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)	4,756	
Emissions after an Air Source Heat pump (renewable technologies)	939	**80.26%**

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 CO_2 per year to **8.3 tonnes**.

However, if it is assumed the emissions could be reduced to 8.3 tonnes of CO_2 this is still **7.361 tonnes** more than the proposed new house (0.939 tonnes). Therefore, if all measures set out in the existing EPC were implemented the emissions from the improved existing house would still be **89%** 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 **5,766 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 **84%** 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 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
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	411.1
Total	**1**	**411.1**

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/m²K	W/m²K	
Ground Floors	**0.18**	**0.11**	**39%**
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%**
Roof Windows	**1.60**	**1.10**	**31%**
Entrance Door	**1.60**	**1.00**	**38%**

'g' Value for Glazing	**0.50**

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. The house will target a 50% improvement over Building Regulations and will seek to achieve a permeability of 4.0 $m^3/hr/m^2$ 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 CO_2 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
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 actually specification can be compared.

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

4-Bedroom Detached house – 411.1 m^2	CO_2 DER
	kg/yr
Space heating	3,832.77
Water heating	840.15
Electricity for pumps, fans & keep-hot	11.93
Electricity for lighting	71.06
Total	4,755.91
DER Emissions Rate (kg CO_2/yr)	**11.57**

The baseline emissions from the house based on the installation of gas heating system to the house is calculated as **4,756 kg CO_2 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 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.

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 suns 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 **420 kg CO_2 per year,** which equates to a reduction in total (DER) emissions of **8.83%**. 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 as 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 – 411.1 m²	**CO_2 DER**
	kg/yr
Space heating	611.07
Water heating	257.34
Electricity for pumps, fans & keep-hot	0.00
Electricity for lighting	71.06
Total	939.47
DER Emissions Rate (kg CO_2/yr)	**2.29**

The emissions from the house based on the installation of an air source heat pump are calculated as **932 kg CO_2 per year**. The reduction in emissions as a result of the installation of an air source heat pump is therefore **3,817 kg CO_2 per year**, which equates to a reduction of **80.26%**.

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 **4,756 kg CO_2 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 **939 kg CO_2 per year.**

The reduction in emissions from the installation of renewable technologies is therefore 3,817 kg CO_2 per year, which equates to a reduction of 80.26%.

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 411 GAS	**Issued on Date**	10/10/2025
Assessment Reference	Finchampstead 4BH DET 411 GAS	**Prop Type Ref**	Finchampstead 4BH DET 411 GAS
Property	The Old Thatch, Lower Sandhurst Road, Finchampstead, Berkshire, RG40 3TH		

SAP Rating	87 B	**DER**	11.57	**TER**	6.97
Environmental	86 B	**% DER < TER**			-66.00
CO_2 Emissions (t/year)	4.31	**DFEE**	38.94	**TFEE**	41.15
Compliance Check	See BREL	**% DFEE < TFEE**			5.37
% DPER < TPER	-66.52	**DPER**	63.31	**TPER**	38.02

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	233.0000 (1b)	x	2.5500 (2b)	=	594.1500	(1b) - (3b)
First floor	178.1400 (1c)	x	2.6800 (2c)	=	477.4152	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	411.1400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1071.5652	(5)

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2. Ventilation rate

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			m3 per hour	
Number of open chimneys		0 * 80 =	0.0000	(6a)
Number of open flues		0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire		0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler		0 * 20 =	0.0000	(6d)
Number of flues attached to other heater		0 * 35 =	0.0000	(6e)
Number of blocked chimneys		0 * 20 =	0.0000	(6f)
Number of intermittent extract fans		6 * 10 =	60.0000	(7a)
Number of passive vents		0 * 10 =	0.0000	(7b)
Number of flueless gas fires		0 * 40 =	0.0000	(7c)
		Air changes per hour		
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =		60.0000 / (5) =	0.0560	(8)
Pressure test			Yes	
Pressure Test Method			Blower Door	
Measured/design AP50			4.0000	(17)
Infiltration rate			0.2560	(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) =	0.2176	(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	0.2774	0.2720	0.2666	0.2394	0.2339	0.2067	0.2067	0.2013	0.2176	0.2339	0.2448	0.2557	(22b)
Effective ac	0.5385	0.5370	0.5355	0.5286	0.5274	0.5214	0.5214	0.5203	0.5237	0.5274	0.5300	0.5327	(25)

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3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows & Glazed Doors			60.1300	1.1450	68.8511			(27)
Doors			1.8900	1.0000	1.8900			(26)
Roof Windows			1.4400	1.0536	1.5172			(27a)
Ground Floor			233.0000	0.1100	25.6300			(28a)
External Wall	258.0100	54.8200	203.1900	0.1800	36.5742			(29a)
Low Level Walls & Dormers	86.1100	7.2000	78.9100	0.1500	11.8365			(29a)
Roof over Ground Floor	54.8600		54.8600	0.1000	5.4860			(30)
Roof over First Floor	147.3000		147.3000	0.1000	14.7300			(30)
Sloping Ceilings	37.3500	1.4400	35.9100	0.1500	5.3865			(30)
Total net area of external elements Aum(A, m2)			816.6300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		171.9016			(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)	41.0200	0.0280	1.1486
E3 Sill	28.1200	0.0240	0.6749
E4 Jamb	103.5000	0.0190	1.9665
E5 Ground floor (normal)	76.8900	0.0460	3.5369

E10 Eaves (insulation at ceiling level)												57.0500	0.0510	2.9095
E6 Intermediate floor within a dwelling												66.0800	0.0000	0.0000
E12 Gable (insulation at ceiling level)												29.8400	0.0290	0.8654
E16 Corner (normal)												53.6000	0.0370	1.9832
E17 Corner (inverted - internal area greater than external area)												77.4000	-0.0790	-6.1146
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														6.9704 (36)
Point Thermal bridges													(36a) =	0.0000
Total fabric heat loss													(33) + (36) + (36a) =	178.8720 (37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	190.4170	189.8885	189.3705	186.9376	186.4824	184.3634	184.3634	183.9710	185.1796	186.4824	187.4033	188.3660	(38)
Heat transfer coeff	369.2889	368.7605	368.2425	365.8096	365.3544	363.2354	363.2354	362.8430	364.0516	365.3544	366.2752	367.2379	(39)
Average = Sum(39)m / 12 =												365.8074	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8982	0.8969	0.8957	0.8897	0.8886	0.8835	0.8835	0.8825	0.8855	0.8886	0.8909	0.8932	(40)
HLP (average)												0.8897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.2764	(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													
	96.1425	94.7147	92.7040	88.9966	86.2205	83.1423	81.4796	83.4763	85.6503	88.9440	92.7278	95.8175	(42b)
Hot water usage for other uses													
	50.7197	48.8754	47.0310	45.1867	43.3423	41.4980	41.4980	43.3423	45.1867	47.0310	48.8754	50.7197	(42c)
Average daily hot water use (litres/day)												135.2481	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	146.8623	143.5901	139.7350	134.1832	129.5628	124.6403	122.9776	126.8186	130.8369	135.9751	141.6032	146.5372	(44)
Energy conte	232.5939	204.4703	214.7675	183.6901	174.4165	153.2598	148.7307	157.0279	161.3350	184.5169	201.7397	229.4419	(45)
Energy content (annual)											Total = Sum(45)m =	2245.9902	
Distribution loss (46)m = 0.15 x (45)m													
	34.8891	30.6705	32.2151	27.5535	26.1625	22.9890	22.3096	23.5542	24.2003	27.6775	30.2609	34.4163	(46)
Water storage loss:													
Store volume												350.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.3932	(55)
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	(56)
If cylinder contains dedicated solar storage													
	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)
Primary loss	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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	313.0811	277.1684	295.2546	261.5809	254.9036	231.1506	229.2179	237.5151	239.2258	265.0040	279.6305	309.9291	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	313.0811	277.1684	295.2546	261.5809	254.9036	231.1506	229.2179	237.5151	239.2258	265.0040	279.6305	309.9291	(64)
											Total per year (kWh/year) = Sum(64)m =	3193.6616	(64)
12Total per year (kWh/year)												3194	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	141.7272	126.1448	135.7999	123.3896	122.3832	113.2715	113.8427	116.6015	115.9565	125.7416	129.3911	140.6792	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5	289.3747	320.3791	289.3747	299.0205	289.3747	299.0205	289.3747	289.3747	299.0205	289.3747	299.0205	289.3747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5	543.0866	548.7221	534.5208	504.2877	466.1239	430.2553	406.2929	400.6574	414.8587	445.0918	483.2556	519.1242	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	(69)
Pumps, fans	3.0000	3.0000	3.0000	3.0000	3.0000	0.0000	0.0000	0.0000	0.0000	3.0000	3.0000	3.0000	(70)
Losses e.g. evaporation (negative values) (Table 5)	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	(71)
Water heating gains (Table 5)	190.4936	187.7155	182.5268	171.3745	164.4936	157.3215	153.0144	156.7225	161.0507	169.0075	179.7098	189.0849	(72)
Total internal gains	1098.1010	1131.9630	1081.5684	1049.8289	995.1383	958.7436	920.8282	918.9007	947.0762	978.6202	1037.1321	1072.7300	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	32.5800	19.6403	0.5000	0.7000	0.7700	155.2028	(76)
South	3.0600	46.7521	0.5000	0.7000	0.7700	34.6995	(78)
Southwest	1.0200	36.7938	0.5000	0.7000	0.7700	9.1028	(79)
West	22.4500	19.6403	0.5000	0.7000	0.7700	106.9461	(80)
Northwest	1.0200	11.2829	0.5000	0.7000	0.7700	2.7914	(81)
South	1.4400	47.0123	0.5000	0.7000	1.0000	21.3248	(82)

Solar gains	330.0675	628.8917	1004.0502	1429.9917	1731.8031	1765.9261	1683.9086	1458.6090	1155.2184	737.0063	408.2971	273.6484	(83)
Total gains	1428.1685	1760.8547	2085.6186	2479.8206	2726.9415	2724.6697	2604.7368	2377.5097	2102.2946	1715.6265	1445.4292	1346.3783	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3145	77.4253	77.5342	78.0499	78.1471	78.6030	78.6030	78.6880	78.4268	78.1471	77.9506	77.7463	
alpha	6.1543	6.1617	6.1689	6.2033	6.2098	6.2402	6.2402	6.2459	6.2285	6.2098	6.1967	6.1831	
util living area	0.9999	0.9996	0.9982	0.9877	0.9366	0.7851	0.6020	0.6772	0.9257	0.9961	0.9997	0.9999	(86)
MIT	19.9783	20.0934	20.2817	20.5441	20.7768	20.9121	20.9440	20.9381	20.8339	20.5207	20.2016	19.9603	(87)
Th 2	20.1690	20.1701	20.1712	20.1762	20.1772	20.1816	20.1816	20.1824	20.1799	20.1772	20.1753	20.1733	(88)
util rest of house	0.9999	0.9995	0.9974	0.9826	0.9097	0.7100	0.4961	0.5692	0.8828	0.9939	0.9996	0.9999	(89)
MIT 2	18.9387	19.0872	19.3294	19.6673	19.9506	20.0932	20.1154	20.1135	20.0217	19.6403	19.2302	18.9191	(90)
Living area fraction										fLA = Living area / (4) =		0.0718	(91)
MIT	19.0132	19.1594	19.3977	19.7302	20.0099	20.1519	20.1749	20.1727	20.0799	19.7035	19.2999	18.9938	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.0132	19.1594	19.3977	19.7302	20.0099	20.1519	20.1749	20.1727	20.0799	19.7035	19.2999	18.9938	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9998	0.9992	0.9965	0.9788	0.9030	0.7070	0.4953	0.5679	0.8762	0.9920	0.9994	0.9999	(94)
Useful gains	1427.8860	1759.4703	2078.2997	2427.3038	2462.4703	1926.2845	1290.0113	1350.0792	1842.1059	1701.8926	1444.5318	1346.1966	(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	5433.4400	5258.2850	4749.4745	3961.7821	3036.0492	2016.6612	1298.5231	1368.8959	2177.0045	3326.0086	4468.5245	5432.8352	(97)
Space heating kWh	2980.1322	2351.2035	1987.3540	1104.8244	426.7427	0.0000	0.0000	0.0000	0.0000	1208.3423	2177.2747	3040.4591	(98a)
Space heating requirement - total per year (kWh/year)												15276.3329	
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	2980.1322	2351.2035	1987.3540	1104.8244	426.7427	0.0000	0.0000	0.0000	0.0000	1208.3423	2177.2747	3040.4591	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15276.3329	
Space heating per m2											(98c) / (4) =	37.1560	(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 %) 83.7000 (206)

Efficiency of main space heating system 2 (in %) 0.0000 (207)

Efficiency of secondary/supplementary heating system, % 0.0000 (208)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Space heating requirement	2980.1322	2351.2035	1987.3540	1104.8244	426.7427	0.0000	0.0000	0.0000	0.0000	1208.3423	2177.2747	3040.4591	(98)
Space heating efficiency (main heating system 1)	83.7000	83.7000	83.7000	83.7000	83.7000	0.0000	0.0000	0.0000	0.0000	83.7000	83.7000	83.7000	(210)
Space heating fuel (main heating system)	3560.4925	2809.0842	2374.3776	1319.9813	509.8479	0.0000	0.0000	0.0000	0.0000	1443.6587	2601.2840	3632.5677	(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	313.0811	277.1684	295.2546	261.5809	254.9036	231.1506	229.2179	237.5151	239.2258	265.0040	279.6305	309.9291	(64)
Efficiency of water heater												79.7000	(216)
(217)m	82.7579	82.6562	82.4230	81.8231	80.1061	74.7000	74.7000	74.7000	74.7000	81.9343	82.5745	82.7830	(217)
Fuel for water heating, kWh/month	378.3097	335.3269	358.2185	319.6909	318.2074	309.4385	306.8513	317.9586	320.2487	323.4349	338.6403	374.3873	(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	61.0064	48.9416	44.0665	32.2850	24.9379	20.3744	22.7491	29.5702	38.4088	50.3944	56.9203	62.7019	(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 18251.2938 (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 4000.7130 (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) 492.3565 (232)

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	22830.3633	(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	18251.2938	0.2100	3832.7717	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	4000.7130	0.2100	840.1497	(264)
Space and water heating			4672.9214	(265)
Pumps, fans and electric keep-hot	86.0000	0.1387	11.9293	(267)
Energy for lighting	492.3565	0.1443	71.0623	(268)
Total CO2, kg/year			4755.9129	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			11.5700	(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	18251.2938	1.1300	20623.9620	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	4000.7130	1.1300	4520.8057	(278)
Space and water heating			25144.7677	(279)
Pumps, fans and electric keep-hot	86.0000	1.5128	130.1008	(281)
Energy for lighting	492.3565	1.5338	755.1929	(282)
Total Primary energy kWh/year			26030.0613	(286)
Dwelling Primary energy Rate (DPER)			63.3100	(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 411	**Issued on Date**	10/10/2025
Assessment Reference	Finchampstead 4BH DET 411	**Prop Type Ref**	Finchampstead 4BH DET 411
Property	The Old Thatch, Lower Sandhurst Road, Finchampstead, Berkshire, RG40 3TH		

SAP Rating	87 B	**DER**	2.29	**TER**	6.97
Environmental	97 A	**% DER < TER**			67.14
CO_2 Emissions (t/year)	0.87	**DFEE**	38.94	**TFEE**	41.15
Compliance Check	See BREL	**% DFEE < TFEE**			5.37
% DPER < TPER	37.72	**DPER**	23.68	**TPER**	38.02

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

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1. Overall dwelling characteristics

	Area (m2)		Storey height (m)		Volume (m3)	
Main dwelling						
Ground floor	233.0000 (1b)	x	2.5500 (2b)	=	594.1500	(1b) - (3b)
First floor	178.1400 (1c)	x	2.6800 (2c)	=	477.4152	(1c) - (3c)
Total floor area TFA = (1a)+(1b)+(1c)+(1d)+(1e)...(1n)	411.1400					(4)
Dwelling volume			(3a)+(3b)+(3c)+(3d)+(3e)...(3n)	=	1071.5652	(5)

2. Ventilation rate

		m3 per hour	
Number of open chimneys	0 * 80 =	0.0000	(6a)
Number of open flues	0 * 20 =	0.0000	(6b)
Number of chimneys / flues attached to closed fire	0 * 10 =	0.0000	(6c)
Number of flues attached to solid fuel boiler	0 * 20 =	0.0000	(6d)
Number of flues attached to other heater	0 * 35 =	0.0000	(6e)
Number of blocked chimneys	0 * 20 =	0.0000	(6f)
Number of intermittent extract fans	6 * 10 =	60.0000	(7a)
Number of passive vents	0 * 10 =	0.0000	(7b)
Number of flueless gas fires	0 * 40 =	0.0000	(7c)

		Air changes per hour	
Infiltration due to chimneys, flues and fans = (6a)+(6b)+(6c)+(6d)+(6e)+(6f)+(6g)+(7a)+(7b)+(7c) =	60.0000 / (5) =	0.0560	(8)
Pressure test		Yes	
Pressure Test Method		Blower Door	
Measured/design AP50		4.0000	(17)
Infiltration rate		0.2560	(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) =	0.2176	(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	0.2774	0.2720	0.2666	0.2394	0.2339	0.2067	0.2067	0.2013	0.2176	0.2339	0.2448	0.2557	(22b)
Effective ac	0.5385	0.5370	0.5355	0.5286	0.5274	0.5214	0.5214	0.5203	0.5237	0.5274	0.5300	0.5327	(25)

3. Heat losses and heat loss parameter

Element	Gross m2	Openings m2	NetArea m2	U-value W/m2K	A x U W/K	K-value kJ/m2K	A x K kJ/K	
Main dwelling								
Windows & Glazed Doors			60.1300	1.1450	68.8511			(27)
Doors			1.8900	1.0000	1.8900			(26)
Roof Windows			1.4400	1.0536	1.5172			(27a)
Ground Floor			233.0000	0.1100	25.6300			(28a)
External Wall	258.0100	54.8200	203.1900	0.1800	36.5742			(29a)
Low Level Walls & Dormers	86.1100	7.2000	78.9100	0.1500	11.8365			(29a)
Roof over Ground Floor	54.8600		54.8600	0.1000	5.4860			(30)
Roof over First Floor	147.3000		147.3000	0.1000	14.7300			(30)
Sloping Ceilings	37.3500	1.4400	35.9100	0.1500	5.3865			(30)
Total net area of external elements Aum(A, m2)			816.6300					(31)
Fabric heat loss, W/K = Sum (A x U)			(26)...(30) + (32) =		171.9016			(33)

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

List of Thermal Bridges

	Length	Psi-value	Total
K1 Element			
E2 Other lintels (including other steel lintels)	41.0200	0.0280	1.1486
E3 Sill	28.1200	0.0240	0.6749
E4 Jamb	103.5000	0.0190	1.9665
E5 Ground floor (normal)	76.8900	0.0460	3.5369

E10 Eaves (insulation at ceiling level)												57.0500	0.0510	2.9095	
E6 Intermediate floor within a dwelling												66.0800	0.0000	0.0000	
E12 Gable (insulation at ceiling level)												29.8400	0.0290	0.8654	
E16 Corner (normal)												53.6000	0.0370	1.9832	
E17 Corner (inverted - internal area greater than external area)												77.4000	-0.0790	-6.1146	
Thermal bridges (Sum(L x Psi) calculated using Appendix K)														6.9704	(36)
Point Thermal bridges													(36a) =	0.0000	
Total fabric heat loss													(33) + (36) + (36a) =	178.8720	(37)

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(38)m	190.4170	189.8885	189.3705	186.9376	186.4824	184.3634	184.3634	183.9710	185.1796	186.4824	187.4033	188.3660	(38)
Heat transfer coeff	369.2889	368.7605	368.2425	365.8096	365.3544	363.2354	363.2354	362.8430	364.0516	365.3544	366.2752	367.2379	(39)
Average = Sum(39)m / 12 =												365.8074	

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
HLP	0.8982	0.8969	0.8957	0.8897	0.8886	0.8835	0.8835	0.8825	0.8855	0.8886	0.8909	0.8932	(40)
HLP (average)												0.8897	
Days in mont	31	28	31	30	31	30	31	31	30	31	30	31	

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4. Water heating energy requirements (kWh/year)

Assumed occupancy												3.2764	(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													
	96.1425	94.7147	92.7040	88.9966	86.2205	83.1423	81.4796	83.4763	85.6503	88.9440	92.7278	95.8175	(42b)
Hot water usage for other uses													
	50.7197	48.8754	47.0310	45.1867	43.3423	41.4980	41.4980	43.3423	45.1867	47.0310	48.8754	50.7197	(42c)
Average daily hot water use (litres/day)												135.2481	(43)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Daily hot water use													
	146.8623	143.5901	139.7350	134.1832	129.5628	124.6403	122.9776	126.8186	130.8369	135.9751	141.6032	146.5372	(44)
Energy conte	232.5939	204.4703	214.7675	183.6901	174.4165	153.2598	148.7307	157.0279	161.3350	184.5169	201.7397	229.4419	(45)
Energy content (annual)											Total = Sum(45)m =	2245.9902	
Distribution loss (46)m = 0.15 x (45)m													
	34.8891	30.6705	32.2151	27.5535	26.1625	22.9890	22.3096	23.5542	24.2003	27.6775	30.2609	34.4163	(46)
Water storage loss:													
Store volume												350.0000	(47)
a) If manufacturer declared loss factor is known (kWh/day):												2.5800	(48)
Temperature factor from Table 2b												0.5400	(49)
Enter (49) or (54) in (55)												1.3932	(55)
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	(56)
If cylinder contains dedicated solar storage													
	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)
Primary loss	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)
Combi loss	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(61)
Total heat required for water heating calculated for each month													
	313.0811	277.1684	295.2546	261.5809	254.9036	231.1506	229.2179	237.5151	239.2258	265.0040	279.6305	309.9291	(62)
WWHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63a)
PV diverter	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63b)
Solar input	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63c)
FGHRS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(63d)
Output from w/h													
	313.0811	277.1684	295.2546	261.5809	254.9036	231.1506	229.2179	237.5151	239.2258	265.0040	279.6305	309.9291	(64)
											Total per year (kWh/year) = Sum(64)m =	3193.6616	(64)
12Total per year (kWh/year)												3194	(64)
Electric shower(s)													
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	(64a)
											Total Energy used by instantaneous electric shower(s) (kWh/year) = Sum(64a)m =	0.0000	(64a)
Heat gains from water heating, kWh/month													
	141.7272	126.1448	135.7999	123.3896	122.3832	113.2715	113.8427	116.6015	115.9565	125.7416	129.3911	140.6792	(65)

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

Metabolic gains (Table 5), Watts

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
(66)m	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	163.8206	(66)
Lighting gains (calculated in Appendix L, equation L9 or L9a), also see Table 5													
	289.3747	320.3791	289.3747	299.0205	289.3747	299.0205	289.3747	289.3747	299.0205	289.3747	299.0205	289.3747	(67)
Appliances gains (calculated in Appendix L, equation L13 or L13a), also see Table 5													
	543.0866	548.7221	534.5208	504.2877	466.1239	430.2553	406.2929	400.6574	414.8587	445.0918	483.2556	519.1242	(68)
Cooking gains (calculated in Appendix L, equation L15 or L15a), also see Table 5													
	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	39.3821	(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)													
	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	-131.0565	(71)
Water heating gains (Table 5)													
	190.4936	187.7155	182.5268	171.3745	164.4936	157.3215	153.0144	156.7225	161.0507	169.0075	179.7098	189.0849	(72)
Total internal gains													
	1095.1010	1128.9630	1078.5684	1046.8289	992.1383	958.7436	920.8282	918.9007	947.0762	975.6202	1034.1321	1069.7300	(73)

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6. Solar gains

[Jan]	Area m2	Solar flux Table 6a W/m2	g Specific data or Table 6b	FF Specific data or Table 6c	Access factor Table 6d	Gains W	
East	32.5800	19.6403	0.5000	0.7000	0.7700	155.2028	(76)
South	3.0600	46.7521	0.5000	0.7000	0.7700	34.6995	(78)
Southwest	1.0200	36.7938	0.5000	0.7000	0.7700	9.1028	(79)
West	22.4500	19.6403	0.5000	0.7000	0.7700	106.9461	(80)
Northwest	1.0200	11.2829	0.5000	0.7000	0.7700	2.7914	(81)
South	1.4400	47.0123	0.5000	0.7000	1.0000	21.3248	(82)

Solar gains	330.0675	628.8917	1004.0502	1429.9917	1731.8031	1765.9261	1683.9086	1458.6090	1155.2184	737.0063	408.2971	273.6484	(83)
Total gains	1425.1685	1757.8547	2082.6186	2476.8206	2723.9415	2724.6697	2604.7368	2377.5097	2102.2946	1712.6265	1442.4292	1343.3783	(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, ni1,m (see Table 9a)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
tau	77.3145	77.4253	77.5342	78.0499	78.1471	78.6030	78.6030	78.6880	78.4268	78.1471	77.9506	77.7463	
alpha	6.1543	6.1617	6.1689	6.2033	6.2098	6.2402	6.2402	6.2459	6.2285	6.2098	6.1967	6.1831	
util living area	0.9999	0.9996	0.9982	0.9878	0.9369	0.7851	0.6020	0.6772	0.9257	0.9961	0.9997	0.9999	(86)
Living	19.9777	20.0927	20.2811	20.5435	20.7764	20.9121	20.9440	20.9381	20.8339	20.5201	20.2009	19.9597	
Non living	18.9379	19.0864	19.3286	19.6666	19.9501	20.0932	20.1154	20.1135	20.0217	19.6396	19.2294	18.9183	
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	20.4770	20.0927	20.2811	20.5435	20.7764	20.9121	20.9440	20.9381	20.8339	20.5201	20.2009	20.1052	(87)
Th 2	20.1690	20.1701	20.1712	20.1762	20.1772	20.1816	20.1816	20.1824	20.1799	20.1772	20.1753	20.1733	(88)
util rest of house	0.9999	0.9995	0.9975	0.9827	0.9101	0.7100	0.4961	0.5692	0.8828	0.9939	0.9996	0.9999	(89)
MIT 2	19.6782	19.0864	19.3286	19.6666	19.9501	20.0932	20.1154	20.1135	20.0217	19.6396	19.2294	19.1444	(90)
Living area fraction										fLA = Living area / (4) =		0.0718	(91)
MIT	19.7355	19.1586	19.3969	19.7295	20.0094	20.1519	20.1749	20.1727	20.0799	19.7028	19.2991	19.2134	(92)
Temperature adjustment												0.0000	
adjusted MIT	19.7355	19.1586	19.3969	19.7295	20.0094	20.1519	20.1749	20.1727	20.0799	19.7028	19.2991	19.2134	(93)

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8. Space heating requirement

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Utilisation	0.9999	0.9992	0.9965	0.9789	0.9034	0.7070	0.4953	0.5679	0.8762	0.9921	0.9994	0.9999	(94)
Useful gains	1424.9577	1756.4856	2075.3646	2424.6542	2460.7426	1926.2845	1290.0113	1350.0792	1842.1059	1699.0352	1441.5439	1343.2141	(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	5700.1667	5257.9996	4749.1931	3961.5262	3035.8822	2016.6612	1298.5231	1368.8959	2177.0045	3325.7351	4468.2405	5513.4762	(97)
Space heating kWh	3180.7555	2353.0174	1989.3284	1106.5478	427.9039	0.0000	0.0000	0.0000	0.0000	1210.2647	2179.2215	3102.6750	(98a)
Space heating requirement - total per year (kWh/year)												15549.7143	
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	3180.7555	2353.0174	1989.3284	1106.5478	427.9039	0.0000	0.0000	0.0000	0.0000	1210.2647	2179.2215	3102.6750	(98c)
Space heating requirement after solar contribution - total per year (kWh/year)												15549.7143	
Space heating per m2										(98c) / (4) =		37.8210	(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 %) 394.9493 (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	3180.7555	2353.0174	1989.3284	1106.5478	427.9039	0.0000	0.0000	0.0000	0.0000	1210.2647	2179.2215	3102.6750	(98)
Space heating efficiency (main heating system 1)	394.9493	394.9493	394.9493	394.9493	394.9493	0.0000	0.0000	0.0000	0.0000	394.9493	394.9493	394.9493	(210)
Space heating fuel (main heating system)	805.3579	595.7771	503.6921	280.1746	108.3440	0.0000	0.0000	0.0000	0.0000	306.4355	551.7725	785.5882	(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	313.0811	277.1684	295.2546	261.5809	254.9036	231.1506	229.2179	237.5151	239.2258	265.0040	279.6305	309.9291	(64)
Efficiency of water heater												174.6166	(216)
(217)m	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	174.6166	(217)
Fuel for water heating, kWh/month	179.2963	158.7297	169.0874	149.8030	145.9791	132.3761	131.2693	136.0209	137.0006	151.7634	160.1397	177.4912	(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	61.0064	48.9416	44.0665	32.2850	24.9379	20.3744	22.7491	29.5702	38.4088	50.3944	56.9203	62.7019	(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 3937.1418 (211)

Space heating fuel - main system 2 0.0000 (213)

Space heating fuel - secondary 0.0000 (215)

Efficiency of water heater 174.6166

Water heating fuel used 1828.9567 (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)	492.3565	(232)
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	6258.4551	(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	3937.1418	0.1552	611.0727	(261)
Total CO2 associated with community systems			0.0000	(373)
Water heating (other fuel)	1828.9567	0.1407	257.3399	(264)
Space and water heating			868.4126	(265)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(267)
Energy for lighting	492.3565	0.1443	71.0623	(268)
Total CO2, kg/year			939.4749	(272)
EPC Dwelling Carbon Dioxide Emission Rate (DER)			2.2900	(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	3937.1418	1.5746	6199.4441	(275)
Total CO2 associated with community systems			0.0000	(473)
Water heating (other fuel)	1828.9567	1.5203	2780.4885	(278)
Space and water heating			8979.9325	(279)
Pumps, fans and electric keep-hot	0.0000	0.0000	0.0000	(281)
Energy for lighting	492.3565	1.5338	755.1929	(282)
Total Primary energy kWh/year			9735.1254	(286)
Dwelling Primary energy Rate (DPER)			23.6800	(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

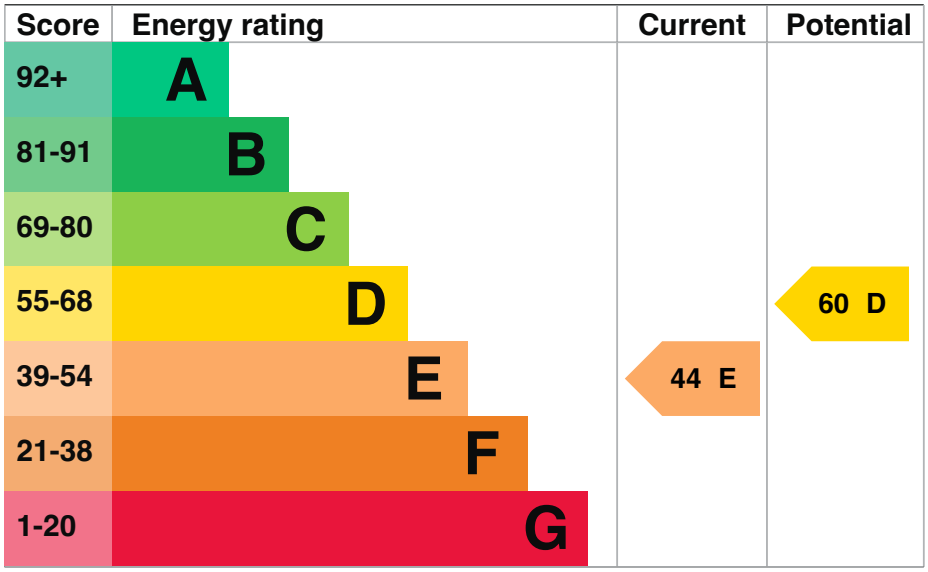
Properties can be let if they have an energy rating from A to E.

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).

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)

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)
- Heat pumps and biomass boilers: Boiler Upgrade Scheme (www.gov.uk/apply-boiler-upgrade-scheme)
- Help from your energy supplier: Energy Company Obligation (www.gov.uk/energy-company-obligation)