Energy Statement

Parker Collins House, Portsmouth Road, Ripley, Surrey, GU23 6JA

Rushmon Homes

Report No: PA-ES-RH-PCH-23-02

Report Date: December 2023

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Project Name	Parker Collins House, Ripley
Project Address	Parker Collins House, Portsmouth Road, Ripley, Surrey, GU23 6JA
Developer	Rushmon Homes
Developer Address	2 Esher Rd, Hersham, KT12 4JY
Architect	Taylor Cox Associates Limited
Architect's Address	Dorset House, 297-299 Kingston Road, Leatherhead, KT22 7PL
Project Description	Erection of 6 x 3 bed semi-detached houses, 1 x 3 bed detached house and 2 x 4 bed detached houses with integral single garage, together with associated parking and new access off Send Marsh Road following demolition of existing house and outbuilding.

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Issue Number	Author	Date	Reason
01	MB	15/12/23	Initial Issue
02	MB	22/12/23	Update to Waste Section
03			
04			

2. Executive Summary

This document has been prepared by Abbey Consultants (Southern) Ltd, a specialist environmental and energy consultancy on behalf of Rushmon Homes, to accompany a planning application for the provision of 9 new residential dwellings at Parker Collins House, Ripley, Surrey.

The proposals seek approval for the construction of 6 x 3 bed semi-detached houses, a detached 3 bed house and 2x detached 4 bed houses together with associated parking and new access off Send Marsh Road, following demolition of existing house and outbuildings.

The development is classed as a non-major residential development by Guildford Borough Council as it is below their 10 dwellings threshold for planning applications to be considered major developments.

The proposed strategy has been based around the relevant planning objectives of Guildford Borough Council, with the aim of achieving compliance with Building Regulations Part L 2021.

This report considers sustainability and includes an assessment of the predicted CO_2 demand for the proposed development. In the formulation of this strategy, much consideration has been given to minimising the carbon emissions of the proposed development, and to ensure the development is constructed to rigorous sustainability standards.

In keeping with the requirements of Guildford Borough Council, and Building Regulations Part L 2021, this report comprises of the following:

- A Building Regulation baseline energy assessment for the proposed development.
- Energy conservation measures to be undertaken in the design of the development.
- A calculation of CO_2 savings that are to be achieved as a result of energy efficiency measures.
- An appraisal of the potential options for on-site renewables or low and zero carbon technologies.
- An outline specification of the proposed water efficiency measures to limit the internal water usage of each dwelling to less than 110 litres per person per day.

The development will reduce regulated CO_2 emissions by integrating a range of passive design and energy efficiency measures throughout the building. These measures include improving building fabric standards beyond the requirements of Part L 2021 of the Building Regulations. These measures enable the proposed scheme to go beyond Target Emission Rates (TER) and Target Fabric Energy Efficiency (TFEE) minimum standards via energy efficiency measures alone. This is in line with the requirements of Guildford Borough Council's Policy D16-Criteria (4).

Following reduction of the energy demand and CO_2 emissions through fabric and energy efficiency improvements, the 'Be Green' stage of the energy hierarchy details that highly efficient individual Air Source Heat Pumps ASHP technology will be utilised to provide both the space heating and hot water demands of the houses.

All of the measures detailed herein combine to see a saving of 8.25 tonnes of CO_2 per year compared to the Building Regulations Part L 2021 baseline. This represents a 67% reduction and adheres to the adopted planning policy requirements of Guildford Borough Council

A summary of the overall reduction in CO_2 emissions after each stage of the energy hierarchy is summarised in the table below.

Table 1: Energy Strategy Carbon Emissions Summary

Stage of Energy Hierarchy	Regulated CO_2 Emissions (tonnes/year)
Total Baseline	12.26
Total After 'Be Lean'	12.11
Total After 'Be Green'	4.01
Total Saving	**8.25**
Total Improvement	**67%**

Finally, the fabric specification detailed within this energy strategy ensures that the average Dwelling Fabric Energy Efficiency improves upon the average Target Fabric Energy

Efficiency (as defined by Building Regulations Part L1 (2021) by 4%. This is detailed within the table below.

Table 2: Residential FEE Performance

Element	Target Fabric Energy Efficiency (TFEE) kWh/m²/year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m²/year	Improvement (%)
Residential Total	39.30	37.61	4%

Energy and Sustainability Summary

The strategy achieves and meets the following requirements:

- Maximises the energy efficiency performance of the building fabric, in accordance with the energy hierarchy.
- The fabric energy efficiency (DFEE) achieves a 4% reduction over the minimum standards defined by Building Regulations Part L1 2021 (TFEE).
- Minimises carbon dioxide emissions further at the 'Be Green' stage of the energy hierarchy by utilising heat pump technology in the form of efficient individual ASHP to meet both space heating and hot water of the houses.
- Reduces a total estimated 8.25 tonnes of CO_2 compared to the Part L 2021 baseline. This equates to a 67% saving. This is in line with the requirements of Guildford Borough Council's Policy D16-Criteria (4).
- In keeping with the requirements of Guildford Borough Council's Policy D2-Criteria 1d of their Local Plan (adopted April 2019), this strategy details a specification of water efficiency measures which meets the highest national standard.
- The proposals detailed herein include sustainable construction techniques and standards in line with National and Guildford Borough Council's planning policy requirements.
- Complies with all of the main compliance criteria required by Part L 2021 of the Building Regulations.

3. INTRODUCTION

This document has been prepared by Abbey Consultants (Southern) Ltd, a specialist environmental and energy consultancy on behalf of Rushmon Homes.

The following report establishes a baseline assessment of the energy demands and associated CO_2 emissions for the development. The energy hierarchy approach of Be Lean, Be Clean and Be Green is then followed to ensure the maximum viable reductions in energy and regulated CO_2 emissions is achieved.

The proposed development is described as:

Erection of 6 x 3 bed semi-detached houses, 1 x 3 bed detached house and 2 x 4 bed detached houses with integral single garage, together with associated parking and new access off Send Marsh Road following demolition of existing house and outbuilding.

The report takes into consideration the layout, use and requirements for the development to recommend a strategy that integrates the most suitable technologies available that are commercially viable, whilst also adhering to the requirements of Building Regulations, and the relevant national and local planning policies.

Figure 1 presents the proposed site layout.

Figure 1: Site Plan

4. Planning Policy

4.1 National Planning Policy Framework (NPPF) 2023

The NPPF sets out the Government's planning policies for England and how these are expected to be applied. It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate, and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Chapter 14 Meeting the challenge of climate change, flooding and coastal change
The following paragraphs set out the Government's position in response to reducing carbon emissions:

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

a. avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
b. can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

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

a. provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
b. consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and
c. identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

Paragraph 156: Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or ither strategic policies that are being taken forward through neighbourhood planning.

Paragraph 157. In determining planning applications, local planning authorities should expect new development to:

a. comply with adopted Local Plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
b. take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

Paragraph 158: When determining planning applications for renewable and low carbon development, local planning authorities should:

a. not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
b. approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas, and
c. in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site, and approve the proposal if its impacts are or can be made acceptable.

4.2 Local Policy

Guildford Borough Council
Guildford Borough Local Plan Strategy & Sites
Adopted -April 2019-Plocy D2 updated in March 2023

POLICY D2: Climate Change, sustainable design, construction, and energy
D2 criteria (5), (6), (7) and (9) have been superseded by LDMP Policy D16 Criteria (1), (2), (3) and (4)

Sustainable design and construction
(1) Proposals for zero carbon development are strongly supported. Applications for development, including refurbishment, conversion and extensions to existing buildings should include information setting out how sustainable design and construction practice will be incorporated including (where applicable):

(a)the efficient use of mineral resources and the incorporation of a proportion of recycled and/or secondary aggregates
(b)waste minimisation and reusing material derived from excavation and demolition.
(c)the use of landform, layout, building orientation, massing, and landscaping to reduce energy consumption.
(d)water efficiency that meets the highest national standard and
(e)measures that enable sustainable lifestyles for the occupants of the buildings, including electric car charging points.

(2) When meeting these requirements, the energy and waste hierarchies should be followed except where it can be demonstrated that greater sustainability can be achieved by utilising measures further down the hierarchy.

(3) Major development should include a sustainability statement setting out how the matters in this policy have been addressed. Smaller developments should include information proportionate to the size of the development in the planning application.

Climate Change Adaptation
(4) All developments should be fit for purpose and remain so into the future. Proposals for major development are required to set out in a sustainability statement how they have incorporated adaptations for a changing climate and changing weather patterns in order to avoid increased vulnerability and offer high levels of resilience to the full range of expected impacts.
Climate change mitigation, decentralised, renewable and low carbon energy

(8) All (C)CHP* systems are required to be scaled and operated in order to maximise the potential for carbon reduction. Ensuring all new development, including residential extensions, include measures to minimise energy and water use through its design, layout, landscape, and orientation.

(10) Retail units falling within Use Classes A1, A2, A3 and A4 in Guildford Town Centre are not subject to the carbon reduction requirement at paragraph (9).

(11) Planning applications must include adequate information to demonstrate and quantify how proposals comply with the energy requirements at paragraphs 5-10of this policy. For major development, this should take the form of an energy statemen.

Guildford Borough Council
Guildford Borough Local Plan Development Management Policies (LPDMP)
Adopted: - March 2023

POLICY D16: Carbon Emissions from Buildings
1)The development of low and zero carbon and decentralised energy, including low carbon heat distribution networks, is strongly supported, and encouraged.

2) Where low carbon heat distribution networks already exist, new developments are required to connect to them or be connection-ready unless it can be clearly demonstrated that utilizing a different energy supply would be more sustainable or connection is not feasible.

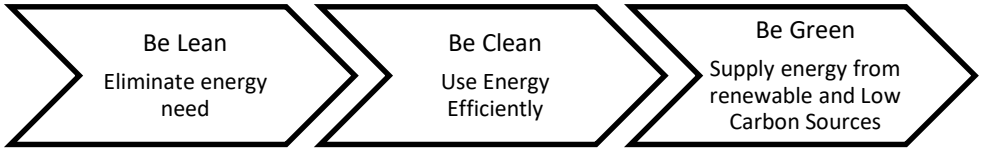
3) Proposals for development within Heat Priority Areas as shown on the Policies Map and all sufficiently large or intensive developments must demonstrate that low carbon heat networks have been given adequate consideration as the primary source of heat.

4) New buildings must achieve an emission rate no higher than the relevant Target Emission Rate (TER) set out in the Building Regulations (Part L).

5) Development proposals are strongly encouraged to improve upon the standards in paragraph 4.

5. Energy Strategy Approach

The proposed energy strategy follows the established and widely accepted Energy Hierarchy of eliminate energy need (Be Lean), Use energy efficiently (Be Clean) and supply energy from renewable and low carbon sources (Be Green) to enable the maximum viable reductions in regulated and total CO_2 emissions over the baseline.



The proposed energy supply solutions aim to match energy profiles of the development ensuring effective use. The proposed solutions consider viability and flexibility of the scheme from both a technical and economic point of view by identifying best combination of energy efficiency measures as well as decentralised and renewable or low and zero carbon technologies (LZC).

Using these principles, Rushmon Homes will deliver the following objectives:

- Comply with the relevant regulatory requirements.
- To reduce energy and CO_2 demand through fabric and energy efficiency measures.
- To propose to reduce energy consumption and carbon dioxide emissions further through the use of on-site renewable or low and zero carbon technologies (LZC),
- Incorporate a number of construction practices and measures to ensure sustainability will be incorporated including waste practices, environmental pollution management and material sourcing.

5.1 Energy and Carbon Assessment Methodology

Elmhurst Energy software, which uses the Standard Assessment Procedure (SAP) 10.2 methodology to assess compliance with Part L1 2021, has been used to evaluate an initial CO_2 performance of all dwellings. To assess energy performance of the entire residential development, an energy and carbon assessment model has been produced, which extrapolates the results of the SAP analysis using the floor area weighted average method detailed within Part L1 2021 to predict the energy consumption and CO_2 performance of the residential development.

Although the produced data detailed within this report provides estimations of possible energy and carbon performance of the development, it is not intended to be used as a detailed design tool.

6. BASELINE CO_2 EMISSIONS

In order to assess the energy demand and CO_2 performance of the proposed energy strategy, a baseline needs to be established. This section sets out the approach taken to calculating the baseline CO_2 emissions for the development.

The total baseline CO_2 emissions for the proposed development is defined as regulated CO_2 emissions, which is covered by Building Regulations Part L. Regulated CO_2 emissions are calculated from the CO_2 emissions associated with space heating, hot water and fixed electrical demands (for lights, fans and pumps).

Unregulated CO_2 emissions are those that are associated with appliances. Unregulated CO_2 emissions are not covered by Part L and are therefore not included as part of the assessment detailed within this energy strategy.

CO_2 Conversion Factors have been applied in accordance with the requirements of Building Regulations Part L 2021. These were detailed in the previous section of this report.

6.1 SAMPLE SAP UNITS

The baseline CO_2 emissions for the proposed development are based on the Part L1 2021 Target Emission Rate (TER) performance of all 9no. dwellings. The baseline CO_2 performance has been determined by carrying out SAP 10.2 modelling to establish the TERs of the dwellings. The TER sets a minimum allowable standard for the energy performance of a building and is defined by the annual CO_2 emissions of a notional building of the same type, size and shape to the proposed building. The specification of the notional building used to calculate the TER is defined within Building Regulations Part L1 2021. The dwellings presented in the following table were used to carry out the SAP assessment.

Table 3: SAP Dwellings

Sample SAP Type Reference	No. of Units
Plot 1-3Bed 6Person House-Semi-Detached	1
Plot 2-3Bed 6Person House-Semi-Detached	1
Plot 3-3Bed 6Person House-Semi-Detached	1
Plot 4-3Bed 6Person House-Semi-Detached	1
Plot 5-3Bed 6Person House-Semi-Detached	1
Plot 6-3Bed 6Person House-Semi-Detached	1
Plot 7-3Bed 6Person House-Detached	1
Plot 8-4Bed 7Person House-Detached	1
Plot 9-4Bed 7Person House-Detached	1
Total	**9**

The TER worksheets of the dwellings can be found in the appendices. The TER results of the SAP assessments from all dwellings have been extrapolated using a weighted average method to predict the baseline.

6.2 TOTAL BASELINE

The total baseline CO_2 emissions for the development are summarised below.

Table 4: Total Baseline CO_2 emissions

Stage of Energy Hierarchy	Regulated CO_2 Emissions (tonnes/year)
Part L1 2021 Baseline	12.26

7. Passive Design and Energy Efficient Measures (Be Lean)

In accordance with the Energy Hierarchy, the energy demands of the development should be reduced as much as practically viable, prior to considering low carbon or renewable measures.

A range of measures to reduce CO_2 emissions and increase resilience to climate change are proposed in the building design including good building fabric standards as well as energy efficient M&E systems and lighting.

7.1 Passive Design

The development will incorporate a range of passive design measures and energy efficient building fabric that will reduce the demand for space heating, ventilation, and artificial lighting.

Passive design utilises daylight, solar energy and shading to illuminate, heat and shade where necessary and ventilate/cool the buildings using thermal mass and cross ventilation, for natural cooling of the dwellings, thus requiring less (mechanical) energy to achieve the performance standards for the health and wellbeing of the occupants.

Natural ventilation has been considered but is judged to be inappropriate due to the high energy efficiency requirements and the CO_2 reduction target. Therefore, efficient decentralised mechanical ventilation has been specified as a more suitable approach to extract air from the dwellings to prevent the accumulation of moisture and prevents condensation and mould growth.

The ventilation strategy will be reviewed again and developed as the design progresses to ensure compliance with all the relevant regulations and standards. Should certain elevations be affected by noise issues restricting the opening of windows, enhanced mechanical ventilation will be introduced to reduce the risk of overheating. It is assumed, in this scenario, that all windows can still be opened (albeit intermittently) for purge ventilation.

The proposed glazed areas have been designed to maximise daylight and optimise solar gains. The glazing specification has been reviewed to ensure that they provide a balance between solar control and solar gain.

7.2 Building Fabric

To reduce demand for space heating, emphasis has been placed on a Fabric First Approach by providing a very high standard of fabric efficiency and reducing heat loss through the building envelope. Approved Document Part L1 2021 sets out the limiting fabric parameters for each of the building elements. Each stated value represents the area-weighted average U-value. The following table details the proposed U-values to be used in the described exposed element within the fabric of the development.

Table 5: Proposed Fabric Specification

Element	Part L1 2021 Minimum Fabric Requirements	Proposed Specification
Ground Floor	0.18 W/m²K	0.12 W/m²K
External Wall	0.26 W/m²K	0.19 W/m²K
Party Wall	0.20 W/m²K	0.00 W/m²K
Roof – insulated at ceiling	0.16 W/m²K	0.10 W/m²K
Roof – insulated at slope	0.16 W/m²K	0.13 W/m²K
Terrace Roof	0.16 W/m²K	0.13 W/m²K
Bay Roof		0.15 W/m²K
Windows/Bifold Doors	1.60 W/m²K	U = 1.20 W/m²K G = 0.43 BFRC Certificate
Dormer Windows	1.60 W/m²K	U = 1.20 W/m²K G = 0.63 FF=0.70
Doors	1.60 W/m²K	1.0W/m²K
Air Permeability	8.0m³/h/m² @50Pa	4.00m³/h/m² @50Pa

Recognised Construction Details (RCD) for all wall junctions will be specified to minimise the effects of non-repeating thermal bridging and reduce heat loss further in all possible junctions. By specifying and ensuring that Recognised Construction Details are designed into the build, CO_2 emissions can be greatly reduced. In addition, it is proposed that all openings will have Hi-Therm lintels installed to maximise thermal efficiency.

7.3 Energy Efficient Systems

Energy efficiency can be significantly reduced by using energy efficient M&E systems. The recommended indicative energy efficiency measures for the proposed development are provided below and have been included within the energy and carbon modelling.

7.1.1 Heating and Hot Water

The space heating requirement of the proposed development will be significantly reduced by the proposed fabric, air tightness and ventilation measures.

It is proposed that all houses will have their heating and hot water being met by highly efficient individual air source heat pumps.

As heat pump technology is considered a low and zero carbon technology, it can only be allowed for at the 'Be Green' stage of this energy hierarchy. Therefore, for the purpose of reporting the 'Be Lean' figures, gas combination boilers have been assumed.

7.1.2 Ventilation

To further minimise heat loss through the building envelope, air leakage will be made a priority. The airtightness of all dwellings will be set to a level of 4.00$m^3/h/m^2$ and will utilise continuously running decentralised extract fans (system 3) to ensure the airtightness of the dwellings can be kept low, without compromising on the necessity for good ventilation. A more detailed ventilation strategy will be developed during detailed design with the aim to specify the most appropriate ventilation systems and achieve a pleasant indoor environment.

7.1.3 Cooling

At this stage, it is considered that cooling requirements during the hot summer months will be met via openable windows/doors and continuous running mechanical ventilation (as detailed above).

7.1.4 Lighting

The proposed windows aim to maximise daylight to minimise the need for artificial lighting. The electricity consumption associated with lighting will be further reduced by effectively controlling the lighting systems by:

- Using energy efficient lamps and luminaires. Low energy lamps and LED's are proposed throughout.
- Having appropriately commissioned lighting systems.

7.1.5 Energy Metering and Monitoring

Electric sub-metering will be installed in line with CIBSE TM39 to monitor and target energy use within the development. Each individual house will have their own meter and it is likely that energy suppliers may insist on smart metering throughout.

7.4 Residential Fabric Energy Efficiency (FEE)

The Target Fabric Energy Efficiency rate is the minimum energy performance requirement, as stipulated by Building Regulations Part L1 2021, for all new l dwellings. It is expressed as the amount of energy demand in units of kilowatt-hours per square metre of floor area per year. This performance metric is influenced by the fabric only, which is why it can be reported at this stage of the energy hierarchy.

The energy strategy has reduced energy demand through fabric and energy efficiency measures. The demand has been shown to have been reduced by an average of 5%, as detailed in the table below.

Table 6: Residential FEE Performance

Element	Target Fabric Energy Efficiency (TFEE) kWh/m²/year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m²/year	Improvement (%)
Residential Total	39.30	37.61	4%

7.5 Total CO_2 Savings: Be Lean

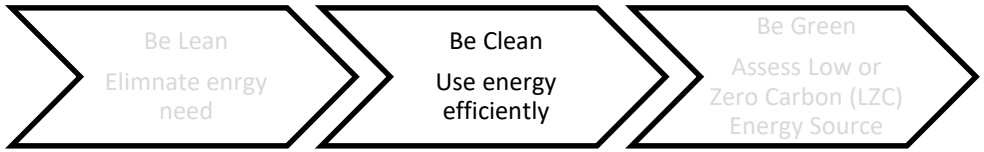
The total 'Be Lean' CO_2 emissions, for the development, are summarised below and compared against the baseline figure.

Table 7: Total 'Be Lean' CO_2 emissions.

Stage of Energy Hierarchy	Regulated CO_2 Emissions (tonnes/year)
Total Baseline	12.26
Total After 'Be Lean'	12.11
Total After 'Be Green'	4.01
Total Saving	**8.25**
Total Improvement	**67%**

It should be noted that the above 'Be Lean' figures have been adjusted to account for the PV that is included within the notional building (Part L 2021) when calculating the TER for the baseline. PV is considered a renewable energy source, so it would not be a fair assessment of the actual 'Be Lean' savings if these were to be compared against a baseline which has the benefit of PV. A carbon reporting spreadsheet has been used to calculate the estimated carbon savings of the PV within the baseline. The same amount of carbon savings has then been deducted from the 'Be Lean' figure reported above. This then enables a like for like comparison of the baseline and 'Be Lean' figures.

8. Supply Energy Efficiently (Be Clean)



Combined Heat and Power (CHP)

Decentralised energy refers to energy that is generated off the main grid. This may include micro-renewables, heating and cooling. It can also refer to energy from waste plants, combined heat and power, district heating and cooling, as well as geothermal, biomass or solar energy. Decentralised Energy schemes can serve a single building or a whole community, even being built out across entire cities.

The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

1. Connect to local or existing planned heat networks
    a. Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
    b. Use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network)
    c. Use ultra-low NOx gas boilers
2. CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that they meet the relevant planning policy requirements.
3. Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.

There are many benefits of decentralised heat generation and Combined Heat and Power (CHP) in terms of cost and CO_2 emissions savings. However, technology such as this is more suitable for sufficiently large heat intensive developments of at least 50 dwellings per hectare and/or at least 300 dwellings, ideally complimented with some non-residential use of significant demand of heat and electricity as stated by Guilford Borough Council Local Plan. The proposed development size of 9no.dwellings is at the lower end of what the industry tends to view as viable for such systems. The development is for residential only and this will result in 'peaky' thermal demands with little anchor load to enable efficient operation of gas fired CHP. This option also risks the potential to increase costs to residents.

The site is neither sufficiently dense nor large enough to warrant investment from 3rd party managing agents or Energy Supply Companies (ESCos). The proposed development would need to be run by an independent agent/company and there would be very little if any interest among existing ESCos in servicing such a small-scale system. Even if it was possible, the cost of managing fuel procurement, customer billing, operation and maintenance would lead to disproportionally and unnecessary high service charges to residents compared to the provision of heat from individual heating sources.

Based on the anticipated timescale of the proposed development and the predicted trajectory of the national electricity grid decarbonisation, the development of a district heat network powered by fossil fuels is also not considered to be the most carbon efficient approach.

The incorporation of a gas fired combined heat and power (CHP) network will lock the development into relatively carbon intensive gas-fired heating and hot water technology and will not facilitate the transition to less carbon intensive solutions.

9. Renewables Or LZC Technology (Be Green)

The following low and zero carbon technologies have been considered for this scheme:

- Air Source Heat Pump (ASHP)
- Domestic Hot Water Heat Pumps
- Photovoltaic Panels (PV)
- Ground Source Heat Pump (GSHP)
- Wind Turbines
- Biomass Boiler
- Solar Thermal

The assessment has shown that Air Source Heat Pumps are considered to be the most suitable renewable/low carbon energy solution for this development.

All other renewable energy technology options are summarised in the appendices and have been deemed as not appropriate for this development.

9.1 Air Source Heat Pumps (ASHP)

Air at any temperature above absolute zero contains some energy. An air source heat pump transfers some of this energy as heat from one place to another, for example, between the outside and inside of a building. This can provide space heating and hot water. A system can be designed to transfer heat in either direction, to heat or cool the interior of the building in winter and summer respectively. For simplicity, the description below focuses on use for interior heating.

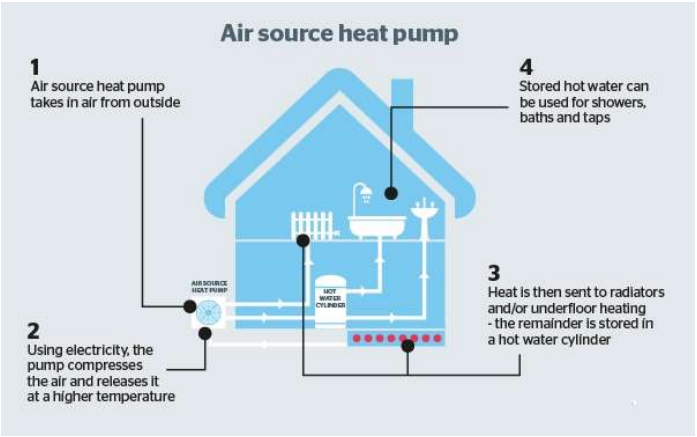
The technology is similar to a refrigerator/freezer or air conditioning unit. The different effect is due to the physical location of the different system components. Just as the pipes on the back of a refrigerator become warm as the interior cools, so an ASHP warms the inside of a building whilst cooling the outside air.

The main components of an ASHP are:

- An outdoor heat exchanger coil, which extracts heat from ambient air.
- An indoor heat exchanger coil, which transfers the heat into hot air ducts, an indoor heating system such as water-filled radiators or underfloor circuits and a domestic hot water tank.

The figure below demonstrates the typical operation of an ASHP system used to supply space heating and hot water to a property.

Figure 2: Example diagram of ASHP System



Some of the key advantages of ASHPs are listed below:

- ASHPs save carbon emissions. Unlike burning oil, gas, LPG or biomass, a heat pump produces no carbon emissions on-site (and no carbon emissions at all, if a renewable energy source is used to power them).
- They save space. There are no fuel storage requirements.
- They require less maintenance than combustion-based heating systems.
- Heat pumps can provide cooling in summer, as well as heating in winter.
- There is no combustion involved and no direct emission of harmful gases.

The use of individual Air Source Heat Pumps (ASHP) is proposed for this development to efficiently supply the houses with space heating and hot water. The ASHP are to be discreetly located within the boundary of each plot.

ASHPs will require electricity to operate, however this electricity can be supplied by renewable sources. This will future proof the home against the decarbonisation of the electricity grid.

A datasheet for the ASHP specified within the SAP calculations for the purpose of this report, has been included within the appendices. The full design of this system will be further developed during the detailed design stage.

9.2 Building Services Energy Efficiency Measures

The building services and systems to be employed within the dwellings are summarised in the following table.

Table 8: Summary of Building Services

Building Service Element	Specification
Space Heating & Hot Water for The Houses:	Vaillant; aroTHERM plus ASHP (dependent on size)
Heating Hot Water Controls	Time and Temperature Zone Control
Cylinder in Houses: Heat Loss:	Vaillant uniSTOR 250-300 (dependent on size) 1.4-1.6kWh/24 Hr
Ventilation:	System 3 fans Decentralised MEV – Greenwood Unity CV2.1
Flue Gas Heat Recovery:	None
Waste Water Heat Recovery:	None
Showers:	Flow rate = 8 litres per minute

10. TOTAL CO_2 SAVINGS: BE GREEN

The total 'Be Green' CO_2 emissions, for the development are summarised below and compared against the previous stages of the energy hierarchy.

Table 9: Total 'Be Green' CO_2 emissions.

Stage of Energy Hierarchy	Regulated CO_2 Emissions (tonnes/year)
Total Baseline	12.26
Total After 'Be Lean'	12.11
Total After 'Be Green'	4.01
Total Saving	**8.25**
Total Improvement	**67%**

11. Sustainable Design and Construction: Materials and Waste

The selection of materials is determined by a number of factors, such as architectural context, design rationale, carbon embodiment and maintenance requirements. The proposed development will concentrate on sustainable design, with selected materials in line with local vernacular and landscape character.

The BRE Green Guide to Specification is a simple guide for design professionals. The guide provides environmental impact, cost, and replacement interval information for a wide range of commonly used building specifications over a notional 60-year building life. The construction specification will prioritise materials within ratings A+, A or B.
Preference will be given to the use of local materials & suppliers where viable to reduce the transport distances and to support the local economy.

Wherever feasible, there will be a commitment to using materials that are also from renewable sources and recycled e.g. secondary aggregates. The use of recycled materials (e.g. crushed concrete from waste used for hard-standing or recycled fibreglass insulation) has zero embodied energy impact, other than that expended in their processing or transport.

Timber would be sourced, where practical, certified by FSC, PEFC or an equivalent approved certification body and all site timber used within the construction process would be recycled.

All insulation materials will have a zero-ozone depleting potential.

A Site Waste Management Plan (SWMP), dated December 2023, has been created for Parker Collins House to help to manage construction waste effectively.

The Developer is committed to implementing the SWMP, making it effective, accurate and economical and ensuring that the procedures being put into place are working and maintained.

The Site Manager is the SWMP co-ordinator of the project and as such is responsible for ensuring the instruction of workers, implementation and overseeing of the SWMP. The Site Manager will monitor the effectiveness and accuracy during the routine site visits. Independent audits will also be completed by the safety consultancy via site inspections. Copies of these reports will be forwarded to the Construction Manager for monitoring.

The Site Manager will provide on-site briefing via induction of appropriate separation, handling, recycling, re-use and return methods to be used by all parties and at appropriate stages of the Project where applicable. Toolbox talks will be carried out regularly on waste issues and all subcontractors will be expected to attend. This will ensure that everyone feels they are included and that their participation is meaningful.

Ways of Minimising Waste.

At Parker Collins House the SWMP identifies ways to minimise the waste produced at early stages, thereby reducing the amount of waste to be removed from the project. Trade Contractors, Design Team and Suppliers are all being encouraged to look at ways to minimise the amount of waste produced.

All the actions listed on the table below will help to reduce the amount of waste and surplus materials, which traditionally would be skipped and sent to landfill.

Table 10: Site Wate Management Plan (SWMP)

Site Waste Management Plan (SWMP)			
Current Actions Table			
ACTION	**RESPONSE**	**ACTION DATE**	**HOW NOTIFIED**
Cutting of plasterboard sheets to be kept to a minimum.	**On site**		**Construction Phase Health & Safety Plan**
Wash down point to be located at site entrance	**Principle Contractor**		**Construction Phase Health & Safety Plan**
Substructure concrete waste to be utilised as fill and blinding	**Site Manager**		**Construction Phase Health & Safety Plan**
Material pallets to be stored for re-use then sent back when economic	**Site Manager**		**Construction Phase Health & Safety Plan**
All other materials to be risk assessed	**Operatives Site Manager Trade Contractors**		**Method Statements Risk Assessments Construction Phase Health & Safety Plan**
Re use of excavated soil on site	**Site Manager**		**Construction Phase Health & Safety Plan**

Segregation

Watse will be segregated on the site. The SWMP Plan has allowed for waste segregation area on site to be allocated for skips for Mixed Waste and Plasterboard collection. Materials at point of use etc., timber to be sorted for re-use.

The labelling systems shall be the Waste Awareness Colour Coding Scheme. If the skips are clearly identified the bulk of the workforce will deposit the correct materials into the correct skip. Skips for segregation of waste identified currently are:

- Wood
- Metal
- Brick/rubble
- Canteen waste

As works progress and other trades come to site other skips will be placed to enable certain waste to be removed from site. This is likely to include:

- Plasterboard
- Paper and cardboard (bagged up)

Management

Waste materials fall into three categories for management, these are:

- Re-use
- Recycle
- Landfill

Re-used

If surplus materials can be used in the permanent works they are classified as materials, which have been re-used. If they are surplus to requirements and need to be removed from site and they can be removed and used in their present form, they can be removed from site for re-use.

Recycling

If the surplus material cannot be re-used in its present form but could be used in a different form, it is sent for recycling such as 50 x 50 timber to make chipboard.

Landfill

If either of the above cannot be satisfied, then the only option left is to send the surplus materials to *landfill*. Landfill is always a last resort.

12. Water Saving Measures

Household water reduction measures will include the following where applicable:

- Water efficient taps.
- Water efficient cisterns.
- Low output showers.
- Flow restrictors to manage water pressures to achieve optimum levels.
- Water meters to all premises with guidance on water consumption and savings.

The following specification or similar will be adopted on the development to ensure that the water efficiency of the dwelling will achieve a maximum internal consumption of 110 litres per person per day, in line with the requirements of Waverley Borough Council's Policy CC2 of their Local Plan (adopted February 2018).

Table 11: Specification of flow rates and volumes for water using appliances

Water using Appliance	Comment
WC Cisterns	Dual Flush to be limited to maximum of 6/3
Baths	Capacity no greater than 190 litres
Basin taps	Flow rates to be no greater than 3 litres/minute at 3 bar
Kitchen taps	Flow rates to be no greater than 6 litres/minute at 3 bar
Shower	Flow rates to be no greater than 8 litres/minute
Water softener	Not to be installed
Washing Machine	Water usage to be limited to 8.17 Litres per KG
Dishwasher	Water Usage to be limited to 1.25 litres per place setting

Table 12: Water Calculations

Water Calculations					
Installation Type	Unit	Capacity/	Use Factor	Fixed use	**Total Use**
		Flow Rate		(l/p/day)	**(l/p/day)**
WC Single Flush	Volume (l)	0.00	4.42	0.00	0.00
WC Dual Flush	Full Flush (l)	6.00	1.46	0.00	8.76
	Pt Flush (l)	3.00	2.96	0.00	8.88
WC's (Multiple)	Volume (l)	0.00	4.42	0.00	0.00
Taps Exc. Kitchen	Flow Rate (l/min)	3.00	1.58	1.58	6.32
Bath (shower present)	(l/min)	190.00	0.11	0.00	20.90
Shower (bath present)	(l/min)	8.00	4.37	0.00	34.96
Bath Only	(l)	0.00	0.50	0.00	0.00
Shower Only	(l/min)	0.00	5.60	0.00	0.00
Kitchen Taps	(l/min)	6.00	0.44	10.36	13.00
Washing Machines	(l/kg dry)	8.17	2.10	0.00	17.16
Dishwashers	(l/place)	1.25	3.60	0.00	4.50
Waste Disposal	(l/min)	0.00	3.08	0.00	0.00
Water Softener	(l/min)	0.00	1.00	0.00	0.00
Total Calculated Water Use (l/p/day)					**114.5**
Grey/Rain Water Reused (l)					0.00
Normalisation Factor	(Factor)				0.91
Total Internal Consumption (l/p/day)					**104.20**
External Water Use Allowance (l)					5.00
Total Consumption Part G (l/p/day)					**109.2**

13. Flood Risk Assessment & Drainage Strategy

The Flood Risk Assessment (Ref:231743/FRA/OR/RS/01) undertaken by LANMOR Consulting Consultants October 2023 confirms that the area of the site proposed for housing development is located within Flood Zone 1. Flood Zone 1 is defined as areas with a 'low' probability of inundation defined as having a less than 1 in 1,000 annual probability of river (fluvial) or sea (tidal) flooding (<0.1%).

The Flood Risk Assessment has looked at the implications of flooding and the impact the proposed development will have on the flood plain in accordance with the government's guidance document: The National Planning Policy Framework (NPPF), with specific reference to its Planning Practice Guidance.

The EA Flood Mapping shows the site is within Flood Zones 2 and 3. The mapping shows the extent of flood zone 3 is confined to the corridor of the watercourse with the majority of the site falling within Flood Zone 2. When climate change allowances have been factored into the flood model the proposed properties will still be free from flooding with a probability of 1.0% +CC.

This assessment has demonstrated that the proposed development will not restrict the free flow of flood waters or result in the loss of flood storage. The proposed buildings will be free of flooding and a safe access can be provided to and from the site during flood conditions.

The drainage strategy for the site will restrict the runoff from the site to as near greenfield as practical, the runoff will be attenuated in the permeable paving on site ensuring there is no risk of flooding to the proposed development or neighbouring area.

This FRA has demonstrated that the proposals will not have any impact on the current flooding in the area and that a suitable drainage strategy can be provided without increasing the risk of flooding, and we therefore see no reason what these proposals should be refused on the grounds of flooding or drainage.

14. ECOLOGY

An Ecological Assessment (Ref:233336/ARB) has been produced by AA Environmental Limited (AAe) dated December 2023 to support the planning application.

The Ecological Assessment confirms that the majority of the established trees and boundary vegetation will be retained and protected during the works. An ecological buffer zone will be provided alongside the stream to be sensitively designed and managed for the benefit of wildlife.

The Ecological Assessment concludes that are no habitats of international, national, county, or local importance that would be directly affected by the proposals. The site is of overall low ecological value, with the species recorded. described as common or abundant and are found in similar places across much of Britain, with no evidence of protected species recorded.

The findings of this ecological appraisal would indicate that there are no ecological constraints to the redevelopment proposals to preclude planning permission being granted. A range of generic mitigation/enhancement measures have been suggested and, if implemented effectively, would reduce the impact of the works on local wildlife, avoid contravention of current legislation and increase the nature conservation value of the site in the long term in accordance with Government guidance as set out in National Planning Policy Framework (NPPF) 2023.

Although no evidence of bats was recorded and no further surveys are considered necessary, it is recommended as a precaution that the areas of restricted tile hanging on the property should be soft stripped under the supervision of a licensed bat worker, with the following controls implemented:

- All site operatives should be given a toolbox talk on the possibility of encountering bats an the legal protection they and their roosts are afforded
- Initial works will be carried out with great care, with the areas of tile hanging removed by hand, lifting each tile clear with two hands rather than lifting the front and rolling the tile backwards which may crush any bats beneath.
- Tiles will also be checked underneath before being stacked or discarded as bats sometimes cling to the underside of tiles.

Although none of the established trees are scheduled to be felled to facilitate the works, in event that any trees need to be removed then a further assessment will be required to determine presence or likely absence of bats. The findings of which will determine any restrictions and control measures to be adopted to comply with current legislation protecting bats and their roosts.

Although, the pond was assessed to be of poor suitability to support great crested newts and therefore no follow-up surveys are recommended, care should be taken during works, with all site operatives made aware of the legislation protecting great crested newts. In the unlikely event of encountering any great crested newts then works should stop immediately and Natural England or AAe contacted so that appropriate advice can be provided.

To protect any vegetation to be retained, suitable fencing may be required at certain locations to reduce the possibility of any damage that could be caused during the works. To minimise accidental damage, any overhanging branches should be pruned back to suitable live growth points. All works should be undertaken by a suitably qualified and experienced specialist contractor and should conform to current industry best practice, i.e. BS 3998: 2010 'Tree Work
- Recommendations'. The retention of these features will maintain existing commuting/foraging routes currently utilised by local wildlife.

As part of the proposals, soft landscaping will be carried out. Where any new planting is proposed, it should aim to use native species, but where this is not practicable then species of known value for wildlife can be used. In particular, flowering plants will be of benefit to invertebrate species and shrubs and trees may provide nesting opportunities for birds once they become established.

Any new boundary treatment should be designed to promote permeability of the site to minimise fragmentation and allow free movement of wildlife throughout the site, for example by strengthening/enhancing the existing boundary vegetation, planting up a series of new hedgerows and/or installing post and rail fences. If close boarded fences are required for security reasons these should be minimised and raised slightly off the ground (c. 150-200 mm) to allow animals to pass underneath.

The ecological buffer alongside the stream will be sensitively designed with existing vegetation supplemented with native species of local provenance only with the species mix agreed by the appointed landscape contractor. An Advisory Note for planting near watercourses is attached at Appendix E. Once established, this buffer zone will provide an important resource for a variety of wildlife, as well as protecting the river in the long-term.

The site could be further enhanced by providing roosting, nesting, and sheltering opportunities for a range of species and the creation of new wildlife habitats, such as some of those recommended by the Chartered Institute of Ecology Environment and Management's published Biodiversity Net Gain Good Practice Guidance, and listed below:

- Nest boxes
- Bug hotels
- Bat boxes
- Hedgehog houses
- Pollinator nest sites
- Planting wildflowers

The effects of lighting on plants and animals are difficult to assess, but it is thought that lighting can adversely affect invertebrates, birds, and bats. Although the site is currently well-lit by onsite sources and neighbouring developments, in accordance with best practice, a sensitive lighting scheme will be designed to minimise light spillage and pollution and not directed onto any wildlife boxes installed or onto the boundary vegetation

15. CONCLUSIONS

The energy strategy detailed has followed the accepted Energy Hierarchy of 'Be Lean', 'Be Clean' and 'Be Green'. The energy strategy proposed for the development can be summarised as below.

Table 13: Summary of Proposed Energy Strategy

Element	Strategy
Passive	Optimised design to enable controlled solar gain and improved direct and indirect natural lighting
Fabric	Building fabric U values have been enhanced over and above those detailed with Part L1 2021
Heating	Vaillant aroTHERM plus Air Source Heat Pump
Hot Water	Vaillant aroTHERM plus Air Source Heat Pumps & UniSTOR HWC
Cooling	None
Ventilation	Mechanical extract ventilation system 3 Low design air permeability (DAP)
Lighting	Energy efficient LED Lighting where applicable

15.1 TOTAL CO_2 SAVINGS

A summary of the overall reduction in CO_2 emissions after each stage of the energy hierarchy is summarised in the table below.

Table 14: Energy Strategy Carbon Emissions Summary

Stage of Energy Hierarchy	Regulated CO_2 Emissions (tonnes/year)
Total Baseline	12.26
Total After 'Be Lean'	12.11
Total After 'Be Green'	4.01
Total Saving	**8.25**
Total Improvement	**67%**

The CO_2 emissions savings detailed above demonstrate that by following the measures outlined within this energy strategy, a 67% reduction will be achieved compared to the Building Regulations Part L 2021 baseline.

Finally, the fabric specification detailed within this energy strategy ensures that the average Dwelling Fabric Energy Efficiency improves upon the average Target Fabric Energy Efficiency (as defined by Building Regulations Part L1 2021) by 4%. This is detailed within the table below.

Table 15: Residential FEE Performance

Element	Target Fabric Energy Efficiency (TFEE) kWh/m²/year	Dwelling Fabric Energy Efficiency (DFEE) kWh/m²/year	Improvement (%)
Residential Total	39.30	37.61	4%

Energy and Sustainability Summary

The strategy achieves and meets the following requirements:

- Maximises the energy efficiency performance of the building fabric, in accordance with the energy hierarchy.
- The fabric energy efficiency (DFEE) achieves a 4% reduction over the minimum standards defined by Building Regulations Part L1 2021 (TFEE).
- Minimises carbon dioxide emissions further at the 'Be Green' stage of the energy hierarchy by utilising heat pump technology in the form of efficient individual ASHP to meet both space heating and hot water of the houses.
- Reduces a total estimated 8.25 tonnes of CO2 compared to the Part L 2021 baseline. This equates to a 67% saving. This is in line with the requirements of Guildford Borough Council's Policy D16-Criteria (4).
- In keeping with the requirements of Guildford Borough Council's Policy D2-Criteria 1d of their Local Plan (adopted April 2019), this strategy details a specification of water efficiency measures which meets the highest national standard.
- The proposals detailed herein include sustainable construction techniques and standards in line with National and Guildford Borough Council's planning policy requirements.
- Complies with all of the main compliance criteria required by Part L 2021 of the Building Regulations.

16. APPENDICES

The following pages detail:

- Appendix A: Alternative Renewable Energy Options
- Appendix B: Vaillant aroTHERM plus Technical Datasheet
- Appendix C: SAP Output Sheets

16.1 Appendix A: Alternative Renewable Energy Options

The following alternative options to supply low carbon and renewable energy generation have been explored and discounted based on the following reasons:

Wind Turbines

Wind turbines come in a variety of sizes and shapes. Turbines of 1 kW can be installed to single house and large-scale turbines of 1-2 MW can be installed on a development to generate electricity to multiple dwellings and other buildings. In both instances the electricity generated can be used on site or exported to the grid. Vertical- or horizontal-axis turbines are available.

A roof-mounted 1 kW micro wind system costs up to £3,000. A 2.5 kW pole-mounted system costs between £9,900 and £19,000. A 6 kW pole-mounted system costs between £21,000 and £30,000 (taken from the Energy Saving Trust, TBC by supplier)

- Local average wind speed is a determining factor. A minimum average wind speed of 6 m/s is required.
- Noise considerations can be an issue dependent on density and build-up of the surrounding area.
- Buildings in the immediate area can disrupt wind speed and reduce performance of the system.
- Planning permission will be required along with suitable space to site the turbine, whether ground installed or roof mounted.

Wind turbines have been discounted due to concerns over reliable wind resources. The use of wind turbines is likely to present aesthetic as well as nuisance issues.

Biomass Boilers

Providing a heating system fuelled by plant-based materials such as wood, crops or food waste. Biomass boilers generate heat for space heating and domestic hot water through the combustion of biofuels, such as woodchip, wood pellets or potentially biofuel or bio diesel. Biomass is considered to be virtually zero carbon. They can be used on an individual scale or for multiple dwellings as part of a district-heating network. A back-up heat source should be provided as consistent delivery of fuel is necessary for continued operation.

Biomass is not considered a technically viable option for this development scheme due to the following constraints; as

- No space has been allowed for fuel storage within the development.
- The capital installation cost would also be high which leads us to the conclusion that biomass would be neither be a technically feasible nor a commercially viable option for this development scheme.

Ground Source Heat Pumps (GSHP)

Ground Source Heat Pumps (GSHPs) operate on the same principle as an Air Source Heat Pump (ASHP) in that they extract heat from a source (in this instance the ground) and compress this energy to increase temperature for space heating and hot water. Pipework is installed into the ground, either through coils or in bore holes and piles, circulating a mix of water and antifreeze to extract energy from the ground, where the year-round temperature is relatively consistent (approx. 10°C at 4 metres depth). This leads to a reliable source of heat for the building.

Again, an electrically powered pump circulates the liquid and powers the compressor, however annual efficiencies for GSHPs tend to be higher than those of ASHPs.

Discounted on the grounds of costs and available space.

Solar Thermal

Solar Thermal generates domestic hot water from the sun's radiation. Glycol circulates within either flat plate or evacuated tube panels, absorbing heat from the sun, and transferring this energy to a water cylinder. A well designed solar thermal system will account for 50-60% of a dwelling's annual hot water demand. Sizing the system to meet a higher demand will lead to excess heat generation in the summer months and overheating of the system.
Unsuitable for blocks of flats and low carbon reduction efficiency compared to photovoltaic systems. Solar hot water systems for flatted blocks are only suitable where a central boiler plant room is provided to accommodate a central thermal store.

Solar Photovoltaics (PV)

Solar energy could be a solution to reduce CO_2 emissions to satisfy building regulations, however, the efficient building fabric and use of air source heat pumps ensures compliance is met without the need for PV.

16.2 Appendix B: Vaillant aroTHERM plus Technical Datasheet

Figure 3: Vaillant aroTHERM plus Technical Datasheet

Technical specifications

aroTHERM plus	Unit	3.5kW VWL 35 / 6	5kW VWL 55 / 6	7kW VWL 75 / 6	10kW VWL 105 / 6	12kW VWL 125 / 6
General						
Width	mm	1,100				
Height	mm	765		965	1,565	
Depth	mm	450				
Weight, ready for operation	kg	114		128	194	
Connection, heating circuit		G 1 1/4"				
Rated voltage	V	230 V (+10%/- 15%), 50 Hz, 1~/N/PE				
Rated current, maximum	A	14.3		15.0	23.3	
Fuse size		16			25	
Fuse type	A	C/D				
RCD type		A				
eBUS (2-core communication cable)	mm2	0.75				
Maximum length eBUS cable (communication cable)	m	50				
IP rating		IP 15 B				
Fan, power consumption	W	40			50	
Fan quantity		1			2	
Fan, air flow , maximum	m^3 /h	2,300			5,100	
Heating pump, power consumption	W	2 - 50			3 - 87	
Heating circuit						
Heating water temperature, minimum/maximum	° C	20 - 75				
Basic length of the heating water pipe, maximum, between the outdoor unit and indoor unit	m	20				
Operating pressure, minimum	bar	0.50				
Operating pressure, maximum	bar	3.00				
Volume flow, minimum	l/h	400		540	995	
Volume flow, maximum	l/h	860		1,205	2,065	
Water volume, in the outdoor unit	l	1.5		2.0	2.5	
Water volume, in the heating circuit, minimum, thawing mode, activated/deactivated back-up heater	l	15 / 40		20 / 55	45 / 150	
Remaining feed pressure, hydraulic	kPa (mbar)	56.0 (560.0)		44.0 (440.0)	55.0 (550.0)	

Compatible with

uniSTOR

sensoCOMFORT

VRC 700

aroTHERM plus	Unit	3.5kW VWL 35 / 6	5kW VWL 55 / 6	7kW VWL 75 / 6	10kW VWL 105 / 6	12kW VWL 125 / 6
Refrigerant circuit						
Fluid type		R290				
Fluid fill quantity	kg	0.6		0.9	1.3	
Refrigerant, Global Warming Potential (GWP)		3				
CO_2 equivalent	t	0.0018		0.0027	0.0039	
Permissable operating pressure	bar	31.5				
Compressor type		Rotary piston			Scroll compressor	
Compressor oil type		Specific polyalkylene glycol (PAG				
Compressor, control		Electronic				

Noise emissions, heating mode						
Sound power, EN 12102, EN 14511 LWA, A7/W35	dB(A)	51		53	58	
Sound power, EN 12102, EN 14511 LWA, A7/W45	dB(A)	53			58	
Sound power, EN 12102, EN 14511 LWA, A7/W55	dB(A)	54		55	60	

Efficiency		
Energy efficiency class 35°C	(A+++ to F)	A+++
Energy efficiency class 55°C	(A+++ to F)	A++
Combination with uniTOWER		
Energy efficiency class	(A+++ to F)	A++
Energy efficiency class for hot water supply	(A+ to F)	A

SCOP and heating output

aroTHERM output		35°C flow		40°C flow		45°C flow		50°C flow		55°C flow	
		Output	SCOP	Output	SCOP	Output	SCOP	Output	SCOP	Output	SCOP
3.5kW	-5°C	4.2	4.41	4.1	4.03	4	3.65	3.9	3.37	3.8	3.10
	-3°C	4.6		4.4		4.3		4.2		4	
	0°C	4.7		4.7		4.6		4.5		4.4	
	2°C	4.9		4.9		4.9		4.7		4.6	
5kW	-5°C	6.3	4.48	6	4.13	5.6	3.77	5.5	3.41	5.4	3.06
	-3°C	6.8		6.4		6.1		5.9		5.8	
	0°C	6.9		6.7		6.6		6.4		6.2	
	2°C	7.1		7		6.9		6.7		6.5	
7kW	-5°C	8.2	4.36	8.1	4.13	8	3.91	7.5	3.65	7	3.39
	-3°C	8.8		8.6		8.4		7.9		7.4	
	0°C	9.5		9.3		9.1		8.6		8.1	
	2°C	10		9.8		9.6		9		8.5	
10kW	-5°C	9.9	5.03	9.7	4.58	9.4	4.13	9.1	3.85	8.8	3.58
	-3°C	10.7		10.3		10		9.6		9.2	
	0°C	11.9		11.6		11.3		10.7		10.2	
	2°C	12.8		12.5		12.1		11.5		10.9	
12kW	-5°C	13.1	4.88	12.8	4.55	12.5	4.21	11.7	3.92	10.8	3.63
	-3°C	13.9		13.4		12.9		12.1		11.2	
	0°C	15.2		14.6		14.1		13.2		12.3	
	2°C	16		15.5		14.9		13.9		13	

16.3 Appendix C: SAP Output Sheets

Summary for Input Data

elmhurst energy

Property Reference	Plot 1	**Issued on Date**	15/12/2023
Assessment Reference	Plot 1	**Prop Type Ref**	Plot 1
Property	Parker Collins House, Plot 1, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	85 B	**DER**	3.22	**TER**	10.21
Environmental	97 A	**% DER < TER**			68.46
CO_2 Emissions (t/year)	0.37	**DFEE**	36.09	**TFEE**	37.10
Compliance Check	See BREL	**% DFEE < TFEE**			2.71
% DPER < TPER	37.20	**DPER**	33.50	**TPER**	53.35

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
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:	19.00 m	47.62 m²	2.39 m
1st Storey:	19.52 m	47.62 m²	2.67 m
2nd Storey:	19.22 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	113.27	94.59	0.00	None	18.68	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	North	0.73	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	11.57	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	6.82	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	25.82	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.52	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	38.74	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	13.20	0.04	0.04	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.62	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	2.79	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.92	0.11	0.11	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	15.99	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	22.76	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value 0.05 W/m²K

18.0 Pressure Testing Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	262.31	
In Summer	278.59	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	

Summary for Input Data

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	

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	1
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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

Summary for Input Data

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Summary for Input Data

elmhurst energy

Property Reference	Plot 2	**Issued on Date**	15/12/2023
Assessment Reference	Plot 2	**Prop Type Ref**	Plot 2
Property	Parker Collins House, Plot 2, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	85 B	**DER**	3.20	**TER**	10.02
Environmental	97 A	**% DER < TER**			68.06
CO_2 Emissions (t/year)	0.37	**DFEE**	35.34	**TFEE**	36.22
Compliance Check	See BREL	**% DFEE < TFEE**			2.42
% DPER < TPER	36.35	**DPER**	33.30	**TPER**	52.32

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
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:	19.00 m	47.62 m²	2.39 m
1st Storey:	19.52 m	47.62 m²	2.67 m
2nd Storey:	19.22 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	113.27	94.59	0.00	None	18.68	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	South	0.73	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	11.57	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	6.82	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	25.82	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.52	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	38.74	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	13.20	0.04	0.04	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.62	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	2.79	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.92	0.11	0.11	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	15.99	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	22.76	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value 0.05 W/m²K

18.0 Pressure Testing Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	262.31	
In Summer	278.59	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	

Summary for Input Data

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	

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	1
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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

Summary for Input Data

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Summary for Input Data

elmhurst energy

Property Reference	Plot 3	**Issued on Date**	15/12/2023
Assessment Reference	Plot 3	**Prop Type Ref**	Plot 3
Property	Parker Collins House, Plot 3, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	85 B	**DER**	3.22	**TER**	10.09
Environmental	97 A	**% DER < TER**			68.09
CO_2 Emissions (t/year)	0.37	**DFEE**	35.66	**TFEE**	36.52
Compliance Check	See BREL	**% DFEE < TFEE**			2.35
% DPER < TPER	36.41	**DPER**	33.50	**TPER**	52.68

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
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:	19.00 m	47.62 m²	2.39 m
1st Storey:	19.52 m	47.62 m²	2.67 m
2nd Storey:	19.22 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	113.27	94.59	0.00	None	18.68	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	North	0.73	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	11.57	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	6.82	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	25.82	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.52	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	38.74	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	13.20	0.04	0.04	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.62	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	2.79	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.92	0.11	0.11	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	15.99	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	22.76	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value 0.05 W/m²K

18.0 Pressure Testing Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	262.31	
In Summer	278.59	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	

Summary for Input Data

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	

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	1
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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

Summary for Input Data

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Summary for Input Data

elmhurst energy

Property Reference	Plot 4	**Issued on Date**	15/12/2023
Assessment Reference	Plot 4	**Prop Type Ref**	Plot 4
Property	Parker Collins House, Plot 4, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	85 B	**DER**	3.18	**TER**	10.01
Environmental	97 A	**% DER < TER**			68.23
CO_2 Emissions (t/year)	0.37	**DFEE**	35.17	**TFEE**	36.30
Compliance Check	See BREL	**% DFEE < TFEE**			3.11
% DPER < TPER	36.71	**DPER**	33.05	**TPER**	52.22

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
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:	19.00 m	47.62 m²	2.39 m
1st Storey:	19.52 m	47.62 m²	2.67 m
2nd Storey:	19.22 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	113.27	92.70	0.00	None	20.57	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	South	2.62	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	12.82	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.07	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	38.86	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.52	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	38.74	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	13.20	0.04	0.04	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.62	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	2.79	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.92	0.11	0.11	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	15.99	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	22.76	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value 0.05 W/m²K

18.0 Pressure Testing Yes

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	262.78	
In Summer	278.64	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	

Summary for Input Data

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	

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	1
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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

Summary for Input Data

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Summary for Input Data

elmhurst energy

Property Reference	Plot 5	**Issued on Date**	15/12/2023
Assessment Reference	Plot 5	**Prop Type Ref**	Plot 5
Property	Parker Collins House, Plot 5, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	85 B	**DER**	3.22	**TER**	10.09
Environmental	97 A	**% DER < TER**			68.09
CO_2 Emissions (t/year)	0.37	**DFEE**	35.66	**TFEE**	36.52
Compliance Check	See BREL	**% DFEE < TFEE**			2.35
% DPER < TPER	36.41	**DPER**	33.50	**TPER**	52.68

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
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:	19.00 m	47.62 m²	2.39 m
1st Storey:	19.52 m	47.62 m²	2.67 m
2nd Storey:	19.22 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	113.27	94.59	0.00	None	18.68	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	North	0.73	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	11.57	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	6.82	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	25.82	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.52	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	38.74	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	13.20	0.04	0.04	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.62	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	2.79	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.92	0.11	0.11	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	15.99	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	22.76	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value 0.05 W/m²K

18.0 Pressure Testing Yes

Summary for Input Data

elmhurst energy

Designed AP_{50}	4.00	$m^3/(h.m^2)$ @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	262.31	
In Summer	278.59	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	

Summary for Input Data

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	

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	1
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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

Summary for Input Data

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Summary for Input Data

elmhurst energy

Property Reference	Plot 6	**Issued on Date**	15/12/2023
Assessment Reference	Plot 6	**Prop Type Ref**	Plot 6
Property	Parker Collins House, Plot 6, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	85 B	**DER**	3.18	**TER**	10.01
Environmental	97 A	**% DER < TER**			68.23
CO_2 Emissions (t/year)	0.37	**DFEE**	35.17	**TFEE**	36.30
Compliance Check	See BREL	**% DFEE < TFEE**			3.11
% DPER < TPER	36.71	**DPER**	33.05	**TPER**	52.22

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
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:	19.00 m	47.62 m²	2.39 m
1st Storey:	19.52 m	47.62 m²	2.67 m
2nd Storey:	19.22 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	113.27	92.70	0.00	None	20.57	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	South	2.62	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory None

15.0 Draught Proofing 100 %

16.0 Draught Lobby No

17.0 Thermal Bridging Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	12.82	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.07	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	38.86	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	19.52	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	38.74	0.00	0.00	RCD	No
E18 Party wall between dwellings	Gov Approved Scheme	13.20	0.04	0.04	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.62	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	2.79	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
P1 Party wall - Ground floor	Gov Approved Scheme	9.92	0.11	0.11	RCD	No
P2 Party wall - Intermediate floor within a dwelling	Table K1 - Default	15.99	0.00	0.00		No
P4 Party wall - Roof (insulation at ceiling level)	Gov Approved Scheme	7.22	0.10	0.10	RCD	No
P5 Party wall - Roof (insulation at rafter level)	Gov Approved Scheme	2.75	0.05	0.05	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	22.76	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value 0.05 W/m²K

18.0 Pressure Testing Yes

Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	262.78	
In Summer	278.64	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	

Summary for Input Data

Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	

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	1
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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

Summary for Input Data

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

None

Summary for Input Data

elmhurst energy

Property Reference	Plot 7	**Issued on Date**	15/12/2023
Assessment Reference	Plot 7	**Prop Type Ref**	Plot 7
Property	Parker Collins House, Plot 7, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	84 B	**DER**	3.47	**TER**	11.11
Environmental	97 A	**% DER < TER**			68.77
CO_2 Emissions (t/year)	0.4	**DFEE**	40.22	**TFEE**	41.33
Compliance Check	See BREL	**% DFEE < TFEE**			2.68
% DPER < TPER	37.94	**DPER**	36.08	**TPER**	58.13

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	3	
3.0 Date Built	2024	
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:	29.47 m	47.62 m²	2.39 m
1st Storey:	29.00 m	47.62 m²	2.67 m
2nd Storey:	25.27 m	32.63 m²	2.38 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	19.62	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	177.92	157.35	0.00	None	20.57	Enter Gross Area
Timber Stud Wall	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	18.61	18.61	0.50	Room In Roof	0.00	Enter Gross Area
Dormer/Cheek Walll	Timber Frame	Timber framed wall (one layer of plasterboard)	0.19	9.00	4.77	0.97	0.00	None	3.80	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	229.87

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.91	15.91	None	0.00	Enter Gross Area	0.00
Sloping Roof	External Slope Roof	Plasterboard, insulated slope	0.13	9.00	13.56	13.56	None	0.00	Enter Gross Area	0.00
Lower Level Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	15.00	15.00	None	0.00	Enter Gross Area	0.00
Dormer Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.27	9.00	7.14	7.14	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	47.62
Internal Ceiling 2	+1	Plasterboard ceiling, carpeted chipboard floor	32.63

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	0.12	None	0.00	75.00	47.62

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	47.62
Internal Floor 2		Plasterboard ceiling, carpeted chipboard floor	9.00	32.63

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	1.93	0
Front Elevation	Windows	External Brick/Block Wall	East	4.94	0
Front Elevation	Dormer Windows	Dormer/Cheek Walll	East	1.90	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	8.09	0
Rear Elevation	Windows	External Brick/Block Wall	West	2.99	0
Side Elevation	Windows	External Brick/Block Wall	South	2.62	45
Rear Elevation	Dormer Windows	Dormer/Cheek Walll	West	1.90	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	12.82	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	8.07	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	38.86	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	29.47	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	54.71	0.00	0.00	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	9.65	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	14.44	0.10	0.10	RCD	No
E13 Gable (insulation at rafter level)	Gov Approved Scheme	5.50	0.06	0.06	RCD	No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	9.48	-0.09	-0.09	RCD	No
R1 Head of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R2 Sill of roof window	Independently assessed	3.62	0.12	0.12	To be calculated	No
R3 Jamb of roof window	Independently assessed	4.20	0.12	0.12	To be calculated	No
R6 Flat ceiling	Independently assessed	9.60	0.06	0.06	To be calculated	No
R7 Flat ceiling (inverted)	Independently assessed	15.19	0.06	0.06	To be calculated	No
R9 Roof to wall (flat ceiling)	Independently assessed	11.19	0.16	0.16	To be calculated	No
E16 Corner (normal)	Gov Approved Scheme	36.04	0.05	0.05	RCD	No
R8 Roof to wall (rafter)	Independently assessed	5.60	0.06	0.06	To be calculated	No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

Summary for Input Data

elmhurst energy

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	265.30	
In Summer	278.91	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	

Summary for Input Data

Boiler Interlock	No

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	1	
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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	Plot 8	**Issued on Date**	15/12/2023
Assessment Reference	Plot 8	**Prop Type Ref**	Plot 8
Property	Parker Collins House, Plot 8, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	84 B	**DER**	3.32	**TER**	9.95
Environmental	97 A	**% DER < TER**			66.63
CO_2 Emissions (t/year)	0.47	**DFEE**	41.16	**TFEE**	44.73
Compliance Check	See BREL	**% DFEE < TFEE**			7.98
% DPER < TPER	34.30	**DPER**	34.35	**TPER**	52.28

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	2024	
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:	41.75 m	82.86 m²	2.39 m
1st Storey:	25.16 m	73.13 m²	2.67 m
2nd Storey:	25.27 m	32.63 m²	2.38 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	20.20	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	193.52	157.84	0.00	None	35.68	Enter Gross Area
Wall to Garage	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	12.57	12.57	0.00	None	0.00	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	261.43

Summary for Input Data

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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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	73.13	73.13	None	0.00	Enter Gross Area	0.00
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	7.25	7.25	None	0.00	Enter Gross Area	0.00
Bay Roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	2.51	2.51	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	73.13

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	0.12	None	0.00	75.00	82.86

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	73.13

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	2.85	0
Front Elevation	Windows	External Brick/Block Wall	East	9.36	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	10.96	0
Rear Elevation	Windows	External Brick/Block Wall	West	4.68	0
Side Elevation	Windows	External Brick/Block Wall	South	3.51	45
Side Elevation	Windows	External Brick/Block Wall	North	2.39	0
Side Elevation	Bifold Door	External Brick/Block Wall	North	1.92	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	
17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	22.14	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	15.58	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	51.25	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	41.75	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	25.16	0.00	0.00	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	19.23	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	20.59	0.10	0.10	RCD	No
E14 Flat roof	Table K1 - Default	4.55	0.16	0.16		No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	14.90	-0.09	-0.09	RCD	No
E16 Corner (normal)	Gov Approved Scheme	35.14	0.05	0.05	RCD	No
E15 Flat roof with parapet	Table K1 - Default	6.39	0.30	0.30		No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	14.54	0.15	0.15		No

Y-value	0.04	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No

Summary for Input Data

Mechanical Ventilation data Type	Database
Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	4
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	4
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	29

24.0 Main Heating 1	Database	
Description	aroTHERM plus 7kW	
Percentage of Heat	100.00	%
Database Ref. No.	104436	
Fuel Type	Electricity	
SAP Code	0	
In Winter	268.46	
In Summer	279.37	
Model Name	aroTHERM plus 7kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

Summary for Input Data

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	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	1	
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		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	250.00	L
Loss	1.40	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	Plot 9	**Issued on Date**	15/12/2023
Assessment Reference	Plot 9	**Prop Type Ref**	Plot 9
Property	Parker Collins House, Plot 9, Parker Collins House, Ripley, Surrey, GU23 6JA		

SAP Rating	83 B	**DER**	3.28	**TER**	9.62
Environmental	97 A	**% DER < TER**			65.90
CO_2 Emissions (t/year)	0.54	**DFEE**	41.64	**TFEE**	45.11
Compliance Check	See BREL	**% DFEE < TFEE**			7.67
% DPER < TPER	32.59	**DPER**	34.16	**TPER**	50.67

Assessor Details	Mrs. Manal Bashir	**Assessor ID**	L797-0001
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	2024	
3.0 Property Age Band	L	
4.0 Sheltered Sides	1	
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:	49.20 m	94.02 m²	2.39 m
1st Storey:	29.58 m	85.52 m²	2.67 m
2nd Storey:	25.27 m	32.63 m²	2.38 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	23.31	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 Brick/Block Wall	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	201.77	160.30	0.00	None	41.47	Enter Gross Area
Wall to Garage	Cavity Wall	Cavity wall; plasterboard on dabs or battens, lightweight aggregate block, filled cavity, any outside structure	0.19	110.00	23.91	23.91	0.00	None	0.00	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	64.70	0.00	None

9.2 Internal Walls

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Timber Stud Partition	Plasterboard on timber frame	9.00	262.72

Summary for Input Data

elmhurst energy

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
Main Roof	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	85.52	85.52	None	0.00	Enter Gross Area	0.00
Terrace Roof	External Flat Roof	Plasterboard, insulated flat roof	0.13	9.00	5.29	5.29	None	0.00	Enter Gross Area	0.00
Bay Roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	2.51	2.51	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings

Description	Storey	Construction	Area (m²)
Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	85.52

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	0.12	None	0.00	75.00	94.02

11.2 Internal Floors

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor		Plasterboard ceiling, carpeted chipboard floor	9.00	85.52

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Door	Manufacturer	Solid Door			Air Filled	0.00	Wood	0.70	1.00
Windows	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Bifold Door	BFRC, BSI or CERTASS data	Window	Double Low-E Soft 0.1		Air Filled	0.43	Wood	1.00	1.20
Dormer Windows	Manufacturer	Window	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20
Roof Light	Manufacturer	Roof Light	Double Low-E Soft 0.1		Air Filled	0.63	Wood	0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Front Elevation	Door	External Brick/Block Wall	East	3.80	0
Front Elevation	Windows	External Brick/Block Wall	East	10.40	0
Rear Elevation	Bifold Door	External Brick/Block Wall	West	16.21	0
Rear Elevation	Windows	External Brick/Block Wall	West	7.25	0
Side Elevation	Windows	External Brick/Block Wall	South	1.06	45
Side Elevation	Windows	External Brick/Block Wall	North	2.73	0

14.0 Conservatory	None	
15.0 Draught Proofing	100	%
16.0 Draught Lobby	No	

17.0 Thermal Bridging	Calculate Bridges	

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted	Reference:	Imported
E1 Steel lintel with perforated steel base plate	Independently assessed	25.26	0.05	0.05	Hi Therm	No
E3 Sill	Gov Approved Scheme	15.76	0.02	0.02	RCD	No
E4 Jamb	Gov Approved Scheme	48.86	0.02	0.02	RCD	No
E5 Ground floor (normal)	Gov Approved Scheme	49.20	0.11	0.11	RCD	No
E6 Intermediate floor within a dwelling	Gov Approved Scheme	29.58	0.00	0.00	RCD	No
E10 Eaves (insulation at ceiling level)	Gov Approved Scheme	17.09	0.07	0.07	RCD	No
E12 Gable (insulation at ceiling level)	Gov Approved Scheme	23.41	0.10	0.10	RCD	No
E14 Flat roof	Table K1 - Default	4.47	0.16	0.16		No
E17 Corner (inverted – internal area greater than external area)	Gov Approved Scheme	17.29	-0.09	-0.09	RCD	No
E16 Corner (normal)	Gov Approved Scheme	37.54	0.05	0.05	RCD	No
E15 Flat roof with parapet	Table K1 - Default	7.89	0.30	0.30		No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	10.95	0.15	0.15		No

Y-value	0.04	W/m²K

18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Property Tested?	Yes	
Test Method	Blower Door	

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present	Yes
Approved Installation	No
Mechanical Ventilation data Type	Database

Summary for Input Data

Type	Mechanical extract ventilation - decentralised
MV Reference Number	500787
Duct Type	Rigid
MVHR Efficiency	0.00
Wet Rooms	5
SFP from Installer Commissioning Certificate	No

19.1 Mechanical extract ventilation - Decentralised

SFP	Fan/Room Type	Count
0.13	In Room Fan Kitchen	1
0.11	In Room Fan Other Wet Room	5
0.00	In Duct Fan Kitchen	0
0.00	In Duct Fan Other Wet Room	0
0.10	Through Wall Fan Kitchen	0
0.10	Through Wall Fan Other Wet Room	0

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	75.00	10	750	35

24.0 Main Heating 1	Database	
Description	aroTHERM plus 10kW	
Percentage of Heat	100.00	%
Database Ref. No.	104983	
Fuel Type	Electricity	
SAP Code	0	
In Winter	322.97	
In Summer	186.49	
Model Name	aroTHERM plus 10kW + AI	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2207	
Delayed Start Stat	No	
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	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Enter value	
Flow Temperature Value	45.00	
Boiler Interlock	No	
25.0 Main Heating 2	None	
26.0 Heat Networks	None	

Summary for Input Data

	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	1	
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
Bathroom 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 1	Combi boiler or unvented hot water system	8.00		No	
Ensuite 2	Combi boiler or unvented hot water system	8.00		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	300.00	L
Loss	1.60	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