Sustainability and Energy Statement

Land at South Hill, Storrington Road, Thakeham, Pulborough

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Executive Summary

This Sustainability and Energy Statement has been prepared in support of a planning application for the construction of five detached houses on land at South Hill, Storrington Road, Thakeham, Pulborough.

The Statement includes an energy strategy showing how selected energy efficiency, low carbon and renewable energy measures have been considered and those, which have been included into the scheme.

The five houses are similar in scale and design and therefore SAP calculations have been prepared for one of them based upon the construction specification set out within the report and the detailed planning drawings. The results have been aggregated across all five units to provide an accurate assessment of the total carbon dioxide emissions from the site and have allowed a number of different specifications and systems to be tested.

It is proposed to enhance the fabric insulation standards of the houses above the minimum required by the Building Regulations. This includes targeting an air tightness value of 4.0, which is 50% better than required by Part L of the Building Regulations (2021).

Various technologies have been considered and whilst wind turbines, combined heat and power, ground source heat pumps and solar hot water heating panels are not considered appropriate, it is proposed to install an air source heat pump into each house. All heating to the houses will be provided by renewable technology. Whilst photovoltaic panels are not proposed, each house could sustain a small array on the south orientated, side roof of each house.

The reduction in emissions from energy efficiency and renewable technologies can be summarised as;

	Emissions	% Reduction
	kg CO^2/year	%
Baseline Carbon Dioxide Emissions (TER)	9,070	
Be Green – Emissions after air source heat pumps (DER)	3,194	**64.79%**

A separate Water Neutrality Statement has been prepared and considers the water efficiency measures incorporated into the development.

1.0 Introduction

This report has been commissioned by Cygnature Homes Ltd and provides a Sustainability and Energy Statement for the construction of five detached houses on land at South Hill, Storrington Road, Thakeham, Pulborough.

The report describes the methodology used in assessing the development and the initiatives proposed.

The houses have been designed and will be constructed to reduce energy demand and carbon dioxide emissions. The objective is to reduce the energy demand to an economic minimum by making investments in the parts of the houses that have the greatest impact on energy demand and are the most difficult and costly to change in the future, namely the building fabric.

Once cost effective structures have been designed, low-carbon and renewable technologies have been considered to provide heat and/or electricity.

The following hierarchy has been followed:

- Be Lean reduce demand and consumption
- Be Clean increase energy efficiency
- Be Green provide low carbon renewable energy sources

The report has been prepared by Ivan Ball of Bluesky Unlimited who are sustainability consultants.

2.0 Planning Policy Context

National Policy

The UK Government published its sustainable development strategy in 1999 entitled "A better quality of life: A strategy for sustainable development in the UK". This sets out four main objectives for sustainable development in the UK:

- Social progress that recognises the needs of everyone.
- Effective protection of the environment.
- Prudent use of natural resources.
- Maintenance of high stable levels of economic growth and employment.

Sustainable Communities: Building for the Future, known colloquially as the Communities Plan was published in 2003. The Plan sets out a long-term programme of action for delivering sustainable communities in both urban and rural areas. It aims to tackle housing supply issues in parts of the country, low demand in other parts and the quality of our public spaces. The Communities Plan describes sustainable communities as: Active, inclusive and safe, well run, environmentally sensitive, well designed and built, well connected, thriving, well served and fair for everyone.

The most relevant national planning policy guidance on sustainability is set out in:

- National Planning Policy Framework - 2023

Paragraph 152 states;

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

Local Policies

Horsham District Council

The local planning policy is provided by the Horsham District Planning Framework, which was adopted in November 2015. The document replaces the Core Strategy and General Development Control Policies documents, which had been adopted in 2007.

The following policies are relevant to this Statement and may have been edited for clarity and specific relevance.

Policy 35

Strategic Policy: Climate Change

Development will be supported where it makes a clear contribution to mitigating and adapting to the impacts of climate change and to meeting the district's carbon reduction targets as set out in the Council's Acting Together on Climate Change Strategy, 2009.

Measures, which should be used to mitigate the effects of climate change include;

1. *Reduced energy use in construction;*
2. *Improved energy efficiency in new developments, including influencing the behaviour of occupants to reduce energy use;*
3. *The use of decentralised, renewable and low carbon energy supply systems;*
4. *The use of patterns of development which reduce the need to travel, encourage walking and cycling and include good accessibility to public transport and other forms of sustainable transport; and*
5. *Measures, which reduce the amount of biodegradable waste sent to landfill.*

Development must be designed so that it can adapt to the impacts of climate change, reducing vulnerability, particularly in terms of flood risk, water supply and changes to the district's landscape. Developments should adapt to climate change using the following measures:

1. *Provision of appropriate flood storage capacity in new building development;*
2. *Use of green infrastructure and dual use SuDS to help absorb heat, reduce surface water runoff, provide flood storage capacity and assist habitat migration;*
3. *Use of measures, which promote the conservation of water and/or grey water recycling;*
4. *Use of site layout, design measures and construction techniques that provide resilience to climate change (opportunities for natural ventilation and solar gain).*

If it is not possible to incorporate the adaption and mitigation measures proposed, an explanation should be provided as to why this is the case.

Policy 36

Strategic Policy: Appropriate Energy Use

Energy hierarchy

All development will be required to contribute to clean, efficient energy in Horsham based on the following hierarchy:

1. *Lean – use less energy – e.g. through demand reduction*
2. *Clean – supply energy efficiently – e.g. through heat networks*
3. *Green – use renewable energy sources*

Energy Statements

All applications for residential or commercial development must include an Energy Statement demonstrating and quantifying how the development will comply with the Energy Hierarchy.

Policy 37

Sustainable Construction

Proposals must seek to improve the sustainability of development. To deliver sustainable design, development should incorporate the following measures where appropriate according to the type of development and location:

1. *Maximise energy efficiency and integrate the use of decentralised, renewable and low carbon energy;*
2. *Limit water use to 110 litres/person/day;*
3. *Use design measures to minimise vulnerability to flooding and heatwave events;*
4. *Be designed to encourage the use of natural lighting and ventilation;*
5. *Be designed to encourage walking, cycling, cycle storage and accessibility to sustainable forms of transport;*
6. *Minimise construction and demolition waste and utilise recycled and low-impact materials;*
7. *Be flexible to allow future modification of use or layout, facilitating future adaptation, refurbishment and retrofitting;*
8. *Incorporate measures, which enhance the biodiversity value of development.*

All new development will be required to provide satisfactory arrangements for the storage of refuse and recyclable materials as an integral part of design.

3.0 Assessment Methodology

The baseline carbon dioxide emissions from the site have been established using agreed building specifications and the detailed planning drawings.

The five houses are similar in scale and design and SAP calculations has been prepared for one of them which is proposed as indicative of all five. These calculations have allowed different fabric specifications and technologies to be tested.

Emission Factors

The CO_2 emission factors, where applicable, used throughout this report have been taken from the Building Regulation Approved Document L - 2021.

	kg CO_2/kWh
Mains gas	0.210
Grid supplied and displaced electricity	0.136

4.0 Proposal

The proposal is for the construction of five, detached houses.

The accommodation schedule is;

Unit Type	Number	Area	Total Area
		m^2	m^2
5-Bedroom Detached houses	3	225.8	677.4
5-Bedroom Detached houses	2	229.6	459.2
	5		**1,136.6**

5.0 Energy Efficiency

5.1 Demand Reduction (Be Lean and Be Clean)

Design

The energy performance of a building is affected by its design, construction and use and whilst occupant behaviour is beyond the remit of this statement, better design and construction methods can significantly reduce the life cycle emissions of a building and assist the occupant to reduce consumption.

Sustainable design is not just about incorporating renewable technologies; buildings should be designed at the outset to provide suitable environmental conditions for the occupants whilst also consuming as little energy as practical.

Passive Design Measures

The passive design measures proposed include;

Passive Solar Gain

The houses are designed with multiple aspects and all have excellent solar orientation and will benefit from direct sunlight throughout the day.

Natural Daylighting

The orientation and the size of the windows have been optimised to maximise the amount of natural daylight and therefore reduce the demand for artificial lighting.

Efficient Building Fabric

Building Envelope

U-values of the building envelope must meet Building Regulations Part L1 standards and further improvements to U-values will reduce the dwelling heating requirements.

There is a commitment to exceed the minimum U-values required by the Building Regulations.

It is assumed that the houses will be constructed using traditional load bearing cavity walls with an external skin of either 102mm facing brickwork, render on 100mm dense concrete block or weather boarding on 100mm dense concrete block with 150mm fully filled cavities and 100mm medium density blockwork internally.

Ground floors will be insulated with at least 150mm thick PIR insulation.

Cold roofs will be insulated with 450mm of mineral wool.

Windows are proposed as double glazed with Low 'e' soft coat and argon filled.

It is proposed to set maximum limits for the elemental U-values as follows:

Element	Part L Limiting U-values	Proposed U-values	Proposed Improvement
	W/m²K	W/m²K	
Ground Floor	**0.18**	**0.13**	**28%**
External Walls	**0.26**	**0.18**	**31%**
Roofs (cold roofs)	**0.16**	**0.10**	**38%**
Sloping Ceilings & Dormers	**0.16**	**0.15**	**6%**
Entrance & Utility Doors	**1.60**	**1.20**	**25%**
Windows and Glazed Doors	**1.60**	**1.20**	**25%**

'g' value for glazing	**0.63**

Air Leakage

Large amounts of heat are lost in winter through air leakage from a building (also referred to as infiltration or air permeability) often through poor sealing of joints and openings in the building

The Building Regulations set a minimum standard for air permeability of 8 m^3 of air per hour per m^2 of envelope area, at 50Pa. It is proposed to target a 50% improvement over Building Regulations and achieve a permeability of 4.0 $m^3/hr/m^2$.

Thermal Bridging

The significance of Thermal Bridging, as a potentially major source of fabric heat losses, is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the Thermal Bridging is no longer an option and will not achieve the fabric energy efficiency and energy and CO_2 reduction targets set out in this strategy.

The buildings will use the thermal details formulated by the Concrete Block Association, which will enable the buildings to achieve the higher energy efficiency requirements of the Building Regulations.

The bridging losses have been based upon the following values;

Reference	Location	PSI Value
		W/mK
E2	Other Lintels (including other steel lintels)	0.058
E3	Sill	0.036

E4	Jamb	0.023
E5	Ground Floor (Normal)	0.165
E6	Intermediate Floor within a Dwelling	0.002
E10	Eaves (Insulation at Ceiling Level)	0.053
E12	Gable (insulation at Ceiling Level)	0.217
E16	Corner (normal)	0.041
E17	Corner (inverted)	-0.062

Ventilation

As a result of increasing thermal efficiency and air tightness, Building Regulations Approved Document F was also revised in 2021 to address the possibility of overheating and poor air quality. The ventilation to any En-Suites and Bathrooms will be comprised of continuous extract ventilation as per System 3 criteria. This reduces the number of external penetrations required to the building envelope.

Active Design Measures will include;

Efficient Lighting and Controls

Throughout the scheme natural lighting will be optimised.

Approved Document L1 requires internal light fittings to have lamps with a minimum luminous efficacy of 85 light source lumens per circuit-watt.

Space Heating and Hot Water

It is proposed to install air source heat pumps to all houses. The SAP modelling has been based upon the installation of Vaillant aroTHERM air source heat pumps although other makes of heat pumps will make marginal changes to the emissions calculations.

5.2 Establishing Carbon Dioxide Emissions

The five houses are similar in scale and design and therefore SAP calculations have been prepared for one of the units, which is proposed as representative of the five.

The Summary SAP Report is attached as Appendix 1 but the results from the SAP Worksheets can be summarised as:

5-Bedroom Detached house – 225.8 m^2	CO_2 TER	CO_2 DER
	kg/yr	kg/yr
Space heating	1,798.84	338.25
Water heating	664.94	243.68
Electricity for pumps and fans	11.93	0.00
Electricity for lighting	48.42	52.52
Energy saving/ generation technologies	-721.34	0.00
Total CO_2 Emissions	1,802.78	634.45
Emissions Rates	**7.98**	**2.81**

The above results can be aggregated across the five houses in order to calculate the total site emissions as follows;

Unit	Area	CO_2 TER	CO_2 DER
	m^2	kg/yr	kg/yr
5-Bedroom Detached houses	1,136.6	9,070	3,194
Total	**1,136.6**	**9,070**	**3,194**

The total emissions allowable through the Building Regulations (TER) are calculated as:

- **9,070 kg CO_2 per year**

With total actual site emissions (DER) assessed as:

- **3,194 kg CO_2 per year**

The carbon dioxide emissions are reduced by 5,876 kg CO_2 per year as a result of the energy efficiency measures and the air source heat pumps installed onto the houses.

This equates to a reduction of 64.79%.

5.3 Low-Carbon and Renewable Technologies (Be Green)

This section determines the appropriateness of various low-carbon and renewable technologies to the development.

The Government's Renewable Obligation defines renewable energy in the UK. The identified technologies are;

- Small hydro-electric
- Landfill and sewage gas
- Onshore and offshore wind
- Biomass
- Tidal and wave power
- Geothermal power
- Solar

The use of landfill or sewage gas, offshore wind or any form of hydroelectric power is not suitable for the site due to its location. The remaining technologies are considered below;

Wind

Wind turbines are available in various sizes from large rotors able to supply whole communities to small roof or wall-mounted units for individual dwellings.

The Government wind speed database predicts local wind speeds at Storrington Road to be 4.7 m/s at 10m above ground level and 5.5 m/s at 25m above ground level. This is below the level generally required for commercial investment in large wind turbines. In addition the land take, potential for noise and signal interference make a large wind turbine unsuitable for this development.

Roof mounted turbines could be used at the development to generate small but valuable amounts of renewable electricity but the small output and contribution to total emissions means any investment would be small and purely tokenism. In addition the use of wind turbines will have a detrimental aesthetic impact on the appearance of the development.

Combined Heat and Power and Community Heating

Combined heat and power (CHP) also called co-generation is a de-centralised method of producing electricity from a fuel and 'capturing' the heat generated for use in buildings. The plant is essentially a small-scale electrical power station. The production and transportation of electricity via the National Grid is very inefficient with over 65% of the energy produced at the power station being lost to the atmosphere and through transportation.

CHP units are generally gas fuelled and generate electricity with heat being a by-product. The heat is usually used to meet the hot water load, which is fairly consistent throughout the year.

Historically CO_2 savings have been achieved because gas has been used to generate electricity and gas has had a lower emissions factor than electricity, However, with the de-carbonisation of the electricity grid the benefit of CHP is negated and consequently the use of a CHP would increase emissions rather than reduce them.

CHP is not proposed.

Ground Source Heat Pumps

Sub soil temperatures are reasonably constant and predictable in the UK, providing a store of the sun's energy throughout the year. Below London the groundwater in the lower London aquifer is at a fairly constant temperature of 12º C. Ground source heat pumps (GSHP) extract this low-grade heat and convert it to usable heat for space heating.

GSHP operates on a similar principle to refrigerators, transferring heat from a cool place to a warmer place.

They operate most efficiently when providing space heating at a low temperature, typically via under floor heating or with low temperature radiators.

There is insufficient external ground area to accommodate a horizontal collection system for the houses and a vertical bore hole collection system would be required.

The infrastructure required for ground source heat pumps makes them more expensive than other low-carbon options and the additional costs associated with the installation a bore hole for each unit makes them cost prohibitive when compared to air source heat pumps.

Ground source heat pumps are not proposed.

Solar

(i) Solar Water Heating

Solar hot water panels use the suns energy to directly heat water circulating through panels or pipes. The technology is simple and easily understood by purchasers.

Solar hot water heating panels are based generally around two types, which are available being 'flat plate collectors' and 'evacuated tubes'. Flat plate collectors can achieve an output of up to 1,124 kWh/annum (Schuco) and evacuated tubes can achieve outputs up to 1,365 kWh/annum (Riomay).

Panels are traditionally roof mounted and for highest efficiencies should be mounted plus or minus 30 degrees of due south. Evacuated tubes can be laid horizontally on flat roofs but flat plate collectors are recommended for installation at an incline of 30 degrees.

Panels could be installed on each of the houses and assuming the panels would reduce energy demand by 50% the installations could reduce the total site energy demand by **4,329 kWh per year.**

This equates to a reduction of **589 kg CO_2 per year**, which would equate to an increase in the total reduction in emissions of **6.49%.**

The emissions are already reduced significantly through the installation of air source heat pumps and whilst solar hot water heating panels could be installed the additional reduction is emissions does not represent good value compared to other options.

Solar hot water heating panels are not proposed.

(ii) Photovoltaics

Photovoltaic panels (PV) provide clean silent electricity. They generate electricity during most daylight conditions although they are most efficient when exposed to direct sunlight or are orientated to face plus or minus 30 degrees of due south.

Whilst not specifically proposed, each house could sustain a small photovoltaic array on the south orientated, side roof of each house.

Air Source Heat Pumps (ASHP)

Air sourced heat pumps operate using the same reverse refrigeration cycle as ground source heat pumps, however the initial heat energy is extracted from the external air rather than the ground. These heat pumps can be reversed to provide cooling to an area although this reduces the coefficient of performance of the pumps.

ASHP tend to have a lower coefficient of performance (CoP) than GSHP but are considerably less costly to install. They work well where there is a large low temperature demand but the efficiency can be impacted on, for example where there is a high hot water demand.

The proposal is appropriate for the installation of air source heat pumps and the SAP calculations have been based on the use of this technology.

5.4 Summary of Energy Strategy and Proposals for Renewable Technologies

Be Lean and Be Green (ASHPs)

SAP calculations have been prepared for one of the houses using the methodology set out in Part L of the Building Regulations (2021).

The Summary SAP Report is as Appendix 1. This is based on the enhanced fabric specification set out above and the installation of air source heat pumps.

The total site CO_2 emissions are calculated as **9,070 kg CO_2 per year** (TER) and **3,194 kg CO_2 per year** (DER)**.**

This equates to a reduction of **5,876 kg CO_2 per year** or **64.79%** of the total TER emissions.

Summary

The total reduction in emissions as a result of the fabric specification and air source heat pumps installed into the houses are calculated as 5,876 kg CO_2 per year, which equates to a reduction of 64.79%.

6.0 Surface Water Drainage

Sustainable Drainage Systems (SUDS)

The site lies within Flood Zone 1 and is classified as being of low risk.

The surface water run-off will be dealt with on site through the use of permeable surfacing and soakaways or if the permeability of the subsoil is insufficient to sustain soakaways the surface water will drain to the existing watercourse on the eastern boundary of the site.

Attenuation will be provided (if required) to ensure the rate of run-off to the watercourse does not exceed greenfield run-off rates.

The houses have private gardens and discretely located rainwater butts will be provided to store rainwater for use with landscaping maintenance.

Consideration has been given to the use of grey water recycling. However, customer's resistance to the appearance of the recycled water and the cost of the systems does not currently make them a viable option. They have therefore not been included in the proposals.

Foul Drainage

Foul drainage from the site will drain into the existing mains sewer in Vicarage Hill

7.0 Materials and Waste

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. A full evaluation of these suppliers will be undertaken at the next stage of design.

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

All insulation materials to will have a zero ozone depleting potential

Construction waste

Targets will be set to promote resource efficiency in accordance with guidance from WRAP, Envirowise, BRE and DEFRA.

The overarching principle of waste management is that waste should be treated or disposed of within the region where it is produced.

Construction operations generate waste materials as a result of general handling losses and surpluses. These wastes can be reduced through appropriate selection of the construction method, good site management practices and spotting opportunities to avoid creating unnecessary waste.

The Construction Strategy will explore these issues, some of which are set out below:

- Proper handling and storage of all materials to avoid damage.
- Efficient purchasing arrangements to minimise over ordering.
- Segregation of construction waste to maximise potential for reuse/recycling.
- Suppliers who collect and reuse/recycle packaging materials.

Appendix 1 – Summary SAP Report for the Modelled Unit

Summary for Input Data

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Property Reference	Thakeham 5BH DET 225	**Issued on Date**	11/10/2023
Assessment Reference	Thakeham 5BH DET 225	**Prop Type Ref**	5BH DET 225
Property	Land at South Hill, Storrington Road, Thakeham, West Sussex, RH20 3EN		

SAP Rating	85 B	**DER**	2.81	**TER**	7.98
Environmental	97 A	**% DER < TER**			64.79
CO_2 Emissions (t/year)	0.57	**DFEE**	37.35	**TFEE**	39.68
Compliance Check	See BREL	**% DFEE < TFEE**			5.88
% DPER < TPER	30.68	**DPER**	29.20	**TPER**	42.12

Assessor Details	Mr. Ivan Ball	**Assessor ID**	X001-7283
Client			

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

Orientation	Southeast	
Property Tenture	1	
Transaction Type	6	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
4.0 Sheltered Sides	2	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Enter TMP value	
Thermal Mass	250.00	kJ/m²K
7.0 Electricity Tariff	Standard	
Smart electricity meter fitted	No	
Smart gas meter fitted	No	

7.0 Measurements

	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
Ground floor:	44.04 m	112.90 m²	2.50 m
1st Storey:	44.04 m	112.90 m²	2.50 m

8.0 Living Area	21.40	m²

9.0 External Walls

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
External Wall 1	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18		220.20	173.40	0.00	None	46.80	Enter Gross Area

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
External Roof 1	External Plane Roof	Plasterboard, insulated at ceiling level	0.10	9.00	112.90	109.60	None	0.00	Enter Gross Area	3.30

11.0 Heat Loss Floors

Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
Heatloss Floor 1	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.13	None	0.00	75.00	112.90

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Rooflight	Manufacturer	Roof Light	Double Low-E Soft 0.05			0.63		0.70	1.20
Half Glazed Door	Manufacturer	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.20
Solid Door	Manufacturer	Solid Door							1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
Living & Kitchen	Windows	External Wall 1	West	10.80	
Family	Windows	External Wall 1	West	3.38	
Family	Windows	External Wall 1	West	1.80	

Summary for Input Data

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Dining & Study	Windows	External Wall 1	East	7.92	
Coats & WC	Windows	External Wall 1	East	1.62	
Living	Windows	External Wall 1	South	1.80	
Bed 1 & 2	Windows	External Wall 1	West	4.86	
Bathroom	Windows	External Wall 1	West	1.62	
Bed 3, 4 & 5	Windows	External Wall 1	East	7.29	
E/S 1	Windows	External Wall 1	North	0.72	
E/S 2	Windows	External Wall 1	South	0.72	
Utility	Half Glazed Door	External Wall 1	North	2.02	
Front Door	Solid Door	External Wall 1	East	2.25	
Lantern	Rooflight	External Roof 1	South	3.30	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
E5 Ground floor (normal)	Non Gov Approved Schemes	44.04	0.17	0.17	No
E2 Other lintels (including other steel lintels)	Non Gov Approved Schemes	28.00	0.06	0.06	No
E3 Sill	Non Gov Approved Schemes	19.80	0.04	0.04	No
E4 Jamb	Non Gov Approved Schemes	63.00	0.02	0.02	No
E6 Intermediate floor within a dwelling	Non Gov Approved Schemes	44.04	0.00	0.00	No
E11 Eaves (insulation at rafter level)	Non Gov Approved Schemes	44.04	0.01	0.01	No
E16 Corner (normal)	Non Gov Approved Schemes	30.00	0.04	0.04	No
E17 Corner (inverted – internal area greater than external area)	Non Gov Approved Schemes	10.00	-0.06	-0.06	No

Y-value	0.03	W/m²K
18.0 Pressure Testing	Yes	
Designed AP_{50}	4.00	m³/(h.m²) @ 50 Pa
Test Method	Blower Door	
19.0 Mechanical Ventilation		
Mechanical Ventilation		
Mechanical Ventilation System Present	No	
20.0 Fans, Open Fireplaces, Flues		
21.0 Fixed Cooling System	No	
22.0 Lighting		
No Fixed Lighting	No	

Name	Efficacy	Power	Capacity	Count
Lighting 1	80.00	5	400	50

24.0 Main Heating 1	Database	
Percentage of Heat	100.00	%
Database Ref. No.	103756	
Fuel Type	Electricity	
In Winter	0.00	
In Summer	0.00	
Model Name	aroTHERM 12kW	
Manufacturer	Vaillant Group UK Ltd	
System Type	Heat Pump	
Controls SAP Code	2208	
Is MHS Pumped	Pump in heated space	
Heating Pump Age	2013 or later	
Heat Emitter	Radiators and Underfloor	
Underfloor Heating	Yes - Pipes in Concrete	
Flow Temperature	Enter value	
Flow Temperature Value	35.00	
25.0 Main Heating 2	None	

Summary for Input Data

elmhurst energy

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										
Heat source 2										
Heat source 3										
Heat source 4										
Heat source 5										

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	No	
Cold Water Source	From mains	
Bath Count	1	
Immersion Only Heating Hot Water	No	

28.3 Waste Water Heat Recovery System

29.0 Hot Water Cylinder	Hot Water Cylinder	
Cylinder Stat	No	
Cylinder In Heated Space	No	
Independent Time Control	No	
Insulation Type	Measured Loss	
Cylinder Volume	250.00	L
Loss	1.22	kWh/day
Pipes insulation	Fully insulated primary pipework	
In Airing Cupboard	No	
31.0 Thermal Store	None	
34.0 Small-scale Hydro	None	

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement SAP rating	Environmental Impact
	£4,000 - £6,000	£76	B 86	A 97
	£3,500 - £5,500	£229	B 90	A 98
			0	0