

Sustainability & Energy Statement

The Old Thatch, Lower Sandhurst Road, Finchampstead

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Executive Summary

This Sustainability and Energy Statement has been prepared in support of a detailed planning application for the demolition of the existing house at The Old Thatch, Lower Sandhurst Road, Finchampstead and the erection of a new energy efficient 4-bedroom detached house.

The adopted planning policy (CC05) requires a reduction in emissions of at least 10% through the installation of low-carbon and/or renewable technologies.

SAP calculations have been prepared for the house, which have been based on the detailed planning drawings and the specification set out in the report.

The fabric insulation standards and the construction specification of the house will exceed the minimum required by the Building Regulations. Whilst various technologies are considered appropriate it is proposed to install an air source heat pump into the house, which is regarded as a renewable technology.

In order to demonstrate the reduction from the installation of the air source heat pump a further set of SAP calculations have been prepared for the house but based on the installation of a gas boiler. These provide a baseline against which the air source heat pump SAP calculations can be compared and hence the reduction from renewable technologies.

The DER Worksheets for both options are attached as Appendices 1 and 2 respectively.

The carbon dioxide emissions and the reductions from the installation of an air source heat pump can be summarised as follows;

	Total Emissions	% Reduction
	kg CO ₂ per year	
Baseline (DER emissions based on a gas boiler)	4,325	
Emissions after an Air Source Heat pump (renewable technologies)	917	78.80%

The EPC for the existing dwelling sets out a number of measures which could be initiated to reduce emissions from the existing house and proposes that if all measures were implemented the emissions could be reduced from the current 12.0 tonnes of CO₂ per year to **8.3 tonnes**.

However, if it is assumed the emissions could be reduced to 8.3 tonnes of CO₂ this is still **7.383 tonnes** more than the proposed new house (0.917 tonnes). Therefore, if all measures set out in the existing EPC were implemented the emissions from the improved existing house would still be **88%** more than the proposed new house.

The EPC also provides an assessment of the energy demand for space heating and hot water for the existing house as **37,041 kWh per year**. The energy demand for space heating and hot water for the proposed new house is **5,640 kWh per year** (lines 261 and 264 in Appendix 2)

Therefore, even though the new house has a greater floor area than the existing dwelling the energy demand is reduced by 85% as a result of the energy efficiency measures and systems incorporated into the new dwelling.

The water efficiency measures incorporated within the house will ensure the water use is less than 105 litres per person per day (excluding 5 l/p/d for external water use) and achieves the enhanced standard required by the Building Regulations.

The proposals significantly exceed the requirements of the planning policy.

1.0 Introduction

This report has been commissioned by Mr and Mrs R Westell and provides a Sustainability and Energy Statement in support of a detailed planning application for the demolition of the existing house at The Old Thatch, Lower Sandhurst Road, Finchampstead and the erection of a new energy efficient 4-bedroom detached house.

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

The house has been designed and will be constructed to reduce energy demand and carbon dioxide emissions.

The objective has been to reduce the energy demand to an economic minimum by making investments in the parts of the building 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 a cost-effective structure has been designed, low-carbon and renewable technologies have been considered to provide further emissions reductions.

The following hierarchy has been followed:

- Lean reduce demand and consumption
- Clean increase energy efficiency
- 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 – December 2024

Paragraph 161 states;

‘The planning system should support the transition to net zero by 2050 and take full account of all climate impacts including overheating, water scarcity, storm and flood risks 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 Policy

Wokingham Borough Local Development Framework – Adopted Core Strategy Development Plan Document, January 2010

CP1 – Sustainable development

Planning permission will be granted for development proposals that:

- 1) Maintain or enhance the high quality of the environment;*
- 2) Minimise the emission of pollutants into the wider environment;*
- 3) Limit any adverse effects on water quality (including ground water);*
- 4) Ensure the provision of adequate drainage;*
- 5) Minimise the consumption and use of resources and provide for recycling;*
- 6) Incorporate facilities for recycling of water and waste to help reduce per capita water consumption;*
- 7) Avoid areas of best and most versatile agricultural land;*
- 8) Avoid areas where pollution (including noise) may impact upon the amenity of future occupiers;*
- 9) Avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater);*
- 10) Provide attractive, functional, accessible, safe, secure and adaptable schemes;*
- 11) Demonstrate how they support opportunities for reducing the need to travel, particularly by private car in line with CP6; and*
- 12) Contribute towards the goal of reaching zero-carbon developments as soon as possible by:*
 - a) Including appropriate on-site renewable energy features; and*
 - b) Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.*

CP2 - Inclusive communities

To ensure that new development contributes to the provision of sustainable and inclusive communities (including the provision of community facilities) to meet long term needs, planning permission will be granted for proposals that address the requirements of:

- a) An ageing population, particularly in terms of housing, health and wellbeing;*
- b) Children, young people and families, including the co-ordination of services to meet their needs;*
- c) People with special needs, including those with a physical, sensory or learning disability or problems accessing services; and*
- d) The specific identified needs of minority groups in the borough, including Gypsies, Travellers and Travelling Showpeople and black and minority ethnic groups. Proposals for gypsies, travellers and travelling showpeople (including allocations in other Development Plan Documents) will demonstrate that:*

- i) *The site is located either within or close to the development limits of a settlement in policy CP9 in order to maximise the possibilities for social inclusion and sustainable patterns of living; and*
- ii) *The proposed site is not disproportionate to the scale of the existing settlement whether singly or cumulatively with any existing sites in the area.*

Wokingham Borough Development Plan – Adopted Managing Development Delivery Local Plan, February 2014

Policy CC01 – Presumption in Favour of Sustainable Development

- 1. *Planning applications that accord with the policies in the Development Plan for Wokingham Borough will be approved without delay, unless material considerations indicate otherwise.*
- 2. *Where there are no policies relevant to the application or relevant policies are out of date at the time of making the decision then the Council will grant permission unless material considerations indicate otherwise – taking into account whether:*
 - a. *Any adverse impacts of planning permission would significantly and demonstrably outweigh the benefits, when assessed against the policies in the National Planning Policy Framework (NPPF) taken as a whole; or*
 - b. *Specific policies in the National Planning Policy Framework indicate that development should be restricted.*

Policy CC04: Sustainable Design and Construction

Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by:

- 1. *In respect of all new homes:*
 - a) *Seeking to achieve the requirements of the full Code for Sustainable Homes Level 4;**
 - b) *Meet internal potable water consumption targets of 105 litres or less per person per day (as part of the requirement to meet full Code for Sustainable Homes Level 4).*

Policy CC05: Renewable energy and decentralised energy networks

- 1. *Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged*
- 2. *Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for:*
 - a) *Schemes of more than 10 dwellings (gross), or*
 - b) *Non-residential proposals of more than 1,000 sq m gross floorspace.*

3. *Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:*
- a) *They are appropriate in scale, location and technology type;*
 - b) *Are compatible with the surrounding area, including the impact of noise and odour;*
 - c) *Do not have a damaging impact on the local topography and landscape;*
 - d) *There is no significant impact upon heritage assets, including views important to their setting;*
 - e) *In the case of wind turbines, take account of their cumulative effect and properly reflect their increasing impact on the landscape and on local amenity.*

Sustainable Design and Construction SPD, 28th May 2010 and **Companion Document to the Sustainable Design and Construction Supplementary Planning Document**, 28th May 2010.

In addition, this site comes under the jurisdiction of the **Finchampstead Neighbourhood Development Plan 2022-2038 Made Version September 2023**

Of relevance to the topic area of this Statement is the following policy:

Policy ES1 - Environmental standards for residential development

Development proposals for residential development should meet the following environmental standards:

- 1. *The achievement of improvements beyond those defined in Part L of the Building Regulations 2021 for minor residential developments or satisfy any higher standard that is required under new national planning policy or Building Regulations.*
- 2. *In addition, major residential development should be designed to achieve carbon neutral homes where this is both practicable and viable.*
- 3. *Conversions to residential and extensions to existing dwellings of 500 sqm of residential floorspace (gross) or more, should achieve or seek to achieve 'excellent' in domestic refurbishment as defined in the Building Research Establishment Environmental Assessment Method <https://www.breeam.com/>.*
- 4. *Provision is made for charging for electric vehicles in all domestic dwellings where garages or vehicle parking spaces are provided.*

These documents have been used to inform this Sustainability and Energy Statement.

* The Code for Sustainable Homes was revoked by the Government in 2015 and is no longer applicable.

3.0 Assessment Methodology

The carbon dioxide emissions from the house have been established using agreed building specifications and the accommodation schedule set out below.

SAP calculations have been prepared for the house, which provides an accurate estimate of the emissions from the site.

Emission Factors

The CO₂ emission factors, where applicable, used throughout this report have been taken from the Building Regulation Approved Document L - 2021.

	kg CO ₂ /kWh
Grid supplied and displaced electricity	0.136
Mains gas	0.210

4.0 Proposal

The proposal is for the demolition of the existing house and the construction of a new energy efficient 4-bedroom detached house.

The accommodation schedule in details is;

Unit Type	Number	Area
		m ²
4-Bedroom Detached house	1	401.8
Total	1	401.8

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 Solar Gain

Passive measures include allowing for natural ventilation and exposed thermal mass coupled with high levels of insulation, air tightness and the control of solar gain.

The position of the new house within plot is broadly in a similar location and has similar orientations as the existing unit. The proposed house has primary orientations towards the west (front) and east (rear) and the house benefits 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 L (2021) standards and further improvements to U-values will reduce the home's heating requirements.

The strategy follows a fabric first approach and the specification proposed for the various thermal elements exceeds the limiting U-values required by the Building Regulations.

The modelling has been based upon the use of traditional cavity wall construction with external walls built with 102mm facing brick, 150mm fully-filled cavities (with DriTherm 32 or similar) and a 100mm medium dense concrete block internally.

The ground floor will be insulated with 150mm PIR insulation and roofs (cold) with 450mm of mineral wool insulation. The flat roof over the rear bay will be insulated with at least 150mm PIR insulation.

Other constructions will meet the targeted U-values.

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/m ² K	W/m ² K	
Ground Floors	0.18	0.13	28%
External Walls	0.26	0.18	31%
Roofs (lofts)	0.16	0.10	38%
Flat Roof	0.16	0.13	19%
Windows and Glazed Doors	1.60	1.20	25%
Entrance Door	1.60	1.00	38%

'g' Value for Glazing	0.50
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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 m³ of air per hour per m² of envelope area, at 50Pa. The house will target a 38% improvement over Building Regulations and will seek to achieve a permeability of 5.0 m³/hr/m² or better.

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 CO₂ reduction targets set out in this strategy.

The thermal details for the building will be modelled at the detailed working drawing stage but for the purposes of this assessment the thermal details formulated by the Recognised Construction Details have been used. Any details not available on the RCD website will be modelled.

These will enable the building to achieve the higher energy efficiency requirements of the Building Regulations.

The following table provides the values currently used within the modelled SAP calculations.

Reference	Location	PSI Value
		W/mK
E2	Other Lintels (including other steel lintels)	0.028
E3	Sill	0.024
E4	Jamb	0.019
E5	Ground Floor (Normal)	0.046
E6	Intermediate Floor within a dwelling	0.000
E10	Eaves (Ceiling)	0.051
E12	Gable (Ceiling)	0.029
E14	Flat Roof	0.041
E16	Corner (normal)	0.037
E17	Corner (inverted)	-0.079

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 Cloakrooms, 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.

Part L of the Building Regulations requires all light fitting to have lamps with a minimum luminous efficacy of 80 light source lumens per circuit-watt. It is assumed the specification will exceed this and all fittings will target 95 lumens per circuit-watt.

Space Heating and Hot Water

The baseline SAP modelling has been based upon the use of a Vaillant gas boiler installed to the house but the proposed specification is based upon the installation of a Vaillant aroTHERM air source heat pump installed to the house.

5.2 Establishing Baseline Carbon Dioxide Emissions - GAS

SAP calculations have been prepared for the house using a gas boiler. This is not the proposed specification but provides the baseline against which the actual specification can be compared.

The DER Worksheets are attached as Appendix 1 but the emissions can be summarised as follows:

4-Bedroom Detached house – 401.8 m ²	CO ₂ DER
	kg/yr
Space heating	3,456.40
Water heating	789.93
Electricity for pumps, fans & keep-hot	11.93
Electricity for lighting	66.24
Total	4,324.50
DER Emissions Rate (kg CO₂/yr)	10.76

The baseline emissions from the site based on the installation of gas heating system to the house is calculated as **4,325 kg CO₂ per year**.

5.3 Low-Carbon and Renewable Technologies (Be Clean and Be Green)

The carbon dioxide emissions established above have been used to test the viability of various renewable and low carbon technologies as follows. This section determines the appropriateness of each renewable technology.

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 Lower Sandhurst 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 CO₂ 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.

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 12° 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.

Whilst the house is set in a private garden area there may not be sufficient external ground area to sustain a horizontal collection system and the installation of a ground source heat pump may require the use of a bore hole collection system. In addition, the sub-soil conditions are currently unknown.

The use of a ground source heat pump may be feasible and will be investigated further at the detailed working drawing stage. A ground source heat pump is not proposed at this stage but will be investigated further.

Solar

(i) Solar Water Heating

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

It is assumed solar panels could reduce the energy demand of the hot water requirements by 50%.

The total reduction in emissions would be **395 kg CO₂ per year**, which equates to a reduction in total (DER) emissions of **9.13%**. The installation of solar hot water heating panels would not meet the requirements of the planning policy and in addition, they would not allow the house to achieve Building Regulation compliance using gas heating systems without additional measures.

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.

PV panels can be integrated into many different aspects of a development including roofs, walls, shading devices or architectural panels. The panels typically have an electrical warranty of 20-25 years and an expected system lifespan of 25-40 years.

Whilst the installation of photovoltaic panels to the house is feasible, it is calculated that a total of **12 x 400W** panels would be required to reduce emissions by the 10% required by the planning policy. These would need to be installed on the east orientated, rear roof of the house and the output of the panels has been discounted accordingly.

Whilst photovoltaic panels are feasible, they are not proposed at this stage.

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.

A further set of SAP calculations have been prepared for the house but with the benefit of an air source heat pump.

The DER Worksheets for the proposed specification are attached as Appendix 2 but the emissions can be summarised as follows:

4-Bedroom Detached house – 401.8 m ²	CO ₂ DER
	kg/yr
Space heating	593.44
Water heating	256.82
Electricity for pumps, fans & keep-hot	0.00
Electricity for lighting	66.24
Total	916.49
DER Emissions Rate (kg CO₂/yr)	2.28

The emissions from the site based on the installation of an air source heat pump are calculated as **917 kg CO₂ per year**. The reduction in emissions as a result of the installation of an air source heat pump is therefore **3,408 kg CO₂ per year**, which equates to a reduction of **78.80%**.

5.4 Summary of Calculations and Proposals for Low-carbon and Renewable Technologies

The baseline carbon emissions based on the installation of a gas heating system are assessed as **4,325 kg CO₂ per year**.

The local planning policy requires a reduction in emissions of 10% through the installation of low-carbon and/or renewable technologies.

Various technologies are considered above and whilst wind turbines, combined heat and power and solar hot heating panels are not considered appropriate the use of ground source heat pump, photovoltaic panels and air source heat pumps are considered feasible and appropriate (albeit the use of ground source heat pumps and photovoltaic panels are not proposed at this stage).

Be Lean

The construction standards proposed include U-values, which demonstrate good practice and improve upon those required by the Building Regulations. Air tightness standards are targeted at a 50% improvement upon the minimum required by the Building Regulations.

Be Clean and Be Green

Various technologies are considered above and it is proposed to install an air source heat pump into the house.

As a result of these installations the total emissions from the house are assessed as **917 kg CO₂ per year**.

The reduction in emissions from the installation of renewable technologies is therefore 3,408 kg CO₂ per year, which equates to a reduction of 78.80%.

The proposal significantly exceeds the emissions reduction target required by the planning policy.

6.0 Climate change adaption and Water resources

Sustainable Drainage Systems (SUDS)

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

Surface Water Management

The house has private gardens and discretely located rainwater butts could 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.

Water efficiency measures

In excess of 20% of the UK's water is used domestically with over 50% of this used for flushing WCs and washing (source: Environment Agency). The majority of this comes from drinking quality standard or potable water.

The water efficiency measures included will ensure that the water use target of 105 litres per person per day is achieved (excluding 5 l/p/d for external water use). This is the standard required by the planning policy.

Water efficient devices will be fully evaluated, and installed, wherever possible. The specification of such devices will be considered at detailed design stage and each will be subject to an evaluation based on technical performance, cost and market appeal, together with compliance with the water use regulations.

The following devices will be incorporated within the house:

- Water efficient taps;
- Water efficient toilets;
- Low output showers;
- Flow restrictors to manage water pressures to achieve optimum levels and
- Water meters.

Below is a typical specification, which would achieve the 105 Litres per person per day target (excluding five litres per person per day allowance for external water use). This is the equivalent of the 110 litres per person per day, which meets the enhanced standard set by the Building Regulations.

Schedule of Appliance Water Consumption		
Appliance	Flow rate or capacity	Total Litres
WC	6/3 litres dual flush	17.64
Basin	2.0 litres/min.	4.74
Shower	9.0 litres/min	39.33
Bath	175 litres	19.25
Sink	5.0 litres/min	12.56
Washing Machine	6.75 litres/kg	14.18
Dishwasher	1.25 litres/places	4.50
		112.20
	Normalisation Factor	0.91
Total Internal Water Consumption		102.10
External Water Use		5.00
Total Water Consumption		107.10

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 – DER Worksheets for the Proposed House based on a GAS baseline

Full SAP Calculation Printout



Property Reference	Finchampstead 4BH DET 402 GAS				Issued on Date	29/04/2025
Assessment Reference	Finchampstead 4BH DET 402 GAS		Prop Type Ref	Finchampstead 4BH DET 402 GAS		
Property	The Old Thatch, Lower Sandhurst Road, Finchampstead, Berkshire, RG40 3TH					
SAP Rating	88 B	DER	10.76	TER	7.08	
Environmental	87 B	% DER < TER				-51.98
CO ₂ Emissions (t/year)	3.9	DFEE	39.20	TFEE	40.26	
Compliance Check	See BREL	% DFEE < TFEE				2.64
% DPER < TPER	-54.63	DPER	58.95	TPER	38.12	
Assessor Details	Mr. Ivan Ball				Assessor ID	DE88-0001
Client						

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	202.6600 (1b)	x 2.5500 (2b)	= 516.7830 (1b) - (3b)
First floor	199.1200 (1c)	x 2.5500 (2c)	= 507.7560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	401.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 1024.5390 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans	= (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) = 50.0000 / (5) = 0.0488 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2488 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2115 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2696	0.2644	0.2591	0.2326	0.2273	0.2009	0.2009	0.1956	0.2115	0.2273	0.2379	0.2485 (22b)
Effective ac	0.5364	0.5349	0.5336	0.5271	0.5258	0.5202	0.5202	0.5191	0.5224	0.5258	0.5283	0.5309 (25)

3. Heat losses and heat loss parameter

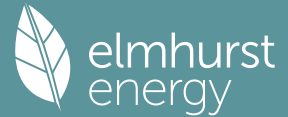
Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows & Glazed Doors			81.5300	1.1450	93.3550		(27)
Doors			2.7000	1.0000	2.7000		(26)
Ground Floor			202.6600	0.1300	26.3458		(28a)
External Wall	317.5300	84.2300	233.3000	0.1800	41.9940		(29a)
Roof over Ground Floor	3.5400		3.5400	0.1300	0.4602		(30)
Roof over First Floor	199.1200		199.1200	0.1000	19.9120		(30)
Total net area of external elements Aum(A, m ²)			722.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	184.7670		(33)

Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K 250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	49.3800	0.0280	1.3826
E3 Sill	39.9800	0.0240	0.9595
E4 Jamb	149.8000	0.0190	2.8462
E5 Ground floor (normal)	62.8000	0.0460	2.8888
E10 Eaves (insulation at ceiling level)	56.3000	0.0510	2.8713
E6 Intermediate floor within a dwelling	61.7200	0.0000	0.0000
E12 Gable (insulation at ceiling level)	10.1000	0.0290	0.2929

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7. Mean internal temperature (heating season)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation factor for gains for living area, nil,m (see Table 9a)													21.0000 (85)
tau	74.0448	74.1387	74.2310	74.6675	74.7497	75.1349	75.1349	75.2067	74.9861	74.7497	74.5835	74.4106	
alpha	5.9363	5.9426	5.9487	5.9778	5.9833	6.0090	6.0090	6.0138	5.9991	5.9833	5.9722	5.9607	
util living area	0.9998	0.9993	0.9964	0.9779	0.9011	0.7240	0.5447	0.6190	0.8900	0.9928	0.9995	0.9999	(86)
MIT	19.6743	19.8518	20.1291	20.5014	20.8101	20.9629	20.9942	20.9882	20.8711	20.4458	19.9870	19.6443	(87)
Th 2	20.1354	20.1364	20.1374	20.1420	20.1429	20.1469	20.1469	20.1477	20.1454	20.1429	20.1411	20.1393	(88)
util rest of house													
	0.9998	0.9990	0.9951	0.9692	0.8645	0.6445	0.4429	0.5123	0.8350	0.9889	0.9993	0.9999	(89)
MIT 2	18.9001	19.0783	19.3557	19.7258	20.0105	20.1294	20.1454	20.1441	20.0687	19.6756	19.2174	18.8732	(90)
Living area fraction									fLA = Living area /	(4) =		0.0921	(91)
MIT	18.9714	19.1496	19.4269	19.7972	20.0841	20.2062	20.2235	20.2218	20.1426	19.7465	19.2882	18.9442	(92)
Temperature adjustment												-0.1500	
adjusted MIT	18.8214	18.9996	19.2769	19.6472	19.9341	20.0562	20.0735	20.0718	19.9926	19.5965	19.1382	18.7942	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9996	0.9985	0.9931	0.9625	0.8539	0.6353	0.4339	0.5024	0.8230	0.9853	0.9989	0.9998	(94)
Useful gains	1515.6291	1921.3092	2305.8909	2684.6026	2642.2883	1968.6059	1284.9441	1350.8818	1945.3890	1873.8921	1553.6358	1418.4925	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	5471.9124	5306.2312	4802.4891	4015.9684	3073.5079	2026.1474	1289.8948	1362.2360	2192.5669	3358.0633	4503.4531	5472.3290	(97)
Space heating kWh	2943.4748	2274.6676	1857.4691	958.5834	320.8274	0.0000	0.0000	0.0000	0.0000	1104.2234	2123.8685	3016.0544	(98a)
Space heating requirement - total per year (kWh/year)												14599.1685	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	2943.4748	2274.6676	1857.4691	958.5834	320.8274	0.0000	0.0000	0.0000	0.0000	1104.2234	2123.8685	3016.0544	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												14599.1685	
Space heating per m2										(98c) / (4) =		36.3362	(99)

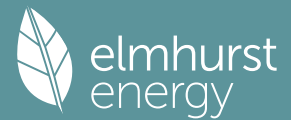
9a. Energy requirements - Individual heating systems, including micro-CHP

Fraction of space heat from secondary/supplementary system (Table 11)

Fraction of space heat from main system(s)	0.0000	(201)
Efficiency of main space heating system 1 (in %)	1.0000	(202)
Efficiency of main space heating system 2 (in %)	88.7000	(206)
Efficiency of secondary/supplementary heating system, %	0.0000	(207)
	0.0000	(208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2943.4748	2274.6676	1857.4691	958.5834	320.8274	0.0000	0.0000	0.0000	0.0000	1104.2234	2123.8685	3016.0544	(98)
Space heating efficiency (main heating system 1)	88.7000	88.7000	88.7000	88.7000	88.7000	0.0000	0.0000	0.0000	0.0000	88.7000	88.7000	88.7000	(210)
Space heating fuel (main heating system)	3318.4609	2564.4505	2094.1027	1080.7028	361.6994	0.0000	0.0000	0.0000	0.0000	1244.8967	2394.4402	3400.2868	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	312.4795	276.6396	294.6992	261.1059	254.4526	230.7542	228.8332	237.1090	238.8086	264.5268	279.1087	309.3357	(64)
Efficiency of water heater (217)m	87.7490	87.6271	87.3493	86.6064	84.4804	79.7000	79.7000	79.7000	79.7000	86.8056	87.5517	79.7000	(216)
Fuel for water heating, kWh/month	356.1060	315.7011	337.3800	301.4858	301.1970	289.5285	287.1182	297.5018	299.6343	304.7348	318.7932	352.4071	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	7.3041	6.5973	7.3041	7.0685	7.3041	7.0685	7.3041	7.3041	7.0685	7.3041	7.0685	7.3041	(231)
Lighting	56.8631	45.6177	41.0737	30.0923	23.2442	18.9907	21.2041	27.5619	35.8002	46.9718	53.0546	58.4435	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												16459.0400	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												79.7000	
Water heating fuel used												3761.5880	(219)
Space cooling fuel												0.0000	(221)
Electricity for pumps and fans:													
central heating pump												41.0000	(230c)
main heating flue fan												45.0000	(230e)
Total electricity for the above, kWh/year												86.0000	(231)
Electricity for lighting (calculated in Appendix L)												458.9180	(232)
Energy saving/generation technologies (Appendices M ,N and Q)													
PV generation												0.0000	(233)

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Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	20765.5460 (238)

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

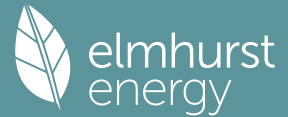
	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	16459.0400	0.2100	3456.3984 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	3761.5880	0.2100	789.9335 (264)
Space and water heating			4246.3319 (265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293 (267)
Energy for lighting	458.9180	0.1443	66.2361 (268)
Total CO2, kg/year			4324.4972 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			10.7600 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	16459.0400	1.1300	18598.7152 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	3761.5880	1.1300	4250.5944 (278)
Space and water heating			22849.3096 (279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008 (281)
Energy for lighting	458.9180	1.5338	703.9038 (282)
Total Primary energy kWh/year			23683.3142 (286)
Dwelling Primary energy Rate (DPER)			58.9500 (287)

Appendix 2 – DER Worksheets for the Proposed House based on an Air Source Heat Pump

Full SAP Calculation Printout



Property Reference	Finchampstead 4BH DET 402				Issued on Date	29/04/2025	
Assessment Reference	Finchampstead 4BH DET 402			Prop Type Ref	Finchampstead 4BH DET 402		
Property	The Old Thatch, Lower Sandhurst Road, Finchampstead, Berkshire, RG40 3TH						
SAP Rating	87 B	DER	2.28	TER	7.14		
Environmental	97 A	% DER < TER				68.07	
CO ₂ Emissions (t/year)	0.85	DFEE	39.20	TFEE	40.26		
Compliance Check	See BREL	% DFEE < TFEE				2.64	
% DPER < TPER	38.58	DPER	23.62	TPER	38.46		
Assessor Details	Mr. Ivan Ball				Assessor ID	DE88-0001	
Client							

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

1. Overall dwelling characteristics

	Area (m ²)	Storey height (m)	Volume (m ³)
Main dwelling			
Ground floor	202.6600 (1b)	x 2.5500 (2b)	= 516.7830 (1b) - (3b)
First floor	199.1200 (1c)	x 2.5500 (2c)	= 507.7560 (1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	401.7800		(4)
Dwelling volume		(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	= 1024.5390 (5)

2. Ventilation rate

	m ³ per hour
Number of open chimneys	0 * 80 = 0.0000 (6a)
Number of open flues	0 * 20 = 0.0000 (6b)
Number of chimneys / flues attached to closed fire	0 * 10 = 0.0000 (6c)
Number of flues attached to solid fuel boiler	0 * 20 = 0.0000 (6d)
Number of flues attached to other heater	0 * 35 = 0.0000 (6e)
Number of blocked chimneys	0 * 20 = 0.0000 (6f)
Number of intermittent extract fans	5 * 10 = 50.0000 (7a)
Number of passive vents	0 * 10 = 0.0000 (7b)
Number of flueless gas fires	0 * 40 = 0.0000 (7c)
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	50.0000 / (5) = 0.0488 (8)
Pressure test	Yes
Pressure Test Method	Blower Door
Measured/design AP50	4.0000 (17)
Infiltration rate	0.2488 (18)
Number of sides sheltered	2 (19)
Shelter factor	(20) = 1 - [0.075 x (19)] = 0.8500 (20)
Infiltration rate adjusted to include shelter factor	(21) = (18) x (20) = 0.2115 (21)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind speed	5.1000	5.0000	4.9000	4.4000	4.3000	3.8000	3.8000	3.7000	4.0000	4.3000	4.5000	4.7000 (22)
Wind factor	1.2750	1.2500	1.2250	1.1000	1.0750	0.9500	0.9500	0.9250	1.0000	1.0750	1.1250	1.1750 (22a)
Adj infilt rate	0.2696	0.2644	0.2591	0.2326	0.2273	0.2009	0.2009	0.1956	0.2115	0.2273	0.2379	0.2485 (22b)
Effective ac	0.5364	0.5349	0.5336	0.5271	0.5258	0.5202	0.5202	0.5191	0.5224	0.5258	0.5283	0.5309 (25)

3. Heat losses and heat loss parameter

Element	Gross m ²	Openings m ²	NetArea m ²	U-value W/m ² K	A x U W/K	K-value kJ/m ² K	A x K kJ/K
Main dwelling							
Windows & Glazed Doors			81.5300	1.1450	93.3550		(27)
Doors			2.7000	1.0000	2.7000		(26)
Ground Floor			202.6600	0.1300	26.3458		(28a)
External Wall	317.5300	84.2300	233.3000	0.1800	41.9940		(29a)
Roof over Ground Floor	3.5400		3.5400	0.1300	0.4602		(30)
Roof over First Floor	199.1200		199.1200	0.1000	19.9120		(30)
Total net area of external elements Aum(A, m ²)			722.8500				(31)
Fabric heat loss, W/K = Sum (A x U)				(26)...(30) + (32) =	184.7670		(33)

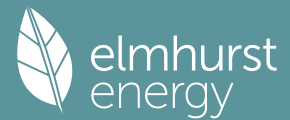
Thermal mass parameter (TMP = Cm / TFA) in kJ/m²K

250.0000 (35)

List of Thermal Bridges

K1 Element	Length	Psi-value	Total
E2 Other lintels (including other steel lintels)	49.3800	0.0280	1.3826
E3 Sill	39.9800	0.0240	0.9595
E4 Jamb	149.8000	0.0190	2.8462
E5 Ground floor (normal)	62.8000	0.0460	2.8888
E10 Eaves (insulation at ceiling level)	56.3000	0.0510	2.8713
E6 Intermediate floor within a dwelling	61.7200	0.0000	0.0000
E12 Gable (insulation at ceiling level)	10.1000	0.0290	0.2929

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E16 Corner (normal) 51.0000 0.0370 1.8870
 E17 Corner (inverted - internal area greater than external area) 30.6000 -0.0790 -2.4174
 Thermal bridges (Sum(L x Psi) calculated using Appendix K)
 Point Thermal bridges (36a) = 10.7110 (36)
 Total fabric heat loss (33) + (36) + (36a) = 195.4779 (37)

Ventilation heat loss calculated monthly (38)m = 0.33 x (25)m x (5)												
(38)m	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Heat transfer coeff	181.3397	180.8625	180.3946	178.1973	177.7862	175.8724	175.8724	175.5180	176.6096	177.7862	178.6179	179.4874 (38)
Average = Sum(39)m / 12 =	376.8177	376.3404	375.8726	373.6753	373.2641	371.3503	371.3503	370.9959	372.0875	373.2641	374.0958	374.9653 (39)
												373.6733
HLP	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
HLP (average)	0.9379	0.9367	0.9355	0.9300	0.9290	0.9243	0.9243	0.9234	0.9261	0.9290	0.9311	0.9333 (40)
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31

4. Water heating energy requirements (kWh/year)

Assumed occupancy	3.2642 (42)											
Hot water usage for mixer showers	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (42a)											
Hot water usage for baths	95.8939 94.4697 92.4642 88.7664 85.9975 82.9273 81.2689 83.2604 85.4288 88.7140 92.4880 95.5697 (42b)											
Hot water usage for other uses	50.5886 48.7490 46.9094 45.0698 43.2302 41.3906 41.3906 43.2302 45.0698 46.9094 48.7490 50.5886 (42c)											
Average daily hot water use (litres/day)	134.8983 (43)											
Daily hot water use	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy conte	146.4824	143.2187	139.3736	133.8362	129.2278	124.3179	122.6595	126.4906	130.4986	135.6234	141.2369	146.1583 (44)
Energy content (annual)	231.9924	203.9415	214.2120	183.2151	173.9654	152.8634	148.3461	156.6218	160.9178	184.0397	201.2179	228.8485 (45)
Distribution loss (46)m = 0.15 x (45)m	34.7989 30.5912 32.1318 27.4823 26.0948 22.9295 22.2519 23.4933 24.1377 27.6060 30.1827 34.3273 (46)											
Water storage loss:	500.0000 (47)											
Store volume	2.5800 (48)											
a) If manufacturer declared loss factor is known (kWh/day):	0.5400 (49)											
Temperature factor from Table 2b	1.3932 (55)											
Enter (49) or (54) in (55)	43.1892 39.0096 43.1892 41.7960 43.1892 41.7960 43.1892 43.1892 41.7960 43.1892 41.7960 43.1892 (56)											
Total storage loss	43.1892 39.0096 43.1892 41.7960 43.1892 41.7960 43.1892 43.1892 41.7960 43.1892 41.7960 43.1892 (57)											
If cylinder contains dedicated solar storage	37.2980 33.6885 37.2980 36.0948 37.2980 36.0948 37.2980 37.2980 36.0948 37.2980 36.0948 37.2980 (59)											
Primary loss	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (61)											
Combi loss	312.4795 276.6396 294.6992 261.1059 254.4526 230.7542 228.8332 237.1090 238.8086 264.5268 279.1087 309.3357 (62)											
Total heat required for water heating calculated for each month	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63a)											
WWHRS	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63b)											
PV diverter	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63c)											
Solar input	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (63d)											
FGHRS	312.4795 276.6396 294.6992 261.1059 254.4526 230.7542 228.8332 237.1090 238.8086 264.5268 279.1087 309.3357 (64)											
Output from w/h	Total per year (kWh/year) = Sum(64)m = 3187.8530 (64)											
12Total per year (kWh/year)	3188 (64)											
Electric shower(s)	0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 (64a)											
Heat gains from water heating, kWh/month	Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m = 0.0000 (64a)											
	141.5272	125.9690	135.6152	123.2317	122.2332	113.1397	113.7148	116.4665	115.8178	125.5829	129.2176	140.4819 (65)

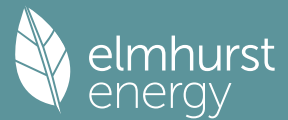
5. Internal gains (see Table 5 and 5a)

Metabolic gains (Table 5), Watts	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(66)m	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122	163.2122 (66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	272.0045	301.1479	272.0045	281.0713	272.0045	281.0713	272.0045	272.0045	281.0713	272.0045	281.0713	272.0045 (67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	536.2813	541.8463	527.8228	497.9686	460.2831	424.8639	401.2018	395.6368	409.6603	439.5145	477.2001	512.6192 (68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212	39.3212 (69)
Pumps, fans	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000 (70)
Losses e.g. evaporation (negative values) (Table 5)	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698	-130.5698 (71)
Water heating gains (Table 5)	190.2247	187.4539	182.2785	171.1551	164.2920	157.1385	152.8425	156.5410	160.8581	168.7942	179.4689	188.8197 (72)
Total internal gains	1070.4743	1102.4117	1054.0696	1022.1587	968.5432	935.0374	898.0124	896.1460	923.5533	952.2769	1009.7040	1045.4071 (73)

6. Solar gains

[Jan]												
				Area m2	Solar flux Table 6a W/m2		g Specific data or Table 6b		FF Specific data or Table 6c		Access factor Table 6d	Gains W
North				12.0200	10.6334		0.5000		0.7000		0.7700	31.0011 (74)
Northeast				1.7300	11.2829		0.5000		0.7000		0.7700	4.7345 (75)
East				31.4600	19.6403		0.5000		0.7000		0.7700	149.8674 (76)
Southeast				1.7300	36.7938		0.5000		0.7000		0.7700	15.4391 (77)
South				11.6900	46.7521		0.5000		0.7000		0.7700	132.5612 (78)
West				22.9000	19.6403		0.5000		0.7000		0.7700	109.0898 (80)
Solar gains	442.6932	818.8568	1264.8228	1764.0777	2122.9340	2163.5188	2063.2283	1792.7300	1440.3216	946.6242	542.7131	370.4221 (83)
Total gains	1513.1674	1921.2685	2318.8924	2786.2364	3091.4773	3098.5562	2961.2407	2688.8760	2363.8750	1898.9011	1552.4170	1415.8292 (84)

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7. Mean internal temperature (heating season)

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

21.0000 (85)

Utilisation factor for gains for living area, nil,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	74.0448	74.1397	74.2310	74.6675	74.7497	75.1349	75.1349	75.2067	74.9861	74.7497	74.5835	74.4106	
alpha	5.9363	5.9426	5.9487	5.9778	5.9833	6.0090	6.0090	6.0138	5.9991	5.9833	5.9722	5.9607	
util living area	0.9998	0.9993	0.9964	0.9780	0.9014	0.7240	0.5447	0.6190	0.8900	0.9929	0.9995	0.9999	(86)
Living	19.9528	20.0860	20.2940	20.5736	20.8054	20.9205	20.9440	20.9396	20.8515	20.5318	20.1877	19.9305	
Non living	18.8787	19.0503	19.3173	19.6741	19.9485	20.0638	20.0791	20.0780	20.0052	19.6258	19.1846	18.8532	
24 / 16	0	0	0	0	0	0	0	0	0	0	0	0	
24 / 9	3	0	0	0	0	0	0	0	0	0	0	0	
16 / 9	28	0	0	0	0	0	0	0	0	0	0	10	
MIT	20.4643	20.0860	20.2940	20.5736	20.8054	20.9205	20.9440	20.9396	20.8515	20.5318	20.1877	20.0801	(87)
Th 2	20.1354	20.1364	20.1374	20.1420	20.1429	20.1469	20.1469	20.1477	20.1454	20.1429	20.1411	20.1393	(88)
util rest of house	0.9998	0.9990	0.9951	0.9693	0.8649	0.6445	0.4429	0.5123	0.8350	0.9890	0.9993	0.9999	(89)
MIT 2	19.6344	19.0503	19.3173	19.6741	19.9485	20.0638	20.0791	20.0780	20.0052	19.6258	19.1846	19.0850	(90)
Living area fraction										flA = Living area / (4) =		0.0921	(91)
MIT	19.7108	19.1457	19.4073	19.7570	20.0274	20.1427	20.1588	20.1573	20.0831	19.7092	19.2770	19.1766	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7108	19.1457	19.4073	19.7570	20.0274	20.1427	20.1588	20.1573	20.0831	19.7092	19.2770	19.1766	(93)

8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9997	0.9986	0.9935	0.9643	0.8591	0.6440	0.4443	0.5136	0.8302	0.9862	0.9989	0.9998	(94)
Useful gains	1512.7859	1918.4967	2303.8119	2686.6629	2655.9529	1995.5550	1315.7894	1380.9112	1962.4521	1872.7676	1550.7644	1415.5421	(95)
Ext temp.	4.3000	4.9000	6.5000	8.9000	11.7000	14.6000	16.6000	16.4000	14.1000	10.6000	7.1000	4.2000	(96)
Heat loss rate W	5807.0692	5361.2225	4851.4972	4056.9807	3108.3372	2058.2713	1321.5491	1393.9552	2226.2533	3400.1527	4555.3560	5615.7102	(97)
Space heating kWh	3194.9468	2313.5117	1895.4779	986.6288	336.5739	0.0000	0.0000	0.0000	0.0000	1136.3745	2163.3059	3124.9251	(98a)
Space heating requirement - total per year (kWh/year)												15151.7447	
Solar heating kWh	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(98b)
Solar heating contribution - total per year (kWh/year)												0.0000	
Space heating kWh	3194.9468	2313.5117	1895.4779	986.6288	336.5739	0.0000	0.0000	0.0000	0.0000	1136.3745	2163.3059	3124.9251	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15151.7447	
Space heating per m2										(98c) / (4) =		37.7115	(99)

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

Fraction of space heat from secondary/supplementary system (Table 11)

0.0000 (201)

Fraction of space heat from main system(s)

1.0000 (202)

Efficiency of main space heating system 1 (in %)

397.1831 (206)

Efficiency of main space heating system 2 (in %)

0.0000 (207)

Efficiency of secondary/supplementary heating system, %

0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	3194.9468	2313.5117	1895.4779	986.6288	336.5739	0.0000	0.0000	0.0000	0.0000	1136.3745	2163.3059	3124.9251	(98)
Space heating efficiency (main heating system 1)	397.1831	397.1831	397.1831	397.1831	397.1831	0.0000	0.0000	0.0000	0.0000	397.1831	397.1831	397.1831	(210)
Space heating fuel (main heating system)	804.4014	582.4799	477.2302	248.4065	84.7402	0.0000	0.0000	0.0000	0.0000	286.1085	544.6621	786.7719	(211)
Space heating efficiency (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(212)
Space heating fuel (main heating system 2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(213)
Space heating fuel (secondary)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(215)
Water heating													
Water heating requirement	312.4795	276.6396	294.6992	261.1059	254.4526	230.7542	228.8332	237.1090	238.8086	264.5268	279.1087	309.3357	(64)
Efficiency of water heater	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	174.6516	(216)
Fuel for water heating, kWh/month	178.9160	158.3951	168.7355	149.5010	145.6915	132.1226	131.0227	135.7611	136.7343	151.4598	159.8089	177.1159	(219)
Space cooling fuel requirement													
(221)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(221)
Pumps and Fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(231)
Lighting	56.8631	45.6177	41.0737	30.0923	23.2442	18.9907	21.2041	27.5619	35.8002	46.9718	53.0546	58.4435	(232)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233a)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234a)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235a)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235a)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235c)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235c)
Electricity generated by PVs (Appendix M) (negative quantity)													
(233b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(233b)
Electricity generated by wind turbines (Appendix M) (negative quantity)													
(234b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(234b)
Electricity generated by hydro-electric generators (Appendix M) (negative quantity)													
(235b)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235b)
Electricity used or net electricity generated by micro-CHP (Appendix N) (negative if net generation)													
(235d)m	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(235d)
Annual totals kWh/year													
Space heating fuel - main system 1												3814.8007	(211)
Space heating fuel - main system 2												0.0000	(213)
Space heating fuel - secondary												0.0000	(215)
Efficiency of water heater												174.6516	
Water heating fuel used												1825.2644	(219)
Space cooling fuel												0.0000	(221)

Electricity for pumps and fans:

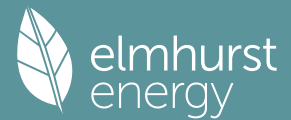
Total electricity for the above, kWh/year

0.0000 (231)

Electricity for lighting (calculated in Appendix L)

458.9180 (232)

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Energy saving/generation technologies (Appendices M ,N and Q)

PV generation	0.0000 (233)
Wind generation	0.0000 (234)
Hydro-electric generation (Appendix N)	0.0000 (235a)
Electricity generated - Micro CHP (Appendix N)	0.0000 (235)
Appendix Q - special features	
Energy saved or generated	-0.0000 (236)
Energy used	0.0000 (237)
Total delivered energy for all uses	6098.9831 (238)

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

	Energy kWh/year	Emission factor kg CO2/kWh	Emissions kg CO2/year
Space heating - main system 1	3814.8007	0.1556	593.4368 (261)
Total CO2 associated with community systems			0.0000 (373)
Water heating (other fuel)	1825.2644	0.1407	256.8176 (264)
Space and water heating			850.2544 (265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (267)
Energy for lighting	458.9180	0.1443	66.2361 (268)
Total CO2, kg/year			916.4905 (272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.2800 (273)

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

	Energy kWh/year	Primary energy factor kg CO2/kWh	Primary energy kWh/year
Space heating - main system 1	3814.8007	1.5759	6011.7819 (275)
Total CO2 associated with community systems			0.0000 (473)
Water heating (other fuel)	1825.2644	1.5203	2774.8647 (278)
Space and water heating			8786.6466 (279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000 (281)
Energy for lighting	458.9180	1.5338	703.9038 (282)
Total Primary energy kWh/year			9490.5504 (286)
Dwelling Primary energy Rate (DPER)			23.6200 (287)

Appendix 3 – Energy Performance Certificate for the Existing House

Energy performance certificate (EPC)

The Old Thatch
Lower Sandhurst Road
Finchampstead
WOKINGHAM
RG40 3TH

Energy rating

E

Valid until: 23 January 2034

Certificate number: 9734-4129-0300-0507-4226

Property type	Detached house
Total floor area	247 square metres

Rules on letting this property

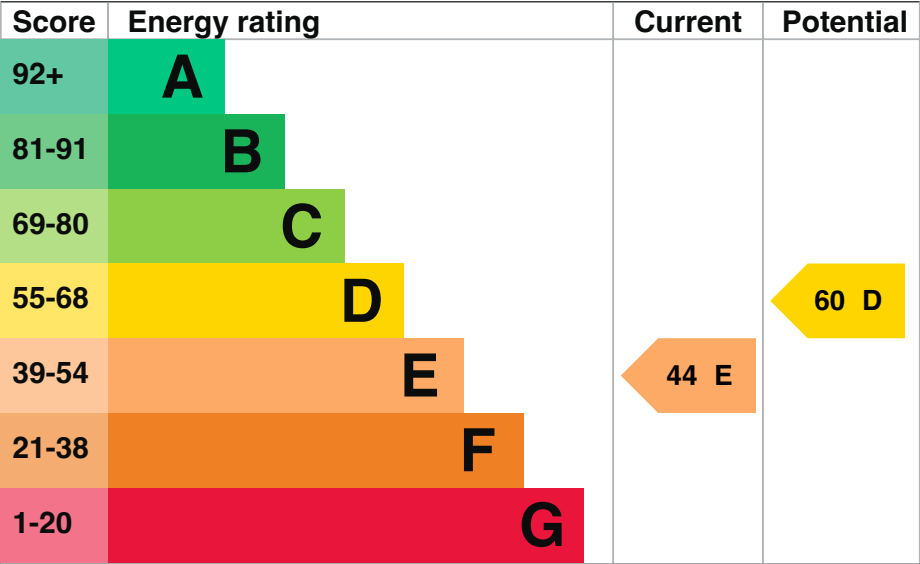
Properties can be let if they have an energy rating from A to E.

You can read [guidance for landlords on the regulations and exemptions \(https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance\)](https://www.gov.uk/guidance/domestic-private-rented-property-minimum-energy-efficiency-standard-landlord-guidance).

Energy rating and score

This property’s energy rating is E. It has the potential to be D.

[See how to improve this property’s energy efficiency.](#)



The graph shows this property’s current and potential energy rating.

Properties get a rating from A (best) to G (worst) and a score. The better the rating and score, the lower your energy bills are likely to be.

For properties in England and Wales:

the average energy rating is D
the average energy score is 60

Breakdown of property's energy performance

Features in this property

Features get a rating from very good to very poor, based on how energy efficient they are. Ratings are not based on how well features work or their condition.

Assumed ratings are based on the property's age and type. They are used for features the assessor could not inspect.

Feature	Description	Rating
Wall	Cavity wall, as built, no insulation (assumed)	Poor
Roof	Thatched	Average
Roof	Roof room(s), thatched	Good
Window	Partial secondary glazing	Poor
Main heating	Boiler and radiators, oil	Average
Main heating control	Programmer, room thermostat and TRVs	Good
Hot water	From main system	Average
Lighting	Low energy lighting in 50% of fixed outlets	Good
Floor	Solid, no insulation (assumed)	N/A
Secondary heating	Room heaters, wood logs	N/A

Low and zero carbon energy sources

Low and zero carbon energy sources release very little or no CO₂. Installing these sources may help reduce energy bills as well as cutting carbon emissions. The following low or zero carbon energy sources are installed in this property:

- Biomass secondary heating

Primary energy use

The primary energy use for this property per year is 224 kilowatt hours per square metre (kWh/m²).

Additional information

Additional information about this property:

- Cavity fill is recommended
-

How this affects your energy bills

An average household would need to spend **£3,985 per year on heating, hot water and lighting** in this property. These costs usually make up the majority of your energy bills.

You could **save £1,209 per year** if you complete the suggested steps for improving this property's energy rating.

This is **based on average costs in 2024** when this EPC was created. People living at the property may use different amounts of energy for heating, hot water and lighting.

Heating this property

Estimated energy needed in this property is:

- 34,110 kWh per year for heating
- 2,931 kWh per year for hot water

Impact on the environment

This property's environmental impact rating is E. It has the potential to be D.

Properties get a rating from A (best) to G (worst) on how much carbon dioxide (CO2) they produce each year.

Carbon emissions

An average household produces	6 tonnes of CO2
This property produces	12.0 tonnes of CO2
This property's potential production	8.3 tonnes of CO2

You could improve this property's CO2 emissions by making the suggested changes. This will help to protect the environment.

These ratings are based on assumptions about average occupancy and energy use. People living at the property may use different amounts of energy.

Steps you could take to save energy

Step	Typical installation cost	Typical yearly saving
1. Increase loft insulation to 270 mm	£100 - £350	£152
2. Cavity wall insulation	£500 - £1,500	£441
3. Floor insulation (solid floor)	£4,000 - £6,000	£318
4. Low energy lighting	£65	£89
5. Replace single glazed windows with low-E double glazed windows	£3,300 - £6,500	£209

Advice on making energy saving improvements

[Get detailed recommendations and cost estimates \(www.gov.uk/improve-energy-efficiency\)](http://www.gov.uk/improve-energy-efficiency)

Help paying for energy saving improvements

You may be eligible for help with the cost of improvements:

- Insulation: [Great British Insulation Scheme \(www.gov.uk/apply-great-british-insulation-scheme\)](http://www.gov.uk/apply-great-british-insulation-scheme)
 - Heat pumps and biomass boilers: [Boiler Upgrade Scheme \(www.gov.uk/apply-boiler-upgrade-scheme\)](http://www.gov.uk/apply-boiler-upgrade-scheme)
 - Help from your energy supplier: [Energy Company Obligation \(www.gov.uk/energy-company-obligation\)](http://www.gov.uk/energy-company-obligation)
-