning requirements, it is necessary for this development to show measures have been taken to ensure high energy efficiency and best practice with regards to energy consumption inline with the Energy Hierarchy.

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Evaluation

The FES Group was instructed by Redrow Homes to review the performance of the proposed Energy Strategy for the development at Ruthin Road, Wrexham. The energy strategy was detailed previously but can be best summarised as follows;

- Redrow Homes proposes an energy strategy, which addresses the two policy concerns of sustainable design and construction: climate change and energy security.
- Redrow Homes has proposed a fabric first strategy, which aims to achieve long term reductions in CO2 emissions and climate change.
- The proposed fabric and building services specification will permanently reduce regulated emissions by 61.73% and the proposed energy demand by 23.90% This is a significant betterment and demonstrates that the proposed development will have a reduced reliance on national resources (gas and electricity).
- The calculations have been based on a mixture of standard housetypes current specification. They are representative of the types of dwellings that would be built on site, with the only possible changes being that, as and when further energy efficiency measures become available and are employed by Redrow Homes, energy performance would be enhanced further beyond that illustrated.
- The planning policy advises that sites that consist of 100 dwellings or more or the development exceeds 1000m2, must incorporate schemes which generate energy from renewable technology. To achieve compliance under Part L 2021, renewable technology such as solar PV or heat pumps are required. As the current specification proposes to use air source heat pumps, solar PV is not required.

After detailed analysis we can conclude that the preferred energy strategy adheres to the principles and aspirations of sustainable design and construction as advanced by national and local government and the house building industry. We therefore recommend the adoption of the preferred energy strategy by Redrow Homes.

Future Energy Surveys Ltd T/A The FES Group and its staff shall not to be held liable for any damage or loss sustained as a result of using of the information provided in this report. The report is based on drawings and information provided by the client and/or project design team at the time of issue. The information and the drawings provided to us determine the results within the report. If anything changes during the course of the ongoing design or construction, the reduction and calculations will be incorrect. The FES Group will not be held responsible for the implications of such change.

As such this report should be viewed as providing a reasonable assessment of the predicted performance of the development based on current knowledge.

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Summary for Input Data

elmhurst energy

Property Reference	008770 - HT - Shaftesbury - De	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Shaftesbury - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	83 B	**DER**	3.57	**TER**	9.64
Environmental	97 A	**% DER < TER**			62.97
CO_2 Emissions (t/year)	0.48	**DFEE**	38.88	**TFEE**	39.97
Compliance Check	See BREL	**% DFEE < TFEE**			2.71
% DPER < TPER	26.28	**DPER**	37.09	**TPER**	50.31

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	34.30 m	65.72 m²	2.54 m
1st Storey:	34.30 m	65.00 m²	2.02 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	22.97	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	167.89	134.74	0.00	None	33.15	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	35.25
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	67.10
Internal Wall FF	Plasterboard on timber frame	9.00	137.36

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	53.03	53.03	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

Dropped Eaves	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	16.56	16.56	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	65.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	65.72

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	65.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.05	0
Front Windows	Windows	External Wall	East	12.00	0
LHS Windows	Windows	External Wall	South	6.74	0
Rear Windows	Windows	External Wall	West	0.62	0
Rear Door	Patio Doors	External Wall	West	2.05	0
RHS Windows	Windows	External Wall	North	4.10	0
RHS Patio Door	Patio Doors	External Wall	North	5.59	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	22.89	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	18.58	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	45.16	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	34.30	0.06	0.06		No
E6 Intermediate floor within a dwelling	Independently assessed	34.30	-0.00	-0.00	Redrow Series G	No
E16 Corner (normal)	Independently assessed	27.01	0.05	0.05		No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	6.67	-0.09	-0.09	Redrow Series G	No
E10 Eaves (insulation at ceiling level)	Independently assessed	2.47	0.04	0.04	Redrow Series G	No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	2.47	0.15	0.15		No
E11 Eaves (insulation at rafter level)	Independently assessed	34.30	0.03	0.03		No
R6 Flat ceiling	Table K1 - Default	31.20	0.12	0.12		No
E12 Gable (insulation at ceiling level)	Table K1 - Default	4.02	0.25	0.25		No

Y-value	0.03	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	5.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	13

Summary for Input Data

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	273.67	
In Summer	271.77	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

Summary for Input Data

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Avon - Mid	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Avon - SAP - MID
Property	Ruthin Road, Wrexham		

SAP Rating	84 B	**DER**	4.25	**TER**	11.31
Environmental	97 A	**% DER < TER**			62.42
CO_2 Emissions (t/year)	0.26	**DFEE**	28.31	**TFEE**	30.95
Compliance Check	See BREL	**% DFEE < TFEE**			8.55
% DPER < TPER	24.10	**DPER**	44.82	**TPER**	59.06

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Mid-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	7.70 m	30.61 m²	2.35 m
1st Storey:	7.70 m	30.61 m²	2.65 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	14.36	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	38.50	25.59	0.00	None	12.91	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	79.50	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	60.82
Internal Wall FF	Plasterboard on timber frame	9.00	75.04

10.0 External Roofs

Summary for Input Data

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Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	30.61	30.61	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	30.61

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	30.61

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	30.61

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	1.91	0
Front Windows	Windows	External Wall	East	3.60	0
Rear Windows	Patio Doors	External Wall	West	3.82	0
Rear Windows	Windows	External Wall	West	3.58	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	8.15	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	4.75	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	15.68	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Table K1 - Default	7.70	0.32	0.32		No
P1 Party wall - Ground floor	Independently assessed	15.90	0.04	0.04	Redrow Series G	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	15.90	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	15.90	0.04	0.04		No
E18 Party wall between dwellings	Independently assessed	20.00	0.03	0.03	Redrow Series G	No

Y-value	0.05	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	4.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	8

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%

Summary for Input Data

Database Ref. No.	104958
Fuel Type	Electricity
SAP Code	0
In Winter	230.82
In Summer	253.32
Model Name	aroTHERM plus 3.5kW + AI-Not valid
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2 None

26.0 Heat Networks None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Summary for Input Data

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Avon - Semi	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Avon - SAP - SEMI
Property	Ruthin Road, Wrexham		

SAP Rating	83 B	**DER**	4.68	**TER**	12.65
Environmental	97 A	**% DER < TER**			63.00
CO_2 Emissions (t/year)	0.29	**DFEE**	34.13	**TFEE**	37.01
Compliance Check	See BREL	**% DFEE < TFEE**			7.79
% DPER < TPER	25.67	**DPER**	49.24	**TPER**	66.24

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	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	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	15.65 m	30.61 m²	2.35 m
1st Storey:	15.65 m	30.61 m²	2.65 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	14.36	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	78.25	65.40	0.00	None	12.85	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	39.75	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	60.82
Internal Wall FF	Plasterboard on timber frame	9.00	75.04

10.0 External Roofs

Summary for Input Data

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Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	30.61	30.61	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	30.61

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	30.61

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	30.61

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	1.91	0
Front Windows	Windows	External Wall	East	3.60	0
Rear Windows	Patio Doors	External Wall	West	3.82	0
Windows	Windows	External Wall	West	3.52	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
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)	Independently assessed	8.15	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	4.75	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	15.68	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	15.65	0.06	0.06	Placeholder	No
E16 Corner (normal)	Independently assessed	10.00	0.05	0.05	Redrow Series G	No
P1 Party wall - Ground floor	Independently assessed	7.95	0.04	0.04	Redrow Series G	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.95	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	7.95	0.04	0.04		No
E18 Party wall between dwellings	Independently assessed	10.00	0.03	0.03	Redrow Series G	No

Y-value	0.02	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.01	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	No	
20.0 Fans, Open Fireplaces, Flues		
21.0 Fixed Cooling System	No	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	8

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%

Summary for Input Data

Database Ref. No.	104958
Fuel Type	Electricity
SAP Code	0
In Winter	234.48
In Summer	249.67
Model Name	aroTHERM plus 3.5kW + AI-Not valid
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Summary for Input Data

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Bakewell - Semi	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Bakewell - SAP - SEMI
Property	Ruthin Road, Wrexham		

SAP Rating	82 B	**DER**	4.63	**TER**	12.82
Environmental	96 A	**% DER < TER**			63.88
CO_2 Emissions (t/year)	0.32	**DFEE**	36.81	**TFEE**	38.84
Compliance Check	See BREL	**% DFEE < TFEE**			5.23
% DPER < TPER	27.54	**DPER**	48.66	**TPER**	67.16

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	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	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	17.49 m	30.61 m²	2.31 m
1st Storey:	17.49 m	37.92 m²	2.51 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	31.09	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	80.98	64.91	0.00	None	16.07	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	39.55	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	44.54
Internal Wall FF	Plasterboard on timber frame	9.00	99.74

10.0 External Roofs

Summary for Input Data

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	29.24	29.24	None	0.00	Enter Gross Area	0.00
Dropped Eaves	External Plane Roof	Plasterboard, insulated at ceiling level	0.16	9.00	10.43	10.43	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	37.92

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	37.92

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	37.92

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	1.89	0
Front Windows	Windows	External Wall	East	4.34	0
Rear Windows	Patio Doors	External Wall	West	3.82	0
Windows	Windows	External Wall	West	5.31	0
LHS Windows	Windows	External Wall	South	0.71	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	11.08	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	7.36	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	19.50	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	17.49	0.06	0.06	Placeholder	No
E16 Corner (normal)	Independently assessed	9.26	0.05	0.05	Redrow Series G	No
P1 Party wall - Ground floor	Independently assessed	7.95	0.04	0.04	Redrow Series G	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	7.95	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	6.89	0.04	0.04		No
P5 Party wall - Roof (insulation at rafter level)	Independently assessed	1.29	0.06	0.06	Redrow Series G	No
E18 Party wall between dwellings	Independently assessed	9.26	0.03	0.03	Redrow Series G	No
E11 Eaves (insulation at rafter level)	Independently assessed	17.49	0.03	0.03	Redrow Series G	No
R6 Flat ceiling	Table K1 - Default	15.38	0.12	0.12		No

Y-value	0.03	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.01	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count

Summary for Input Data

	Lighting	80.00	28	2240	8

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	247.21	
In Summer	246.67	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2
Supplementary Immersion	No

Summary for Input Data

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Chester - Det	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Chester - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	83 B	**DER**	3.76	**TER**	9.66
Environmental	96 A	**% DER < TER**			61.08
CO_2 Emissions (t/year)	0.49	**DFEE**	40.81	**TFEE**	41.58
Compliance Check	See BREL	**% DFEE < TFEE**			1.85
% DPER < TPER	22.74	**DPER**	39.05	**TPER**	50.55

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Unheated Space Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²		0.00 m
Ground floor:	36.54 m	68.24 m²	4.21 m²	2.64 m
1st Storey:	33.30 m	59.85 m²		1.97 m
2nd Storey:	0.00 m	0.00 m²		0.00 m
3rd Storey:	0.00 m	0.00 m²		0.00 m
4th Storey:	0.00 m	0.00 m²		0.00 m
5th Storey:	0.00 m	0.00 m²		0.00 m
6th Storey:	0.00 m	0.00 m²		0.00 m
7th Storey:	0.00 m	0.00 m²		0.00 m

8.0 Living Area	16.64	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	134.67	105.58	0.00	None	29.09	Enter Gross Area
Garage Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.25	9.00	15.47	15.47	0.60	Garage Single 3 Inside	0.00	Enter Gross Area
Truss Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.21	9.00	9.81	9.81	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	79.46
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	38.28
Internal Wall FF	Plasterboard on timber frame	9.00	134.31

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

elmhurst energy

Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	58.30	58.30	None	0.00	Enter Gross Area	0.00
Dropped Eaves	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	19.31	19.31	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	59.85

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	75.00	68.24
Exposed Floor	Exposed Floor - Timber	+1	Timber exposed floor, insulation between joists	0.15	Garage Single 3 Inside	0.60	20.00	4.21

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	59.85

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.05	0
Front Windows	Windows	External Wall	East	9.84	0
LHS Half Glazed Door	Half Glazed Doors	External Wall	South	2.05	0
Rear Windows	Windows	External Wall	West	10.39	0
Rear Patio Doors	Patio Doors	External Wall	West	4.07	0
RHS Windows	Windows	External Wall	North	0.69	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	19.25	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	14.60	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	35.34	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	30.68	0.06	0.06	Placeholder	No
E11 Eaves (insulation at rafter level)	Independently assessed	20.39	0.03	0.03	Redrow Series G	No
E6 Intermediate floor within a dwelling	Independently assessed	23.86	-0.00	-0.00	Redrow Series G	No
E12 Gable (insulation at ceiling level)	Independently assessed	10.86	0.06	0.06	Redrow Series G	No
E13 Gable (insulation at rafter level)	Independently assessed	3.08	0.08	0.08	Redrow Series G	No
R5 Ridge (inverted)	Table K1 - Default	0.46	0.12	0.12		No
E20 Exposed floor (normal)	Independently assessed	4.24	0.05	0.05	Redrow Series G	No
E21 Exposed floor (inverted)	Independently assessed	4.24	0.04	0.04	Redrow Series G	No
E16 Corner (normal)	Independently assessed	16.89	0.18	0.18		No
E5 Ground floor (normal)	Table K1 - Default	5.86	0.32	0.32		No
E16 Corner (normal)	Independently assessed	7.78	0.18	0.18		No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	4.75	-0.09	-0.09	Redrow Series G	No
E17 Corner (inverted – internal area greater than external area)	Table K1 - Default	2.64	0.00	0.00		No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	6.81	0.15	0.15		No
R8 Roof to wall (rafter)	Table K1 - Default	7.85	0.12	0.12		No

Y-value	0.04	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	5.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

Summary for Input Data

elmhurst energy

21.0 Fixed Cooling System	No	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	14

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	273.61	
In Summer	271.78	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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

Summary for Input Data

Summer Immersion	No
Cold Water Source	From mains
Bath Count	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	
Shower 3	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Dart - Mid	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Dart - SAP - MID
Property	Ruthin Road, Wrexham		

SAP Rating	85 B	**DER**	3.52	**TER**	9.08
Environmental	97 A	**% DER < TER**			61.23
CO_2 Emissions (t/year)	0.33	**DFEE**	25.80	**TFEE**	29.12
Compliance Check	See BREL	**% DFEE < TFEE**			11.41
% DPER < TPER	21.34	**DPER**	37.06	**TPER**	47.11

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Mid-Terrace	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	10.00 m	45.93 m²	2.31 m
1st Storey:	10.00 m	45.93 m²	2.61 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	15.46	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	49.21	34.03	0.00	None	15.18	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	90.38	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	88.42
Internal Wall FF	Plasterboard on timber frame	9.00	96.36

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	45.93	45.93	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	45.93

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	45.93

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	45.93

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.06	0
Front Windows	Windows	External Wall	East	4.90	0
Rear Windows	Patio Doors	External Wall	West	5.22	0
Windows	Windows	External Wall	West	3.00	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
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)	Independently assessed	9.70	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	6.24	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	20.85	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	10.00	0.06	0.06	Placeholder	No
P1 Party wall - Ground floor	Independently assessed	18.38	0.04	0.04	Redrow Series G	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	18.38	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	18.38	0.04	0.04		No
E18 Party wall between dwellings	Independently assessed	19.68	0.03	0.03	Redrow Series G	No

Y-value	0.02	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.01	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	No	
20.0 Fans, Open Fireplaces, Flues		
21.0 Fixed Cooling System	No	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	8

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%

Summary for Input Data

Database Ref. No.	104958
Fuel Type	Electricity
SAP Code	0
In Winter	248.64
In Summer	246.36
Model Name	aroTHERM plus 3.5kW + AI-Not valid
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2 None

26.0 Heat Networks None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Summary for Input Data

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Dart - Semi	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Dart - SAP - SEMI
Property	Ruthin Road, Wrexham		

SAP Rating	84 B	**DER**	3.78	**TER**	10.09
Environmental	97 A	**% DER < TER**			62.54
CO_2 Emissions (t/year)	0.35	**DFEE**	31.23	**TFEE**	33.72
Compliance Check	See BREL	**% DFEE < TFEE**			7.40
% DPER < TPER	24.39	**DPER**	39.70	**TPER**	52.51

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	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	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	19.19 m	45.93 m²	2.31 m
1st Storey:	19.19 m	45.93 m²	2.61 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	15.46	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	94.40	79.22	0.00	None	15.18	Enter Gross Area

9.1 Party Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)	Shelter Res	Shelter
Party Wall	Filled Cavity with Edge Sealing	Single plasterboard on dabs both sides, lightweight aggregate blocks, cavity or cavity fill	0.00	110.00	45.19	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	88.42
Internal Wall FF	Plasterboard on timber frame	9.00	96.36

10.0 External Roofs

Summary for Input Data

elmhurst energy

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	45.93	45.93	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	45.93

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	45.93

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	45.93

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.06	0
Front Windows	Windows	External Wall	East	4.90	0
Rear Windows	Patio Doors	External Wall	West	5.22	0
Windows	Windows	External Wall	West	3.00	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
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)	Independently assessed	9.70	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	6.24	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	20.85	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	19.19	0.06	0.06	Placeholder	No
E16 Corner (normal)	Independently assessed	9.84	0.05	0.05	Redrow Series G	No
P1 Party wall - Ground floor	Independently assessed	9.19	0.04	0.04	Redrow Series G	No
P3 Party wall - Intermediate floor between dwellings (in blocks of flats)	Table K1 - Default	9.19	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Independently assessed	9.19	0.04	0.04		No
E18 Party wall between dwellings	Independently assessed	9.84	0.03	0.03	Redrow Series G	No

Y-value	0.02	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.01	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	No	
20.0 Fans, Open Fireplaces, Flues		
21.0 Fixed Cooling System	No	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	8

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%

Summary for Input Data

Database Ref. No.	104958
Fuel Type	Electricity
SAP Code	0
In Winter	252.25
In Summer	256.25
Model Name	aroTHERM plus 3.5kW + AI-Not valid
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2 None

26.0 Heat Networks None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Summary for Input Data

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Hampstead - Det	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Hampstead - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	82 B	**DER**	3.58	**TER**	8.97
Environmental	96 A	**% DER < TER**			60.09
CO_2 Emissions (t/year)	0.64	**DFEE**	41.83	**TFEE**	42.95
Compliance Check	See BREL	**% DFEE < TFEE**			2.61
% DPER < TPER	21.65	**DPER**	37.04	**TPER**	47.28

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Unheated Space Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²		0.00 m
Ground floor:	39.42 m	75.75 m²	20.51 m²	2.82 m
1st Storey:	43.95 m	96.27 m²		2.27 m
2nd Storey:	0.00 m	0.00 m²		0.00 m
3rd Storey:	0.00 m	0.00 m²		0.00 m
4th Storey:	0.00 m	0.00 m²		0.00 m
5th Storey:	0.00 m	0.00 m²		0.00 m
6th Storey:	0.00 m	0.00 m²		0.00 m
7th Storey:	0.00 m	0.00 m²		0.00 m

8.0 Living Area	37.97	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	171.47	138.84	0.00	None	32.63	Enter Gross Area
Garage Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.25	9.00	20.32	20.32	0.60	Garage Single 3 Inside	0.00	Enter Gross Area
Truss Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.21	9.00	4.14	4.14	0.00	None	0.00	Enter Gross Area
Dormer Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.25	9.00	6.20	4.26	0.00	None	1.94	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	50.42
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	49.80
Internal Wall FF	Plasterboard on timber frame	9.00	232.26

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

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						(m²)				
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	80.58	80.58	None	0.00	Enter Gross Area	0.00
Dropped Eaves	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	20.51	20.51	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	75.75

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	75.75
Exposed Floor	Exposed Floor - Timber	+1	Timber exposed floor, insulation between joists	0.15	Garage Single 3 Inside	0.60	20.00	20.51

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	75.75

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.09	0
Front Windows	Windows	External Wall	East	6.88	0
Front Dormer Windows	Windows	Dormer Wall	East	1.94	0
Bay Window RHS	Windows	External Wall	North East	1.57	0
Bay Windows LHS	Windows	External Wall	South East	1.57	0
Windows LHS	Windows	External Wall	South	1.31	0
LHS Half Glazed Door	Half Glazed Doors	External Wall	South	2.05	0
Rear Windows	Windows	External Wall	West	12.47	0
Rear Patio Doors	Patio Doors	External Wall	West	4.07	0
RHS Windows	Windows	External Wall	North	0.62	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	21.98	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	16.78	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	39.00	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	39.42	0.06	0.06	Placeholder	No
E11 Eaves (insulation at rafter level)	Independently assessed	30.77	0.03	0.03	Redrow Series G	No
E6 Intermediate floor within a dwelling	Independently assessed	29.44	-0.00	-0.00	Redrow Series G	No
R6 Flat ceiling	Table K1 - Default	34.33	0.12	0.12		No
E12 Gable (insulation at ceiling level)	Independently assessed	3.47	0.06	0.06	Redrow Series G	No
E13 Gable (insulation at rafter level)	Independently assessed	5.35	0.08	0.08	Redrow Series G	No
R4 Ridge (vaulted ceiling)	Table K1 - Default	1.50	0.12	0.12		No
R5 Ridge (inverted)	Table K1 - Default	0.56	0.12	0.12		No
E20 Exposed floor (normal)	Independently assessed	11.74	0.05	0.05	Redrow Series G	No
E21 Exposed floor (inverted)	Independently assessed	7.21	0.04	0.04	Redrow Series G	No
R7 Flat ceiling (inverted)	Table K1 - Default	9.13	0.12	0.12		No
E16 Corner (normal)	Table K1 - Default	3.02	0.18	0.18		No
R9 Roof to wall (flat ceiling)	Table K1 - Default	6.36	0.32	0.32		No
R1 Head of roof window	Table K1 - Default	1.85	0.24	0.24		No
R2 Sill of roof window	Table K1 - Default	1.85	0.24	0.24		No
R3 Jamb of roof window	Table K1 - Default	2.10	0.24	0.24		No

Y-value	0.04	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	4.50	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Summary for Input Data

elmhurst energy

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	14

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	276.39	
In Summer	274.71	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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

Summary for Input Data

Solar Panel	No
Water use <= 125 litres/person/day	Yes
Summer Immersion	No
Cold Water Source	From mains
Bath Count	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	
Shower 3	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Harrogate - Det	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Harrogate - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	83 B	**DER**	3.47	**TER**	9.02
Environmental	97 A	**% DER < TER**			61.53
CO_2 Emissions (t/year)	0.51	**DFEE**	37.78	**TFEE**	38.55
Compliance Check	See BREL	**% DFEE < TFEE**			1.99
% DPER < TPER	23.41	**DPER**	36.07	**TPER**	47.09

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	33.82 m	71.23 m²	2.47 m
1st Storey:	33.82 m	71.23 m²	2.44 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

8.0 Living Area	16.68	m²	

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	157.60	128.34	0.00	None	29.26	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	40.52
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	28.27
Internal Wall FF	Plasterboard on timber frame	9.00	172.99

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	49.12	49.12	None	0.00	Enter Gross Area	0.00

Summary for Input Data

elmhurst energy

Dropped Eaves	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	26.99	26.99	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	71.23

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	71.23

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	71.23

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	1.91	0
Front Windows	Windows	External Wall	East	11.81	0
LHS Windows	Windows	External Wall	South	0.72	0
Rear Windows	Windows	External Wall	West	8.81	0
Rear Door	Half Glazed Doors	External Wall	West	2.05	0
Patio Doors	Patio Doors	External Wall	West	3.96	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	20.72	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	16.08	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	34.40	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	33.82	0.06	0.06		No
E11 Eaves (insulation at rafter level)	Independently assessed	33.82	0.03	0.03	Redrow Series G	No
E6 Intermediate floor within a dwelling	Independently assessed	33.82	-0.00	-0.00	Redrow Series G	No
R6 Flat ceiling	Table K1 - Default	28.11	0.12	0.12		No
R4 Ridge (vaulted ceiling)	Table K1 - Default	4.51	0.12	0.12		No
E16 Corner (normal)	Independently assessed	18.94	0.05	0.05		No

Y-value	0.03	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	5.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	13

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	

Summary for Input Data

elmhurst energy

Fuel Type	Electricity
SAP Code	0
In Winter	274.40
In Summer	271.64
Model Name	aroTHERM plus 3.5kW + AI-Not valid
Manufacturer	Vaillant Group UK Ltd
System Type	Heat Pump
Controls SAP Code	2207
Delayed Start Stat	Yes
Burner Control	Modulating
HETAS approved System	No
Oil Pump Inside	No
FI Case	0.00
Flue Type	None or Unknown
Fan Assisted Flue	No
Is MHS Pumped	Pump in heated space
Heating Pump Age	2013 or later
Heat Emitter	Underfloor
Underfloor Heating	Yes - Pipes in thin screed
Flow Temperature	Enter value
Flow Temperature Value	55.00
Boiler Interlock	Yes
Combi boiler type	No Combi
Combi keep hot type	None

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	

Summary for Input Data

Shower 2	Combi boiler or unvented hot water system	11.00	No

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

elmhurst energy

Property Reference	008780 - HT - Ledsham - DET	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Ledsham - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	81 B	**DER**	4.18	**TER**	11.53
Environmental	96 A	**% DER < TER**			63.75
CO_2 Emissions (t/year)	0.56	**DFEE**	48.24	**TFEE**	48.71
Compliance Check	See BREL	**% DFEE < TFEE**			0.97
% DPER < TPER	28.34	**DPER**	43.38	**TPER**	60.54

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	
8.0 Living Area	46.19	m²

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²	0.00 m
Ground floor:	41.88 m	68.40 m²	2.73 m
1st Storey:	41.88 m	61.30 m²	2.39 m
2nd Storey:	0.00 m	0.00 m²	0.00 m
3rd Storey:	0.00 m	0.00 m²	0.00 m
4th Storey:	0.00 m	0.00 m²	0.00 m
5th Storey:	0.00 m	0.00 m²	0.00 m
6th Storey:	0.00 m	0.00 m²	0.00 m
7th Storey:	0.00 m	0.00 m²	0.00 m

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	182.27	150.99	0.00	None	31.28	Enter Gross Area
Garage Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.25	9.00	9.69	9.69	0.00	None	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	43.25
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	79.56
Internal Wall FF	Plasterboard on timber frame	9.00	95.52

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	68.68	68.68	None	0.00	Enter Gross Area	0.00

Dropped Eaves	External Slope Roof	Plasterboard, insulated slope	0.16	9.00	20.33	20.33	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	81.59

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	89.60

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	89.60

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.00	0
Front Windows	Windows	External Wall	East	9.53	0
LHS Windows	Windows	External Wall	South	1.27	0
LHS Doors	Entrance Doors	External Wall	South	2.00	0
Rear Windows	Windows	External Wall	West	8.73	0
Rear Patio Door	Patio Doors	External Wall	West	7.06	0
RHS Windows	Windows	External Wall	North	0.69	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	
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)	Independently assessed	22.13	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	16.87	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	38.14	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	37.86	0.06	0.06		No
E6 Intermediate floor within a dwelling	Independently assessed	37.86	-0.00	-0.00	Redrow Series G	No
E16 Corner (normal)	Independently assessed	21.44	0.05	0.05		No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	7.18	-0.09	-0.09	Redrow Series G	No
E10 Eaves (insulation at ceiling level)	Independently assessed	3.98	0.04	0.04	Redrow Series G	No
E12 Gable (insulation at ceiling level)	Independently assessed	3.08	0.06	0.06	Redrow Series G	No
E5 Ground floor (normal)	Table K1 - Default	4.02	0.32	0.32		No
E16 Corner (normal)	Table K1 - Default	4.82	0.18	0.18		No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	4.02	0.15	0.15		No
E11 Eaves (insulation at rafter level)	Independently assessed	34.22	0.03	0.03		No
R6 Flat ceiling	Table K1 - Default	32.67	0.12	0.12		No
E12 Gable (insulation at ceiling level)	Table K1 - Default	4.02	0.25	0.25		No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count

Summary for Input Data

	Lighting	80.00	28	2240	13

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	275.70	
In Summer	272.16	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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	2	
Supplementary Immersion	No	

Summary for Input Data

Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

Property Reference	008780 - HT - Oxford - Det	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Oxford - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	82 B	**DER**	3.97	**TER**	10.49
Environmental	96 A	**% DER < TER**			62.15
CO_2 Emissions (t/year)	0.49	**DFEE**	42.97	**TFEE**	44.11
Compliance Check	See BREL	**% DFEE < TFEE**			2.59
% DPER < TPER	24.91	**DPER**	41.24	**TPER**	54.92

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Unheated Space Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²		0.00 m
Ground floor:	33.99 m	53.00 m²	13.90 m²	2.74 m
1st Storey:	33.99 m	66.91 m²		2.40 m
2nd Storey:	0.00 m	0.00 m²		0.00 m
3rd Storey:	0.00 m	0.00 m²		0.00 m
4th Storey:	0.00 m	0.00 m²		0.00 m
5th Storey:	0.00 m	0.00 m²		0.00 m
6th Storey:	0.00 m	0.00 m²		0.00 m
7th Storey:	0.00 m	0.00 m²		0.00 m

8.0 Living Area	15.16	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	150.24	120.84	0.00	None	29.40	Enter Gross Area
Garage Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.25	9.00	20.80	20.80	0.60	Garage Single 3 Inside	0.00	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	76.44
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	17.86
Internal Wall FF	Plasterboard on timber frame	9.00	175.73

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

elmhurst energy

Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	66.91	66.91	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	53.00

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	53.00
Exposed Floor	Exposed Floor - Timber	+1	Timber exposed floor, insulation between joists	0.15	Garage Single 3 Inside	0.60	20.00	13.90

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	53.00

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.05	0
Front Windows	Windows	External Wall	East	7.88	0
Rear Patio Doors	Patio Doors	External Wall	West	7.62	0
Rear Windows	Windows	External Wall	West	4.39	0
Rear Door	Half Glazed Doors	External Wall	West	2.05	0
RHS BAY	Windows	External Wall	South East	1.59	0
LHS BAY	Windows	External Wall	South West	1.50	0
RHS BAY	Windows	External Wall	South East	1.50	0
RHS Bay	Windows	External Wall	North	0.82	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	17.66	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	12.46	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	33.30	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	26.40	0.06	0.06	Placeholder	No
E6 Intermediate floor within a dwelling	Independently assessed	26.40	-0.00	-0.00	Redrow Series G	No
E20 Exposed floor (normal)	Independently assessed	7.58	0.05	0.05	Redrow Series G	No
E21 Exposed floor (inverted)	Independently assessed	7.58	0.04	0.04	Redrow Series G	No
E16 Corner (normal)	Independently assessed	28.00	0.18	0.18		No
E5 Ground floor (normal)	Table K1 - Default	7.58	0.32	0.32		No
E16 Corner (normal)	Independently assessed	5.48	0.18	0.18		No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	15.43	-0.09	-0.09	Redrow Series G	No
E17 Corner (inverted – internal area greater than external area)	Table K1 - Default	2.74	0.00	0.00		No
E10 Eaves (insulation at ceiling level)	Independently assessed	33.99	0.04	0.04		No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	5.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	
As Built AP_{50}	0.10	m³/(h.m²) @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System	No

22.0 Lighting

Summary for Input Data

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No Fixed Lighting	No

Name	Efficacy	Power	Capacity	Count
Lighting	80.00	28	2240	14

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	273.66	
In Summer	271.77	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

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

Summary for Input Data

Bath Count	2	
Supplementary Immersion	No	
Immersion Only Heating Hot Water	No	

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	
Shower 3	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None

Summary for Input Data

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Property Reference	008780 - HT - Richmond - Det	**Issued on Date**	02/11/2023
Assessment Reference	As Designed	**Prop Type Ref**	Richmond - SAP - DET
Property	Ruthin Road, Wrexham		

SAP Rating	81 B	**DER**	3.79	**TER**	9.18
Environmental	96 A	**% DER < TER**			58.71
CO_2 Emissions (t/year)	0.73	**DFEE**	45.54	**TFEE**	45.73
Compliance Check	See BREL	**% DFEE < TFEE**			0.43
% DPER < TPER	19.43	**DPER**	39.12	**TPER**	48.56

Assessor Details	Mr. Dean Shores	**Assessor ID**	W976-0001
Client			

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

Orientation	East	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
Which Floor	0	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
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	N/A	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	Yes	
Smart gas meter fitted	Yes	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Unheated Space Floor Area	Average Storey Height
Basement:	0.00 m	0.00 m²		0.00 m
Ground floor:	45.94 m	92.46 m²	13.90 m²	2.82 m
1st Storey:	46.70 m	93.25 m²		2.40 m
2nd Storey:	0.00 m	0.00 m²		0.00 m
3rd Storey:	0.00 m	0.00 m²		0.00 m
4th Storey:	0.00 m	0.00 m²		0.00 m
5th Storey:	0.00 m	0.00 m²		0.00 m
6th Storey:	0.00 m	0.00 m²		0.00 m
7th Storey:	0.00 m	0.00 m²		0.00 m

8.0 Living Area	47.16	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall	Cavity Wall	Cavity wall : plasterboard on dabs, AAC block, filled cavity, any outside structure	0.21	60.00	203.84	156.23	0.00	None	47.61	Enter Gross Area
Garage Wall	Solid Wall	Solid wall : plasterboard on dabs, insulation, any outside structure	0.25	9.00	21.87	19.82	0.60	Garage Single 3 Inside	2.05	Enter Gross Area
Dormer Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.25	9.00	12.90	6.37	0.00	None	6.53	Enter Gross Area

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Wall GF Timber	Plasterboard on timber frame	9.00	113.98
Internal Wall GF Block	Dense block, plasterboard on dabs	75.00	50.99
Internal Wall FF	Plasterboard on timber frame	9.00	232.51

10.0 External Roofs

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings

Summary for Input Data

elmhurst energy

Roof Plane	External Plane Roof	Plasterboard, insulated at ceiling level	0.09	9.00	99.93	99.93	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.11	9.00	3.31	3.31	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling GF	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	82.47

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.11	None	0.00	110.00	92.46
Exposed Floor	Exposed Floor - Timber	+1	Timber exposed floor, insulation between joists	0.15	Garage Single 3 Inside	0.60	20.00	10.78

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	92.46

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Entrance Doors	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Patio Doors	Manufacturer	Window	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.20
Half Glazed Doors	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05		Air Filled	0.63	Wood	0.70	1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Door	Entrance Doors	External Wall	East	2.05	0
Front Windows	Windows	External Wall	East	9.56	0
Rear Patio Doors	Patio Doors	External Wall	West	7.62	0
Rear Windows	Windows	External Wall	West	12.79	0
Rear Patio Door	Patio Doors	External Wall	West	8.13	0
RHS BAY	Windows	External Wall	South East	1.59	0
LHS BAY	Windows	External Wall	South West	1.50	0
RHS BAY	Windows	External Wall	South East	1.50	0
RHS Bay	Windows	External Wall	North	0.82	0
Garage Door	Entrance Doors	Garage Wall	East	2.05	0
RHS Door	Half Glazed Doors	External Wall	North	2.05	0
Dormer Window	Windows	Dormer Wall	East	2.03	0
Dormer Window RHS	Windows	Dormer Wall	North	1.50	0
Dormer Window RHS	Windows	Dormer Wall	North	1.50	0
Dormer Window LHS	Windows	Dormer Wall	South	1.50	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	Yes	

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)	Independently assessed	25.00	0.05	0.05	Redrow Series G	No
E3 Sill	Independently assessed	19.12	0.01	0.01	Redrow Series G	No
E4 Jamb	Independently assessed	18.30	0.01	0.01	Redrow Series G	No
E5 Ground floor (normal)	Independently assessed	38.18	0.06	0.06	Placeholder	No
E6 Intermediate floor within a dwelling	Independently assessed	24.20	-0.00	-0.00	Redrow Series G	No
E20 Exposed floor (normal)	Independently assessed	10.50	0.05	0.05	Redrow Series G	No
E21 Exposed floor (inverted)	Independently assessed	6.59	0.04	0.04	Redrow Series G	No
E16 Corner (normal)	Independently assessed	33.36	0.18	0.18		No
E5 Ground floor (normal)	Table K1 - Default	7.58	0.32	0.32		No
E16 Corner (normal)	Independently assessed	10.66	0.18	0.18		No
E17 Corner (inverted – internal area greater than external area)	Independently assessed	21.29	-0.09	-0.09	Redrow Series G	No
E17 Corner (inverted – internal area greater than external area)	Table K1 - Default	10.24	0.00	0.00		No
E10 Eaves (insulation at ceiling level)	Independently assessed	53.33	0.04	0.04		No
R1 Head of roof window	Independently assessed	3.63	0.06	0.06	Redrow Series G	No
R2 Sill of roof window	Independently assessed	3.63	0.06	0.06	Redrow Series G	No
R3 Jamb of roof window	Independently assessed	2.40	0.07	0.07	Redrow Series G	No
R9 Roof to wall (flat ceiling)	Independently assessed	5.60	0.00	0.00		No
R7 Flat ceiling (inverted)	Independently assessed	11.90	0.00	0.00		No
E1 Steel lintel with perforated steel base plate	Table K1 - Default	0.86	1.00	1.00		No
E4 Jamb	Independently assessed	4.30	0.00	0.00		No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.80	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	

Summary for Input Data

elmhurst energy

Test Method	Blower Door	
As Built AP_{50}	0.10	$m^3/(h.m^2)$ @ 50 Pa

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	No	

20.0 Fans, Open Fireplaces, Flues

21.0 Fixed Cooling System — No

22.0 Lighting

No Fixed Lighting	No				
	Name	**Efficacy**	**Power**	**Capacity**	**Count**
	Lighting	80.00	28	2240	14

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	104958	
Fuel Type	Electricity	
SAP Code	0	
In Winter	278.94	
In Summer	264.62	
Model Name	aroTHERM plus 3.5kW + AI-Not valid	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	Yes	
Burner Control	Modulating	
HETAS approved System	No	
Oil Pump Inside	No	
FI Case	0.00	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	55.00	
Boiler Interlock	Yes	
Combi boiler type	No Combi	
Combi keep hot type	None	

25.0 Main Heating 2 — None

26.0 Heat Networks — None

	Heat Source	Fuel Type	Heating Use	Efficiency	Percentage Of Heat	Heat	Heat Power Ratio	Electrical	Fuel Factor	Efficiency type
Heat source 1	None									
Heat source 2	None									
Heat source 3	None									
Heat source 4	None									
Heat source 5	None									

28.0 Water Heating

Water Heating	Main Heating 1
SAP Code	901

Summary for Input Data

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	2
Supplementary Immersion	No
Immersion Only Heating Hot Water	No

28.1 Showers

Description	Shower Type	Flow Rate [l/min]	Rated Power [kW]	Connected	Connected To
Shower 1	Combi boiler or unvented hot water system	11.00		No	
Shower 2	Combi boiler or unvented hot water system	11.00		No	
Shower 3	Combi boiler or unvented hot water system	11.00		No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	Yes	
Cylinder In Heated Space	Yes	
Independent Time Control	Yes	
Insulation Type	Measured Loss	
Cylinder Volume	150.00	L
Loss	1.91	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	
Electricity Generated	0.00	
Apportioned	0.00	kWh/Year
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

None