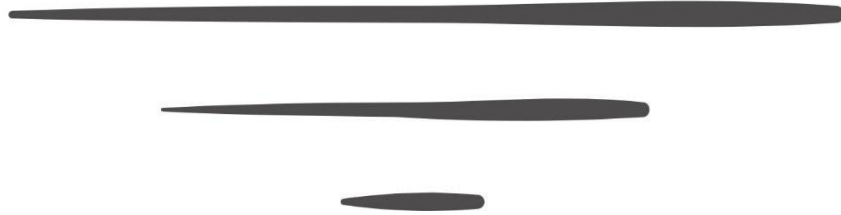


J O S T E C

BUILDING REGULATIONS COMPLIANCE SERVICES



ENERGY STATEMENT

1A New Road, Reading, RD1 5JD

JosTec Ref: 23560
Date: 02/04/2026
Prepared for: Trace Architects

Version: ES3

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ES1	First Issue	03/10/2023	-
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ES2	Second Issue	30/10/2023	Addition of PV to reach B rating
ES3	Third Issue	02/04/2026	Change in design

1. Introduction

JosTec has been commissioned by Trace Architects to prepare an Energy Statement in support of the planning application for the proposed development of the Land adjacent to 1A New Road, Reading, RG1 5JD. This development falls within the jurisdiction of the Reading Borough Council. Therefore, must adhere to the policies in the Local Plan (Adopted November 2019).

2. Planning Policy

2.1. National Policy - England

The Department Ministry of Housing, Communities & Local Government released the National Planning Policy Framework (NPPF) in March 2012. The latest revision was released in July 2021. The Government's objective is to streamline the process, encouraging sustainable development and promoting the needs and priorities of local communities.

This framework is to be used as the base by councils to develop their own local policy. Section 14 of the framework addresses climate change, flooding and coastal change. Considerations include:

- Minimising CO₂ emissions by providing a positive strategy for energy from these sources that maximises the potential for suitable development while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts).
- Consider identifying suitable areas for renewable and low carbon energy sources and supporting infrastructure, where this would help secure their development A promotion of decentralised, low carbon and renewable energy sources wherever viable.
- Recognize opportunities for development to draw its energy supply from decentralised, renewable, or low-carbon energy supply systems and for co-locating potential heat customers and suppliers.

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

In determining planning applications, local planning authorities should expect new developments too:

- Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
- Take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

2.2. Local Policy – Reading Borough Local Plan

The three planning policies affecting the sustainable design are:

- Policy H5 – Standards For New Housing
- Policy CC2 – Sustainable Design and Construction
- Policy CC3 – Adaption To Climate Change

2.3. Reading Borough Local Plan – Policy H5: Standards For New Housing

New build housing should be built to the following standards, unless it can be clearly demonstrated that this would render a development unviable:

- a. All new build housing outside the Central Area as defined on the Proposals Map will comply with the nationally-described space standard.
- b. All new build housing will be built to the higher water efficiency standard under Regulation 36(3) of the Building Regulations⁷⁹
- c. All major new-build residential development should be designed to achieve zero carbon homes.
- d. All other new build housing will achieve at a minimum a 19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations.
- e. All new build housing will be accessible and adaptable in line with M4(2) of the Building Regulations, unless it is built in line with M4(3) (see below).
- f. On developments of 20 or more new build dwellings, at least 5% of dwellings will be wheelchair user dwellings in line with M4(3) of the Building Regulations. Any market homes provided to meet this requirement will be 'wheelchair adaptable' as defined in part M, whilst homes where the Council is responsible for allocating or nominating an individual may be 'wheelchair accessible'.

2.4. Reading Borough Local Plan – Policy CC2: Sustainable Design and Construction

Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.

To meet these requirements:

- All major non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Excellent' standards, where possible;
- All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM 'Very Good' standard as a minimum;
- All non-residential development or conversions to residential should incorporate water conservation measures so that predicted per capita consumption does not exceed the appropriate levels set out in the applicable BREEAM standard. Both residential and non-residential development should include recycling grey water and rainwater harvesting where systems are energy and cost effective.

2.5. S Reading Borough Local Plan – Policy CC3: Adaptation To Climate Change

All developments will demonstrate how they have been designed to incorporate measures to adapt to climate change. The following measures shall be incorporated into development:

- Wherever possible, new buildings shall be orientated to maximise the opportunities for both natural heating and ventilation and reducing exposure to wind and other elements;
- Proposals involving both new and existing buildings shall demonstrate how they have been designed to maximise resistance and resilience to climate change for example by including measures such as solar shading, thermal mass, heating and ventilation of the building and appropriately coloured materials in areas exposed to direct sunlight, green and brown roofs, green walls, etc;
- Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and adaptable to meet the predicted changed climatic conditions; and
- All development shall minimise the impact of surface water runoff from the development in the design of the drainage system, and where possible incorporate mitigation and resilience measures for any increases in river flooding levels as a result of climate change.

2.6. Building Regulations – England Approved Document L

Approved document L1 – Conservation of Fuel and Power sets the standard for carbon emissions for new dwellings. Residential development will need to comply with the criteria set out in the document, as follows:

1. The predicted Dwelling Emission Rate of CO₂ emissions from dwellings (DER) are not greater than the Target Emission Rate (TER).
2. The predicted Dwelling Primary Energy Rate from dwellings (DPER) are not greater than the Target Primary Energy Rate (TPER)
3. The performance of the building fabric and fixed building services should be no worse than the design limits set out in the Approved Document.
4. The dwellings will have appropriate passive control measures to limit the effect of solar gains on indoor temperatures in summer.
5. That the performance of dwellings as built comply with the DER values achieved, including site testing of a representative sample of dwellings demonstrating that the 'air permeability' rate achieved is as per that specified, or better.
6. The necessary provisions for energy-efficient operation of dwellings are put in place, including operation and maintenance instructions aimed at achieving economy in the use of fuel and power in a way that householders can understand.

Compliance with the Approved Document Parts L1 should be demonstrated at the detailed design stage, prior to construction.

2.7. Assessment Methodology Domestic (SAP)

The Standard Assessment Procedure (SAP) is the official methodology endorsed by the Government for evaluating the projected energy consumption and carbon dioxide emissions of new constructions. The outcomes are determined based on the building's floor area and account for energy usage (kWh/m²/yr) as well as the associated CO₂ emissions (kg.CO₂/m²/yr). These calculations encompass the following factors:

- Space heating
- Domestic hot water
- Ventilation
- Lighting
- Ancillary pumps and fans
- Energy generating technology.

A trained and accredited Elmhurst Energy Assessor has used Elmhurst Design SAP 2012 (4.14r19) & SAP 10 software to assess compliance and generate the necessary results data.

SAP calculations have been conducted for the intended residential dwelling, and the outcomes have been employed to ascertain the anticipated energy consumption and CO₂ emissions for the entire development. An overview of the input data utilised in these calculations can be found in the Appendix. Furthermore, comprehensive SAP Calculations will be included in the Appendix to support these findings will be included in the Appendix as well.

A detailed fabric and systems specification has been based on information provided by Trace Architects.



Figure 1. Sketch Up Model

3. Target Emission Rates

The following results are calculated using approved SAP 2012 software with minimum standards used to achieve Part L 2013 Building Regulations compliance, including a notional gas-fired system boiler to provide heating and hot water.

The 2013 Building Regulations referred to within Reading Borough Local Plan are the Approved Document L1A 2012: Conservation of Fuel and Power – Edition 2013 incorporating 2016 amendments. For the ease of this document, we will refer to this as “Part L 2012 Building Regulations or ADL: 2012”.

3.1. Emission requirements

The development is subject to 19% Carbon Emissions Reduction compared to the notional building described above. This is as per the latest Reading Borough Local Plan.

A fabric-first approach has been followed, incorporating passive design measures such as low u-values, low air leakage and low thermal bridging.

Active design measures have then been incorporated via energy-efficient building services, such as 100% low-energy lighting, and an air source heat pump.

We can now explore several options to reduce the Dwelling Emission Rates (DER) in order to comply with the Reading Borough Local Plan target requirements.

	ADL:2012 Emission Rate KG CO ₂ /m ² /year (TER/DER)	ADL:2012 Fabric Energy Efficiency kWh/m ² /year (TFEE/DFEE)
TER	22.77	87.82

Table 1. TER & TFEE ADL:2012

3.2. Baseline Calculation

This section outlines the proposals for specifying building fabric and services beyond the requirements of Building Regulations (the baseline).

Fundamental to achieving energy efficiency in any new building is the specification of a thermally efficient building envelope. Passive design features such as high levels of insulation, designing to maximise solar gain and limiting heat loss through reduced air leakage and enhanced thermal bridging are all proven techniques to reduce energy consumption and emissions.

The baseline “compliant” case for emissions will be determined by using the Target Emissions Rates (TER) from the compliance calculations. These figures provide an emission rate, and hence a figure for acceptable total regulated emissions from a dwelling.

The emissions saving from efficiency measures will be determined by comparing the total emissions based on the TER figures with the predicted emissions based on the actual proposed specification. The emissions saving from the low and zero-carbon technologies will be calculated separately and incorporated into the final residential results using the SAP methodology.

FABRIC FIRST

Use Less Energy

4.1. Building Fabric - Residential

Limited assumptions have been made on this development to meet the fabric efficiency targets for Building Regulations 2013 as the majority of the specification has been provided by the client.

Compliance has been achieved by aiming for values corresponding to the prescribed notional U-values specified in Table 1.1: Summary of concurrent notional dwelling specification, as outlined in Approved Document L 2012. The Target Fabric Energy Efficiency (TFEE) has been successfully met by targeting a thermal bridging Y Value lower than 0.150. This will likely entail incorporating improved thermal bridging details into the design to minimize heat losses.

Table 2 shows the proposed building fabric specification applied to the SAP calculations with respect to the upper limits stipulated by Part L: 2012. The values represent in some areas a significant bettering of the mandatory requirements set out in the current Building Regulations

Fabric	ADL:2012 Limiting U-Values W/m ² K	Proposed Values W/m ² K
Walls	0.30	0.18
Roof	0.20	0.15
Floor	0.25	0.16
Windows	2.00	1.20
Doors	2.00	1.00
Air Permeability	10.0 m ³ / (h. m ²) at 50 Pa	5.0 m ³ / (h. m ²) at 50 Pa
Ventilation	Natural Ventilation (openable windows + trickle vents)	Natural Ventilation (openable windows + trickle vents)
Thermal bridging	Default Psi Values Y = 0.05	Psi Values Calculated Y = 0.00

Table 2. Building Fabric Specification

4.2. Building Services - Residential

For the early design stage, space heating and domestic hot water (DHW) will be supplied by an 89.5% efficient combi boiler, adhering to the guidance provided. To ensure energy efficiency, heating controls will be implemented, including a programmer with independent time and temperature zone controls, in accordance with Part L 2012 Approved Document. These controls will enable effective management of heating requirements based on specific zones and desired temperature settings.

The dwelling will be ventilated primarily through natural means, utilising openable windows and trickle vents. Additionally, in the wet room areas and kitchen, demand-controlled mechanical extract ventilation (dMEV) systems will be installed. These systems will provide efficient and targeted extraction of air in specific areas where moisture and pollutants are likely to be generated, ensuring a healthy and comfortable indoor environment.

To promote energy efficiency, low-energy lighting will be selected for the development. In accordance with the Domestic Building Services Compliance Guide (DBSCG), the specified lighting will possess a luminous efficacy exceeding 45 lumens per circuit watt and an output greater than 400 lamp lumens. This

requirement is typically met by utilizing LED or compact fluorescent lights, rather than low-voltage Halogen variants. By opting for these energy-saving lighting options, the development can reduce its overall electricity consumption and contribute to sustainability objectives.

Element	Specification
Boilers	95% Efficiency
Heating emitter	Underfloor heating – pipes in screed above insulation and radiators upper floor
Heating control	Time and temperature zone control.
Domestic hot water	From the main heating system/Hot water cylinder
Water consumption	≤125 litres/person/day
Internal fixed lighting	100% low energy
Ventilation	Natural Ventilation (openable windows + trickle vents) + Intermittent extract
Thermal bridging	Psi Values Calculated Y = 0.00
Thermal mass parameter	Calculated

Table 3. Building HVAC/TMP

4.3. Fabric First – Results Summary

	ADL:2012 Emission Rate KG CO ² /m ² /year (TER)	ADL:2012 Fabric Energy Efficiency kWh/m ² /year (TFEE)	Percentage Reduction DER %	Percentage Reduction DFEE %
TER	22.77	87.82	-	-
DER – Fabric First	23.26	69.64	0.00	20.70

Table 4. Fabric First Results

4.4. Summertime Overheating

In recent years, the impacts of overheating have been extensively studied and qualified, in part, to climate change and modern construction practices. The industry has developed various guidelines to assess and predict the risk of overheating. However, it is crucial to address design considerations during the concept stage to implement effective measures for adequate mitigation.

By acknowledging the potential risks of overheating early in the design process, appropriate strategies can be incorporated to prevent or minimise excessive heat build-up within buildings. These strategies may include optimising building orientation, incorporating effective shading systems, implementing natural ventilation techniques, utilising thermal insulation, and integrating efficient cooling systems.

Considering these design considerations ensures that the development can effectively mitigate the adverse effects of overheating and create comfortable and sustainable indoor environments for occupants.

4.5. Common Causes

The Zero Carbon Hub states three factors most associated with overheating risk: location, building design and occupational usage.

4.6. Location

A specific site's climate, or microclimate, is influenced by its geographic location. Factors such as sunlight, wind patterns, and rainfall intensity vary based on the site, and the design approach must be tailored accordingly. For instance, average summertime temperatures are typically higher in the southeast of England compared to the northeast. Therefore, in the southeast, increasing ventilation levels may have a limited impact on reducing internal temperatures.

Dense urban developments with limited open green spaces may be susceptible to the "urban heat island" effect. This phenomenon occurs when heat is absorbed by dense man-made structures during the day and then radiated at night, leading to elevated local temperatures. To mitigate this effect, increasing the amount of green space and incorporating solar reflective materials and coatings can help reduce heat absorption and minimise heat retention.

By recognising and addressing the specific climate characteristics and potential risks associated with a site, the design can be optimised to create comfortable and sustainable environments that mitigate the effects of climate-related factors such as high temperatures and urban heat islands.

4.7. Building Design

There are multiple aspects of building design that impact its performance in terms of overheating. The orientation of a building, along with the size and placement of glazing areas, plays a significant role in determining the amount of solar heat gain. If solar gain cannot be effectively absorbed or removed, it can lead to increased internal temperatures. While harnessing "free" solar energy for heating purposes can be beneficial, controlling the amount of solar energy entering the building is essential to prevent overheating.

Modern structures are frequently built with high levels of energy efficiency in mind, resulting in improved insulation and airtightness. However, these design features, combined with reduced levels of thermal mass compared to older buildings, can limit the ability to absorb or naturally dissipate heat. As a result, modern buildings may be more prone to overheating if not properly designed and equipped with appropriate mitigation strategies.

To address these challenges, designers need to consider various factors such as building orientation, glazing design, solar shading systems, insulation techniques, and ventilation strategies. By integrating these elements effectively, the building's ability to manage solar gain and control internal temperatures can be optimised, ensuring a comfortable and energy-efficient indoor environment.

4.8. Occupants

While occupants' specific use and behaviour cannot be controlled in new construction projects, it is important to consider the impact of room use type and location when planning a building. The arrangement of spaces should consider the potential solar and other incident heat gains. The risk of overheating is influenced by factors such as occupant density and the anticipated activity type within a particular zone.

For instance, rooms with glazed perimeter areas that are predominantly occupied in the afternoon may benefit from being situated in east-facing locations. The direct solar heat gain can be minimised by positioning them where the sun has already passed its peak. This thoughtful placement considers the potential heat load and aims to create a more comfortable indoor environment.

Considering the occupant activities and their corresponding heat generation patterns, along with the solar exposure of different spaces, allows for better design decisions that help mitigate the risk of overheating and enhance occupant comfort.

5.1. Mitigation

When it comes to new-build construction projects, it is crucial to consider design considerations for reducing the risk of overheating at the earliest opportunity. While performance measures can be incorporated at later stages, the most effective and robust techniques are often inherent to the building's design.

The "cooling hierarchy," outlines the preferred approach to mitigating overheating risks and minimising reliance on mechanical cooling. The hierarchical steps include:

1. Minimizing heat generation through energy-efficient design.
2. Reducing the amount of heat entering the building in summer through considerations such as orientation, shading, albedo, fenestration, insulation, and the incorporation of green roofs and walls.
3. Managing heat within the building using exposed thermal mass and high ceilings.
4. Implementing passive ventilation strategies.
5. Considering mechanical cooling as a last resort.

In addition to appropriate siting and orientation, several properties and functions influence the performance of overheating mitigation measures. One such consideration is the location, proportion, and specification of glazing. It is important to strike a balance between the benefits of natural light and "free heat" while ensuring that the levels of solar gain are not excessive. Glass manufacturers offer a variety of products, including those with solar control coatings, which can help reduce the transmitted solar gain (measured by the "g-value") without significantly impacting visual performance. Different glass specifications may be more suitable for specific orientations, such as using lower g-value glass for south-facing facades compared to north-facing ones.

5.2. Solar shading

In line with solar control glass coatings, the use of external solar shading is another effective approach to prevent direct transmission of solar gain while allowing for the maintenance or maximisation of glazed areas. The selection of the appropriate type of external shading depends on the orientation of the windows and the sun angles at different times of the day.

Horizontal overhangs are typically more suitable for windows facing south, with higher sun angles. These overhangs can effectively block the high-angle summer sun while allowing the lower-angle winter sun to penetrate and provide natural daylight.

On the other hand, for windows facing east and west, where the sun angles are lower, vertical fins are often a better choice. These fins can help minimise the direct entry of the low-angle morning and afternoon sun, reducing the potential for overheating while allowing for views and daylight.

By carefully selecting and designing external solar shading devices based on the orientation of the windows and the specific solar angles, it is possible to achieve optimal control of solar heat gain and create comfortable indoor environments with ample natural light.

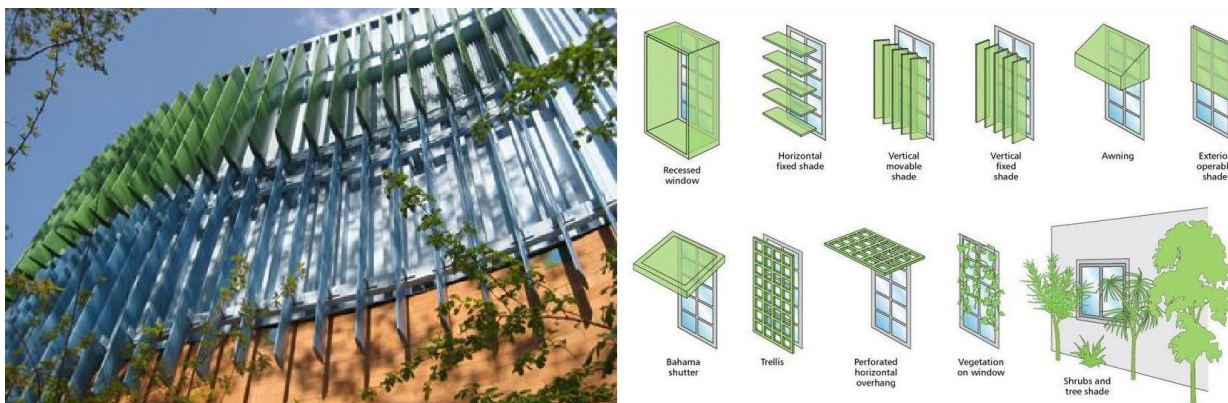


Figure 2. Examples of External Shading Systems

5.3. Thermal Mass

Thermal mass refers to the capacity of an object or construction to absorb and store heat energy. Objects with higher thermal mass can absorb heat during the day and release it at night. This characteristic can help reduce daytime temperatures and enhance the overall thermal stability of a building. However, it's important to note that increasing thermal mass may require more energy to heat the building fabric, potentially leading to increased energy consumption in certain cases. Therefore, achieving a balance is crucial when considering the use of thermal mass in building design.

There are various ways to increase thermal mass. One approach is to expose dense materials, such as concrete or masonry, which naturally possess higher thermal mass properties. Another method involves improving the physical connection between finishing materials and the building structure, ensuring efficient heat transfer between them. By increasing the physical connection, the thermal mass of the building elements can be effectively utilised.

By strategically incorporating thermal mass into the design, it is possible to optimise energy performance and enhance thermal comfort within the building. However, it's important to consider the project's specific requirements and strike a balance between the benefits of thermal mass and the potential energy implications to achieve the desired outcomes.

For example, plaster and the structural core, e.g., blockwork.

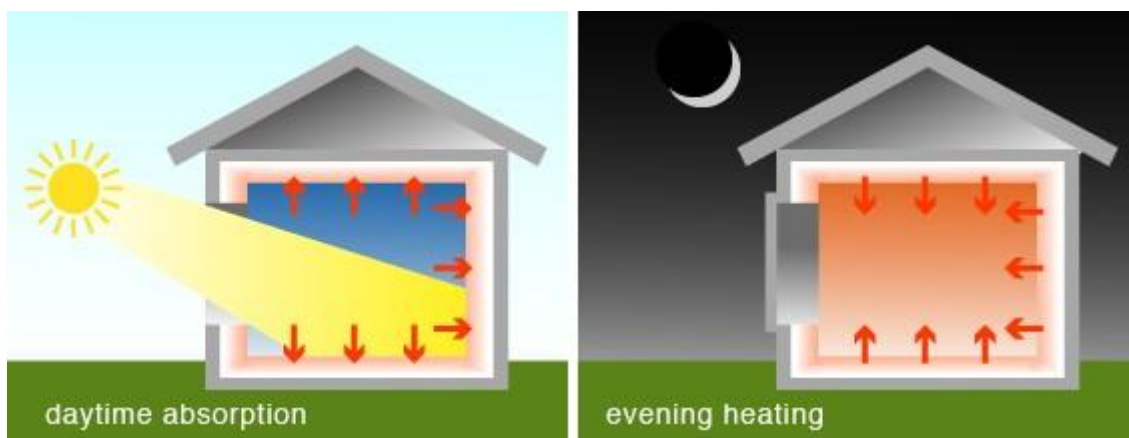


Figure 3. Thermal Mass Explained

5.4. Ventilation

The ventilation strategy plays a crucial role in managing overheating performance. While background ventilation levels are typically low, they may not be sufficient to purge excess heat from a building effectively. Therefore, the ventilation strategy must allow for significant air movement when required.

Several factors influence the potential rate of ventilation, including:

- Opening type, size, and duration: The design of ventilation openings, such as windows or vents, should consider maximising the size of the openings and their ability to remain open for an extended period, allowing for effective air exchange when needed.
- Building height and exposure: The height and exposure of the building to external factors such as wind can impact ventilation rates. Tall buildings or those in exposed locations may benefit from additional consideration in the ventilation strategy to ensure adequate air movement.
- Number of storeys and cross-ventilation opportunities: Buildings with multiple storeys offer cross-ventilation potential, where air can flow through the building from one side to the other. This design consideration can enhance ventilation rates and improve the cooling potential.

It is essential to balance the need for effective ventilation with considerations such as security and protection against water ingress. Ventilation openings should be designed to allow for the greatest possible opening size and duration without compromising the building's security or introducing the risk of water penetration.

By carefully considering these factors and incorporating an appropriate ventilation strategy, it is possible to optimise the ventilation rates and improve the building's ability to manage overheating, ensuring a comfortable and healthy indoor environment.

5.5. Calculating Overheating Risk

Numerous guidance documents are available that outline the assessment of overheating risk and establish acceptable thresholds. These include CIBSE Guide A, BB101, TM52, and TM59. To evaluate the risk, these methodologies involve conducting a Dynamic Simulation Modelling (DSM) exercise to estimate projected internal temperatures. These predicted temperatures are then compared to recommended limits to ascertain their acceptability or if they exceed the prescribed thresholds.

5.6. Part O Outline

The recently introduced Building Regulations Part O, 2021 edition, marks the first comprehensive effort to address overheating specifically in new residential buildings. The primary objective of Part O is to promote the design and construction of buildings that effectively mitigate excessive solar heat gain during summer periods and ensure occupants have suitable means to alleviate indoor heat levels. It is essential to understand that the measures implemented under Part O do not guarantee occupants' comfort but are primarily aimed at safeguarding their health and well-being.

5.7. Buildings Covered by Part O

Table 0.1 Residential buildings within the scope of this approved document	
Title	Purpose for which the building is intended to be used
Residential (dwellings)	Dwellings, which includes both dwellinghouses and flats.
Residential (institutional)	Home, school or other similar establishment, where people sleep on the premises. The building may be living accommodation for the care or maintenance of any of the following. a. Older and disabled people, due to illness or other physical or mental condition. b. People under the age of 5 years.
Residential (other)	Residential college, hall of residence and other student accommodation, and living accommodation for children aged 5 years and older.

Figure 4. Approved document Part O

5.8. Part O Calculation

Part O of the Approved Document is satisfied by utilising either of the following methods:

5.9. Simplified Method:

- This method considers factors such as risk location and the presence of cross ventilation.
- Risk location is categorised as high (e.g., Greater London and Manchester) or medium (other areas).
- Threshold tables in Part O are referenced to determine the maximum glazing area for the building and the most glazed room.
- In high-risk locations, specific shading requirements must be met, including external shutters with ventilation, glazing with specific g-values and light transmittance, or overhangs on due south-facing facades.

5.10. Dynamic Thermal Modelling:

- This methodology is applicable to all residential buildings and offers greater design flexibility compared to the simplified method.
- CIBSE's TM59 methodology is used for predicting overheating risk, and the limits provided in Part O are applied during the assessment.
- Dynamic Thermal Modelling allows for a more detailed analysis of the building's thermal performance and can inform design decisions.

Our Team is committed to helping your project achieve compliance with Part O using either the simplified method or dynamic thermal modelling, ensuring that the proposed development meets the necessary criteria and guidelines to mitigate overheating risks in residential buildings.

CLEAN ENERGY

Supply Energy Efficiently

6.1. District Heating

The potential for connecting the development to an existing district heating network, or contributing to the establishment of a new network, has been considered in accordance with national and local planning policy requirements. District heating networks can deliver significant carbon, energy and operational efficiency benefits by enabling the use of low-carbon and renewable heat sources at scale. These may include technologies such as Combined Heat and Power (CHP), heat pumps, energy from waste, anaerobic digestion (AD), geothermal sources, and waste heat recovery from industrial or commercial processes

District heating systems allow for the efficient distribution of heat across multiple buildings, improving overall system performance through load balancing and centralised plant optimisation. They also provide flexibility for future decarbonisation, as heat sources can be upgraded over time without requiring major alterations to individual dwellings.

The feasibility of district heating is typically influenced by factors such as heat demand density, proximity to existing or planned heat networks, infrastructure requirements, capital investment, and distribution losses. Where applicable, consideration is given to published heat network mapping, Local Authority energy strategies, and any relevant heat network zones or safeguarding areas identified within planning policy.

In line with the energy hierarchy, the potential for connection to a heat network is assessed alongside on-site low-carbon heating solutions to determine the most appropriate and deliverable strategy for the development. Further detail on the preferred heating approach and justification is provided in the following sections of this Energy Statement.

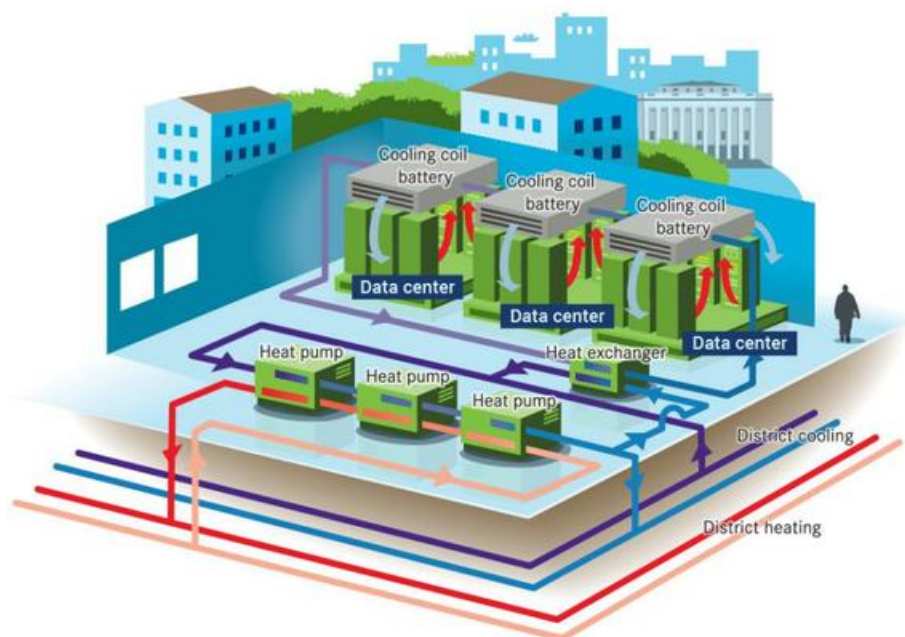


Figure 5. District Heating Underground Pipework

6.2. Network Creation

Given that the proposed development is low-rise and consists of only one dwelling, it is important to consider the specific characteristics and energy demands of the project. In this case, the predominant annual energy load is expected to come from heating and domestic hot water (DHW), with limited peak periods during the day.

When evaluating the suitability of district heating or community networks for the project, it is essential to consider not only the capital costs but also the thermal losses and circulation energy associated with such systems. In smaller-scale developments like this, the thermal losses and energy required for circulation within a district or community network may outweigh the potential benefits and render them technically and economically unviable.

In such cases, alternative energy supply solutions should be explored. This may involve implementing high-performance specifications for the individual dwellings, including efficient heating systems and insulation, to minimise energy demand and optimise energy efficiency. Localised heating solutions, such as individual boilers or heat pumps, may be more suitable for meeting the specific heating and DHW requirements of each dwelling.

By carefully considering the energy needs, cost implications, and technical feasibility of various options, the most appropriate and cost-effective energy supply solution can be identified for the proposed development.

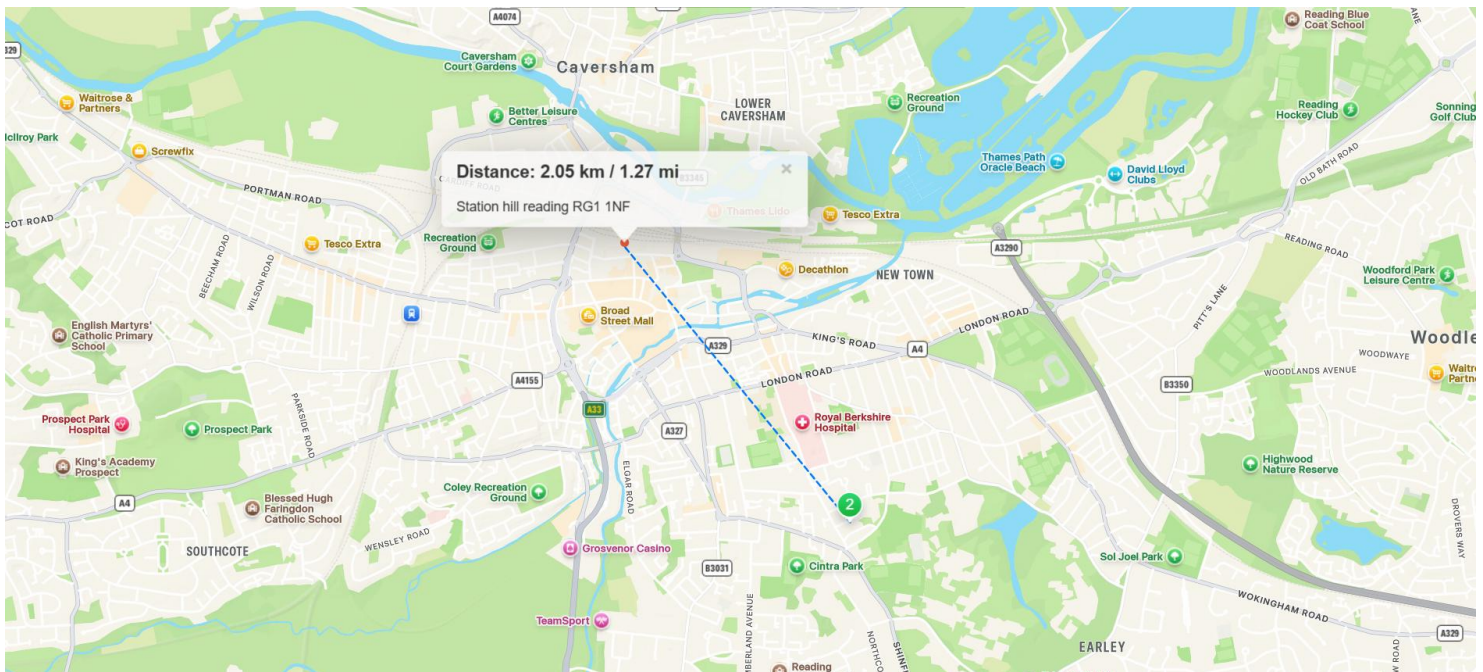


Figure 6. Location of Development Site Relative to Nearest DHN

By checking the Reading Borough Council Heat Network Feasibility Study, where information provided on both district and communal heat network deployment is collated, we found that the closest operational DHN is. This DHN is located at Station Hill, Reading RG1 1NF. In addition to it being located 1.24m away, which is impractical for a single residential development.

Considering the absence of existing district heating networks in the vicinity of the development site and the low heat density within the region, connecting to an existing network is not a feasible option. Furthermore, the energy profile of the development, with a low and infrequent heat demand, does not support the development of a new district heating network.

In terms of integrating Combined Heat and Power (CHP) into the development, it would not be technically or economically viable. The low and infrequent heat demand of the project, combined with the high relative distribution losses associated with CHP systems, makes it impractical to implement CHP as an energy supply solution.

Given these constraints, it is advisable to explore alternative options for meeting the heating and domestic hot water (DHW) needs of the development. This may involve implementing individual heating systems for each dwelling, such as boilers or heat pumps, which can provide a more tailored and efficient heat supply without the need for a district heating network or CHP integration.

By considering the specific requirements and limitations of the development, an appropriate and cost-effective energy supply solution can be identified to meet the heating and DHW demands of the project.

6.3. Clean Energy – Results Summary

	ADL:2012 Emission Rate KG CO ₂ /m ² /year (TER)	ADL:2012 Fabric Energy Efficiency kWh/m ² /year (TFEE)	Percentage Reduction DER %	Percentage Reduction DFEE %
TER	22.77	87.82	-	-
DER – Fabric First	23.26	69.64	0.00	20.70
DER – Clean Energy	-	-	-	-

Table 6. Clean Energy Results

GREEN ENERGY

Use Renewable Energy

7.1. Green Energy – Use of Renewable Technology

The CO2 emissions resulting from the implementation of 'Fabric First' measures have been evaluated and compared to the baseline CO2 emissions. Reductions in CO2 emissions have been observed at each stage, to tackle the next stage – 'Green Energy' where the impact of renewable energy generation will be assessed.

Renewable energy is characterized as energy derived from naturally occurring and replenishable energy sources in the environment. Unlike fossil fuels or nuclear power, which can be depleted, renewable energy sources are sustained by ongoing natural processes. Therefore, the term "equipment to generate renewable energy" is somewhat contradictory, as the primary function of such technology is to harness and utilize natural energy flows.

Most renewable energy technologies, with a few exceptions, rely on energy derived from the sun, either directly or indirectly. The exceptions include true geothermal energy, which utilizes heat from the Earth's core, and tidal/marine current electricity generation, which capitalizes on gravitational forces between the Earth and the Moon (although solar energy also affects some marine currents). However, since this report focuses on practical on-site renewable energy options, these exceptions will not be further explored. Instead, the focus will be on the broad range of technologies listed below, some of which may not appear solar-related at first glance. These technologies can be summarized as follows: [Further details on the specific solar technologies can be provided if desired.

- Solar thermal – direct heating of water for space heating or domestic hot water
- Photovoltaic – direct generation of electricity from sunlight
- Hydroelectricity – use of solar (water cycle) driven water flows to generate electricity.
- Wind turbines – use of solar-driven air movement to generate electricity.
- Heat pumps – extraction of solar heat from the earth, atmosphere, or water bodies
- Bio-fuels – combustion of solid or liquid biofuels to produce heat or electricity.

While the technologies and their potential application to this site will be discussed in more detail in the subsequent sections, it is important to address another crucial point. The adoption of renewable energy technologies aims to reduce greenhouse gas emissions, primarily carbon dioxide. However, it is important to recognise that none of these technologies can be considered completely "zero carbon." This is because when considering the entire life cycle of these systems, energy is required for manufacturing, maintenance, and operation, and this energy is often sourced from non-renewable sources. For instance, the production and processing of silicon for manufacturing photovoltaic panels, the transportation of wood pellets using diesel fuel, and the energy used to produce fertilisers for biofuels are all examples of energy inputs derived from non-renewable sources.

Furthermore, it should be noted that the renewable energy technology industry is dynamic and innovative, and even seemingly similar products can vary significantly in practical details. As a result, the detailed design of installations must be carried out by experts, often in collaboration with product manufacturers. Virtually no two products are identical or interchangeable in this field.

The following section provides an overview of the technologies that have been considered for implementation in this development.

7.2. Solar Thermal

Solar thermal energy systems harness the sun's radiant heat to generate electricity or provide direct heating for various applications. These systems typically employ reflective surfaces or solar collectors to concentrate sunlight onto a fluid-filled receiver. The absorbed heat raises the temperature of the fluid, which is then used to produce steam, drive turbines, or supply hot water for industrial, residential, or commercial purposes.

One of the notable advantages of solar thermal technology is its ability to store thermal energy for use during periods of reduced sunlight or high demand. This thermal energy storage capacity makes it a reliable and consistent source of renewable energy. Solar thermal systems can significantly reduce the consumption of fossil fuels for heating and electricity generation, thereby contributing to the reduction of greenhouse gas emissions.

However, the effectiveness of solar thermal systems is influenced by factors such as location, weather conditions, and system design. The optimal placement of collectors and their alignment with the sun's path are critical for maximizing energy production. Additionally, the choice of heat transfer fluid and storage technology impacts the overall efficiency and cost-effectiveness of the system. As we strive for a more sustainable and eco-friendly energy landscape, integrating solar thermal technology into our energy infrastructure represents a promising avenue for reducing our carbon footprint and meeting our energy needs with clean and renewable sources.

7.3. Solar Photovoltaics (PV)

Solar Photovoltaic (PV) panels consist of interconnected cells that use semiconductor technology to convert solar energy into electricity. The generated electricity, initially in high voltage direct current (DC), is converted into alternating current (AC) and integrated into the main supply through an inverter. PV panels are most efficient when installed on exposed areas facing south, with an inclination angle close to 30° from the horizontal.

This technology has been extensively tested and requires minimal maintenance. Most panels are designed to be self-cleaning when installed at the appropriate angles, and their design life typically surpasses the expected payback period by a significant margin. PV panels offer several notable advantages. They reduce energy consumption and costs for residents on-site while decreasing the demand for electricity from the national grid. In fact, they can even contribute surplus energy back to the grid. This saves considerable carbon dioxide emissions by reducing reliance on the relatively inefficient and fossil fuel-intensive national infrastructure for heat generation and promotes a more sustainable and environmentally friendly energy system.

7.4. Hydroelectricity

Hydroelectricity is harnessed through the utilization of flowing water to generate electrical power, a process facilitated by hydroelectric power plants. These power plants are designed with turbines that spin as water flows over them, subsequently converting the kinetic energy of water into electricity. This electricity is primarily generated in alternating current (AC) form, making it readily compatible with the main electrical grid. Optimal locations for hydroelectric power plants typically involve rivers with consistent water flow, elevation changes, and suitable infrastructure.

This renewable energy technology boasts several advantages, foremost among them being its low environmental impact and minimal maintenance requirements. Hydroelectric power plants are renowned for their longevity, often surpassing their projected operational lifespans by a considerable margin. Moreover, hydroelectricity contributes significantly to reducing greenhouse gas emissions by providing a clean and sustainable energy source. It plays a pivotal role in reducing the reliance on fossil fuels for electricity generation, thereby bolstering efforts to combat climate change. Additionally, hydroelectric power plants can store surplus electricity, making them a valuable asset for grid stability during peak demand periods.

However, the implementation of hydroelectricity projects demands careful consideration of environmental and ecological factors. Impact assessments, fish passage solutions, and ecosystem preservation strategies must be integrated into project planning to mitigate potential adverse effects on local ecosystems. Furthermore, the effective design and operation of hydroelectric power plants require attention to factors such as water flow predictability and seasonal variations to maximize efficiency. Given these considerations, integrating hydroelectricity into our energy strategy represents a sustainable and environmentally conscious choice that aligns with our commitment to reducing carbon emissions and promoting cleaner energy alternatives.

7.5. Wind Turbines

Wind turbines are mechanical devices that harness the kinetic energy of wind to generate electricity. These turbines consist of large blades attached to a hub, which is connected to a generator. As the wind blows, it causes the blades to rotate, turning the generator and producing electricity in the form of alternating current (AC). Wind turbines are typically situated in locations with consistent and relatively strong wind patterns, such as coastal areas or open plains.

One of the key advantages of wind turbines is their ability to produce clean and renewable energy without the emissions associated with fossil fuels. They are a vital component of our efforts to transition to a more sustainable energy system. Wind power significantly reduces greenhouse gas emissions and dependence on non-renewable energy sources. Moreover, wind energy can be harnessed both onshore and offshore, offering flexibility in deployment to suit specific geographical conditions.

However, the effective deployment of wind turbines requires careful planning and consideration. Their location is crucial, as they must be sited in areas with sufficient wind resources to ensure consistent energy production. Environmental impact assessments are often necessary to address concerns related to wildlife, visual aesthetics, and noise levels. Additionally, wind turbine technology continues to advance, with larger and more efficient turbines being developed to increase energy production and reduce costs. As we seek to reduce our carbon footprint and transition to a cleaner energy future, the strategic integration of wind turbines into our energy infrastructure is a vital step toward achieving our sustainability goals.

7.6. Bio-Fuels

Biofuels are renewable fuels derived from organic materials, such as plant crops and animal waste. These fuels are typically used to power vehicles, heat buildings, and generate electricity. The two primary types of biofuels are ethanol and biodiesel. Ethanol is typically made from crops like corn, sugarcane, or switchgrass, while biodiesel is derived from sources such as vegetable oil and animal fats.

Biofuels offer several significant advantages in the pursuit of sustainable and eco-friendly energy sources. Firstly, they are considered carbon-neutral because the carbon dioxide emitted during combustion is roughly equivalent to the amount absorbed by the plants during growth. This characteristic makes biofuels an attractive option for reducing greenhouse gas emissions and mitigating climate change. Additionally, biofuels can be blended with traditional fossil fuels, reducing the overall carbon footprint of transportation and heating sectors.

However, the production and utilization of biofuels require careful consideration of factors such as land use, crop choice, and resource availability. Sustainable practices, including responsible land management and crop rotation, are essential to avoid deforestation and maintain biodiversity. Furthermore, the production of biofuels must not compromise food security or lead to the displacement of essential food crops.

As we transition towards a more sustainable energy landscape, biofuels play a crucial role in reducing our reliance on fossil fuels. Their integration into our energy strategy helps promote renewable alternatives and contributes to a greener and cleaner energy future. Careful planning and responsible production practices are vital to ensure that biofuels remain a sustainable and environmentally friendly energy source.

7.7. Heat Pumps

Heat pumps are devices that collect low-temperature heat and amplify it to a usable temperature. Typically, a heat pump serving a heat network can deliver 2-3 kWh of useful energy for every 1 kWh of input energy. Therefore, it can be considered as providing 1-2 kWh of low-carbon energy.

There are two common types of heat pumps: ground source and air source. Ground source heat pumps involve drilling boreholes up to 100m deep and spacing them at least 6m apart to extract heat from the ground. However, in urban areas like this development site, ground-source heat pumps are often not feasible due to the complexity of drilling and the need for a significant area for installation.

Air source heat pumps, on the other hand, collect heat from the ambient air using air-heat-exchanger units. While heat pumps can offer good performance, they have practical limitations. They need to be located externally, which can impact both acoustics and visual aesthetics. Additionally, their efficiency is affected by the temperature of the air. At peak heat demand, the system's efficiency is at its lowest. Moreover, since heat pumps rely on electricity from the national grid, their actual carbon emissions are influenced by the carbon intensity of the grid, which can vary.

7.8. Green Energy – Specification Applied

The design team faces the challenge of incorporating heat pump technology in a way that allows it to operate at its highest efficiency capacity. Considerations such as location, visual impact, and the grid's carbon intensity must be considered during the design process.

After thorough consideration, our team has determined that the most effective approach to meet policy and Building Regulation requirements is to incorporate both an Air Source Heat Pump (ASHP) system into the proposed development and 2.0 KWP of Photovoltaic panels. This approach significantly reduces carbon emissions compared to using a conventional mains gas boiler for primary heating and hot water demand.

Elements	Specification
Heating	Brand Name: Samsung Electronics Model Name: AE160JXYDEH
Secondary Heating	None
Hot Water Cylinder	Size: 200 Litre Declared Heat loss kWh/24hr: 1.65
Ventilation	Natural Ventilation with Intermittent Extract in Wet Rooms
Solar PV	2.0KWP South-West Facing 30° pitch

Table 5. Green Energy Specifications

7.9. Green Energy – Results Summary

	ADL:2012 Emission Rate KG CO ₂ /m ² /year (TER)	ADL:2012 Fabric Energy Efficiency kWh/m ² /year (TFEE)	Percentage Reduction DER %	Percentage Reduction DFEE %
TER	22.77	87.82	-	-
DER – Fabric First	23.26	69.64	0.00	20.70
DER – Clean Energy	-	-	-	-
DER – Green Energy	13.68	69.94	39.92	20.70

Table 6. Green Energy Results

8. Conclusions

The Energy Statement presented in this document has detailed the proposed specification for the development, highlighting the significant savings achieved at each stage of the energy hierarchy compared to the current Building Regulations baseline. By adopting a fabric-first approach, substantial energy savings have been realised.

The fabric-first approach prioritises designing and constructing a highly energy-efficient building envelope, focusing on insulation, air tightness, and thermal performance. This approach ensures that the building's fabric itself acts as a primary source of energy efficiency, reducing the need for additional energy-consuming systems.

The proposed specification surpasses the minimum requirements of the Building Regulations by implementing advanced insulation materials, efficient windows and doors, and effective air-sealing techniques. This results in substantial energy savings throughout the lifetime of the development.

By emphasising the fabric-first approach, the proposed development achieves improved energy efficiency, provides enhanced thermal comfort for occupants, and reduces environmental impact. The combination of energy-saving measures implemented in the design contributes to a more sustainable and environmentally conscious building.

8.1. Fabric First Approach

The proposed development features a high-performance building envelope incorporating low U-values, construction details designed for thermal efficiency, and minimal air permeability. The performance values of the building envelope show significant enhancements compared to the 2012 Notional building used as a reference for compliance assessment.

8.2. Clean Energy Approach

There is no operational heat network currently available near the site, and no confirmed connection point. Therefore, connection is not feasible at this time, and a low-carbon on-site heating system is proposed instead.

8.3. Green Energy Approach

The inclusion of an ASHP has been proposed along with 2.0 KWP of Solar PV. This will help future-proof the dwelling with the envisaged decarbonisation of the National Grid.

8.4. SAP 10/ Part L 2021 Compliance Check

Lastly, an additional compliance check has been carried out against the newly introduced version of the Building Regulations Part L 2021 via SAP 10, as the building will be adhering to the new regulations. The table below shows compliance with all metrics required.

	ADL:2021 Emission Rate KG CO ₂ /m ² /year (TER/DER)	ADL:2021 Fabric Energy Efficiency kWh/m ² /year (TFEE/DFEE)	ADL:2021 Primary Energy Rate kWh _{PE} /m ² /year (TPER/DPER)
Targets	14.77	65.90	78.34
Dwelling	6.19	62.98	66.49
Reduction %	58.09%	4.43%	15.12%

Table 7. SAP 10 Compliance

9. Summary

This statement has outlined the approach taken by the development to incorporate an energy-efficient design that surpasses the requirements of Part L 2012 and 2021 regulations. By integrating an Air Source Heat Pump (ASHP) with the addition of Solar PV and utilising an efficient fabric design specification, a significant carbon emission reduction of 60% within 2012 regulations and 58% within 2021 regulations can be achieved.

SAP Calculations

Appendices

Fabric First SAP Reports

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	23560 - 1A New Road V2	Issued on Date	02/04/2026
Assessment Reference	Fabric First	Prop Type Ref	19% Energy Statement
Property			

SAP Rating	80 C	DER	23.26	TER	22.77
Environmental	79 C	% DER<TER	-2.14		
CO ₂ Emissions (t/year)	2.20	DFEE	69.64	TFEE	87.82
General Requirements Compliance	Fail	% DFEE<TFEE	20.70		

Assessor Details	Mr. Mohamed Egal, Mohamed Egal, Tel: 01923 518 923, mohamed@jostec.co.uk	Assessor ID	AW35-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	14.84 m	34.37 m ²	2.90 m
	1st Storey:	38.63 m	79.96 m ²	3.57 m

7.0 Living Area	18.17	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	271.38	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall 1	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18	150.00	181.85	141.00

9.2 Internal Walls				
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Plasterboard on timber frame		9.00	201.66

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Roof 1 - Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	47.71	47.71
Roof 2 - Pitched Roof	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	44.22	44.22

10.2 Internal Ceilings				
Description	Construction		Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor		9.00	34.37

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Floor 1 - Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.16	75.00	79.96

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.37

12.0 Opening Types

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

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
NW Openings	Window	[1] External Wall 1	North West	Dark-coloured curtain or roller blind	0.00					22.67	100
SE Openings	Half Glazed Door	[1] External Wall 1	South East							2.86	
SE Openings	Window	[1] External Wall 1	South East	Dark-coloured curtain or roller blind	0.00					11.46	100
SW Openings	Window	[1] External Wall 1	South West	Dark-coloured curtain or roller blind	0.00					3.86	100

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
Independently assessed	E2 Other lintels (including other steel lintels)	17.75	0.050	No	TEST
Independently assessed	E3 Sill	17.75	0.050	No	TEST
Independently assessed	E4 Jamb	41.32	0.050	No	TEST
Independently assessed	E5 Ground floor (normal)	38.63	0.050	No	
Table K1 - Default	E20 Exposed floor (normal)	3.07	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	3.07	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	16.27	0.050	No	TEST
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	11.77	0.240	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	11.77	0.240	No	
Table K1 - Default	E11 Eaves (insulation at rafter level)	12.80	0.080	No	
Table K1 - Default	E13 Gable (insulation at rafter level)	13.82	0.080	No	
Independently assessed	E15 Flat roof with parapet	26.86	0.100	No	TEST
Independently assessed	E16 Corner (normal)	27.28	0.050	No	TEST
Table K1 - Default	E17 Corner (inverted – internal area greater than external area)	5.80	0.000	No	
Table K1 - Default	R4 Ridge (vaulted ceiling)	6.40	0.080	No	
Y-value	0.059	W/m²K			

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No
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22.0 Lighting

Internal

Total number of light fittings	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
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23.0 Electricity Tariff	Standard
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24.0 Main Heating 1

Percentage of Heat	100	%
Main Heating	BGB	
SAP Code	102	
Efficiency (SAP Table)	84.0	%
Controls	CBI Time and temperature zone control	
PCDF Controls	0	
Delayed Start Stat	Yes	
Sap Code	2110	
Flue Type	None or Unknown	
Fan Assisted Flue	No	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Normal (> 45°C)	

25.0 Main Heating 2	None
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Community Heating	None
28.0 Water Heating	HWP From main heating 1
Water Heating	Main Heating 1
Flue Gas Heat Recovery System	No
Waste Water Heat Recovery Instantaneous System 1	No
Waste Water Heat Recovery Instantaneous System 2	No
Waste Water Heat Recovery Storage System	No
Solar Panel	No
Water use <= 125 litres/person/day	Yes
SAP Code	901
29.0 Hot Water Cylinder	Hot Water Cylinder
Cylinder Stat	Yes
Cylinder In Heated Space	Yes
Independent Time Control	Yes
Insulation Type	Measured Loss
Cylinder Volume	200.00
Loss	1.65
Pipes insulation	Fully insulated primary pipework
31.0 Thermal Store	None

Recommendations

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£78	B 82	
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar photovoltaic panels, 2.5 kWp	£3,500 - £5,500	£475	B 90	

Green Energy SAP Reports

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Property Reference	23560 - 1A New Road V2	Issued on Date	02/04/2026
Assessment Reference	Green Energy	Prop Type Ref	19% Energy Statement
Property			

SAP Rating	87 B	DER	13.68	TER	34.02
Environmental	88 B	% DER<TER	59.79		
CO ₂ Emissions (t/year)	1.09	DFEE	69.64	TFEE	87.82
General Requirements Compliance	Pass	% DFEE<TFEE	20.70		

Assessor Details	Mr. Mohamed Egal, Mohamed Egal, Tel: 01923 518 923, mohamed@jostec.co.uk	Assessor ID	AW35-0001
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Client	
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SUMMARY FOR INPUT DATA FOR: New Build (As Designed)

Orientation	South East
Property Tenure	Unknown
Transaction Type	None of the above
Terrain Type	Suburban
1.0 Property Type	House, Detached
2.0 Number of Storeys	2
3.0 Date Built	2023
4.0 Sheltered Sides	0
5.0 Sunlight/Shade	Average or unknown

6.0 Measurements				
		Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	Ground Floor:	14.84 m	34.37 m ²	2.90 m
	1st Storey:	38.63 m	79.96 m ²	3.57 m

7.0 Living Area	18.17	m ²
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8.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	271.38	kJ/m ² K

9.0 External Walls						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
External Wall 1	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18	150.00	181.85	141.00

9.2 Internal Walls					
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)
Internal Wall 1	Plasterboard on timber frame			9.00	201.66

10.0 External Roofs						
Description	Type	Construction	U-Value (W/m ² K)	Kappa (kJ/m ² K)	Gross Area (m ²)	Nett Area (m ²)
Roof 1 - Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	47.71	47.71
Roof 2 - Pitched Roof	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	44.22	44.22

10.2 Internal Ceilings					
Description	Construction			Kappa (kJ/m ² K)	Area (m ²)
Internal Ceiling 1	Plasterboard ceiling, carpeted chipboard floor			9.00	34.37

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

11.0 Heat Loss Floors

Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Area (m²)
Floor 1 - Ground Floor	Ground Floor - Solid	Suspended concrete floor, carpeted	0.16	75.00	79.96

11.2 Internal Floors

Description	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.37

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Argon Filled	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacture r	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Door	Manufacture r	Half Glazed Door	Double Low-E Soft 0.05			0.63		0.70	1.20

13.0 Openings

Name	Opening Type	Location	Orientation	Curtain Type	Overhang Ratio	Wide Overhang	Width (m)	Height (m)	Count	Area (m²)	Curtain Closed
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SE Openings	Half Glazed Door	[1] External Wall 1	South East							2.86	
SE Openings	Window	[1] External Wall 1	South East	Dark-coloured curtain or roller blind	0.00					11.46	100
SW Openings	Window	[1] External Wall 1	South West	Dark-coloured curtain or roller blind	0.00					3.86	100

14.0 Conservatory

None

15.0 Draught Proofing

100

%

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Source Type	Bridge Type	Length	Psi	Imported	Reference:
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Independently assessed	E3 Sill	17.75	0.050	No	TEST
Independently assessed	E4 Jamb	41.32	0.050	No	TEST
Independently assessed	E5 Ground floor (normal)	38.63	0.050	No	
Table K1 - Default	E20 Exposed floor (normal)	3.07	0.320	No	
Table K1 - Default	E21 Exposed floor (inverted)	3.07	0.320	No	
Independently assessed	E6 Intermediate floor within a dwelling	16.27	0.050	No	TEST
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	11.77	0.240	No	
Table K1 - Default	E24 Eaves (insulation at ceiling level - inverted)	11.77	0.240	No	
Table K1 - Default	E11 Eaves (insulation at rafter level)	12.80	0.080	No	
Table K1 - Default	E13 Gable (insulation at rafter level)	13.82	0.080	No	
Independently assessed	E15 Flat roof with parapet	26.86	0.100	No	TEST
Independently assessed	E16 Corner (normal)	27.28	0.050	No	TEST
Table K1 - Default	E17 Corner (inverted – internal area greater than external area)	5.80	0.000	No	
Table K1 - Default	R4 Ridge (vaulted ceiling)	6.40	0.080	No	
Y-value	0.059	W/m²K			

SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

18.0 Pressure Testing	Yes	
Designed AP ₅₀	5.00	m ³ /(h.m ²) @ 50 Pa
Property Tested ?		
As Built AP ₅₀		m ³ /(h.m ²) @ 50 Pa

19.0 Mechanical Ventilation

Summer Overheating

Windows open in hot weather	Windows half open
Cross ventilation possible	Yes
Night Ventilation	No
Air change rate	4.00

Mechanical Ventilation

Mechanical Ventilation System Present	No
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20.0 Fans, Open Fireplaces, Flues

	MHS	SHS	Other	Total
Number of Chimneys	0		0	0
Number of open flues	0		0	0
Number of intermittent fans				4
Number of passive vents				0
Number of flueless gas fires				0

21.0 Fixed Cooling System	No
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22.0 Lighting

Internal

Total number of light fittings	10	
Total number of L.E.L. fittings	10	
Percentage of L.E.L. fittings	100.00	%

External

External lights fitted	No
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23.0 Electricity Tariff	Standard
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24.0 Main Heating 1

Database		
Percentage of Heat	100	%
Database Ref. No.	102726	
Fuel Type	Electricity	
Main Heating	PET	
SAP Code	224	
In Winter	234.6	
In Summer	236.9	
Controls	CHD Time and temperature zone control	
PCDF Controls	0	
Sap Code	2207	
Is MHS Pumped	Pump in heated space	
Heat Emitter	Underfloor	
Underfloor Heating	Yes - Pipes in thin screed	
Flow Temperature	Normal (> 45°C)	

25.0 Main Heating 2	None
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SUMMARY FOR INPUT DATA

Calculation Type: New Build (As Designed)

Community Heating	None			
28.0 Water Heating	HWP From main heating 1			
Water Heating	Main Heating 1			
Flue Gas Heat Recovery System	No			
Waste Water Heat Recovery Instantaneous System 1	No			
Waste Water Heat Recovery Instantaneous System 2	No			
Waste Water Heat Recovery Storage System	No			
Solar Panel	No			
Water use <= 125 litres/person/day	Yes			
SAP Code	901			
Immersion Only Heating Hot Water	No			
29.0 Hot Water Cylinder	Hot Water Cylinder			
Cylinder Stat	Yes			
Cylinder In Heated Space	Yes			
Independent Time Control	Yes			
Insulation Type	Measured Loss			
Cylinder Volume	200.00	L		
Loss	1.65	kWh/day		
Pipes insulation	Fully insulated primary pipework			
31.0 Thermal Store	None			
32.0 Photovoltaic Unit	One Dwelling			
PV Cells kWp	Orientation	Elevation	Overshading	Connected to Dwelling
2.00	South West	30°	None Or Little	Yes
Recommendations				
Lower cost measures				
None				
Further measures to achieve even higher standards				
	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £6,000	£98	B 89	

SAP 10 SAP Reports

Summary for Input Data

Plot Reference	23560	Issued on Date	02/04/2026
Assessment Reference	Be Green/ Green Energy	Plot Type Ref	
Plot Address	Land Adjacent, 1 New Road, Reading, RG1 5JD	SAP Version	10.2

SAP Rating	72 C	DER	6.19	TER	14.77
Environmental	94 A	% DER < TER			58.09
CO ₂ Emissions (t/year)	0.59	DFEE	62.98	TFEE	65.90
Compliance Check	See BREL	% DFEE < TFEE			4.44
% DPER < TPER	15.12	DPER	66.49	TPER	78.34

Assessor Details	Mr. Mohamed Egal	Assessor ID	AW35-0001
Client	JosTec, -		

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

Orientation	Southeast	
Property Tenture	ND	
Transaction Type	5	
Terrain Type	Suburban	
1.0 Property Type	House, Detached	
2.0 Number of Storeys	2	
3.0 Date Built	2023	
4.0 Sheltered Sides	0	
5.0 Sunlight/Shade	Average or unknown	
6.0 Thermal Mass Parameter	Precise calculation	
Thermal Mass	268.67	kJ/m²

7.0 Electricity Tariff	Standard
Smart electricity meter fitted	No
Smart gas meter fitted	No

7.0 Measurements	Ground floor:	Heat Loss Perimeter	Internal Floor Area	Average Storey Height
	1st Storey:	38.63 m	79.96 m²	3.57 m
		14.84 m	34.37 m²	2.90 m

8.0 Living Area	18.17	m²
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9.0 External Walls	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Res	Shelter	Openings	Area Calculation Type
	Wall 1 - Ext Wall	Cavity Wall	Cavity wall : plasterboard on dabs, dense block, filled cavity, any outside structure	0.18	150.00	181.85	141.00	0.00	None	40.85	Enter Gross Area

9.2 Internal Walls	Description	Construction	Kappa (kJ/m²K)	Area (m²)
	Internal Wall 1	Plasterboard on timber frame	9.00	201.66

10.0 External Roofs	Description	Type	Construction	U-Value (W/m²K)	Kappa (kJ/m²K)	Gross Area(m²)	Nett Area (m²)	Shelter Code	Shelter Factor	Calculation Type	Openings
	Roof 1 - Flat Roof	External Flat Roof	Plasterboard, insulated flat roof	0.15	9.00	47.71	47.71	None	0.00	Enter Gross Area	0.00
	Roof 2 - Pitched Roof	External Slope Roof	Plasterboard, insulated slope	0.15	9.00	44.22	44.22	None	0.00	Enter Gross Area	0.00

10.2 Internal Ceilings	Description	Storey	Construction	Kappa	Area (m²)
	Internal Ceiling 1	Lowest occupied	Plasterboard ceiling, carpeted chipboard floor	9.00	34.37

11.0 Heat Loss Floors	Description	Type	Storey Index	Construction	U-Value (W/m²K)	Shelter Code	Shelter Factor	Kappa (kJ/m²K)	Area (m²)
	Floor 1 - Ground Floor	Ground Floor - Solid	Lowest occupied	Suspended concrete floor, carpeted	0.16	None	0.00	75.00	79.96

11.2 Internal Floors

Summary for Input Data

Description	Storey Index	Construction	Kappa (kJ/m²K)	Area (m²)
Internal Floor 1	+1	Plasterboard ceiling, carpeted chipboard floor	18.00	34.37

12.0 Opening Types

Description	Data Source	Type	Glazing	Glazing Gap	Filling Type	G-value	Frame Type	Frame Factor	U Value (W/m²K)
Windows	Manufacturer	Window	Double Low-E Soft 0.05			0.63		0.70	1.20
Door	Manufacturer	Solid Door				0.63			1.00

13.0 Openings

Name	Opening Type	Location	Orientation	Area (m²)	Pitch
NW Openings	Windows	Wall 1 - Ext Wall	North West	22.67	
SE Openings	Windows	Wall 1 - Ext Wall	South East	11.46	
SW Openings	Windows	Wall 1 - Ext Wall	South West	3.86	
SE Openings	Door	Wall 1 - Ext Wall	South East	2.86	

14.0 Conservatory

None

15.0 Draught Proofing

100

 %

16.0 Draught Lobby

No

17.0 Thermal Bridging

Calculate Bridges

17.1 List of Bridges

Bridge Type	Source Type	Length	Psi	Adjusted Reference:	Imported
E2 Other lintels (including other steel lintels)	Independently assessed	17.75	0.05	0.05 TEST	No
E3 Sill	Independently assessed	17.75	0.02	0.02 TEST	No
E4 Jamb	Independently assessed	41.32	0.05	0.05 TEST	No
E5 Ground floor (normal)	Independently assessed	38.63	0.05	0.05 TEST	No
E20 Exposed floor (normal)	Table K1 - Default	3.07	0.32	0.32	No
E21 Exposed floor (inverted)	Table K1 - Default	3.07	0.32	0.32	No
E6 Intermediate floor within a dwelling	Independently assessed	16.27	0.05	0.05 TEST	No
E24 Eaves (insulation at ceiling level - inverted)	Table K1 - Default	11.77	0.15	0.15	No
E11 Eaves (insulation at rafter level)	Table K1 - Default	12.80	0.15	0.15	No
E15 Flat roof with parapet	Independently assessed	26.86	0.10	0.10 TEST	No
E16 Corner (normal)	Independently assessed	27.28	0.05	0.05 TEST	No
E17 Corner (inverted - internal area greater than external area)	Table K1 - Default	5.80	0.00	-0.08	No
R4 Ridge (vaulted ceiling)	Table K1 - Default	6.40	0.12	0.12	No
E13 Gable (insulation at rafter level)	Table K1 - Default	13.82	0.25	0.25	No

Y-value

0.06

 W/m²K

19.0 Mechanical Ventilation

Mechanical Ventilation

Mechanical Ventilation System Present

No

20.0 Fans, Open Fireplaces, Flues

Number of open chimneys

0

Number of open flues

0

Number of chimneys/flues attached to closed fire

0

Number of flues attached to solid fuel boiler

0

Number of flues attached to other heater

0

Number of blocked chimneys

0

Number of intermittent extract fans

4

Number of passive vents

0

Number of flueless gas fires

0

21.0 Fixed Cooling System

No

22.0 Pressure Testing

Yes

Designed AP₅₀

5.00

 m³/(h.m²) @ 50 Pa

Test Method

Blower Door

22.0 Lighting

No Fixed Lighting

No

Name	Efficacy	Power	Capacity	Count
LED	80.00	5.00	400.00	10

24.0 Main Heating 1

Database

Percentage of Heat

100.00

 %

Summary for Input Data

Database Ref. No.	102726					
Fuel Type	Electricity					
In Winter	196.92					
In Summer	141.66					
Model Name	AE160JXYDEH					
Manufacturer	Samsung Electronics Air Conditioner Europe B.V.					
System Type	Heat Pump					
Controls SAP Code	2207					
Controls description	Time and temperature zone control by arrangement					
Is MHS Pumped	Pump in heated space					
Heating Pump Age	2013 or later					
Heat Emitter	Underfloor					
Underfloor Heating	Yes - Pipes in thin screed					
Flow Temperature	Enter value					
Flow Temperature Value	55.00					

25.0 Main Heating 2	None					
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26.0 Heat Networks	None					
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27.0 Secondary Heating	None					
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28.0 Water Heating						
Water Heating	Main Heating 1					
SAP Code	901					
Flue Gas Heat Recovery System	No					
Waste Water Heat Recovery Instantaneous System 1	No					
Waste Water Heat Recovery Instantaneous System 2	No					
Waste Water Heat Recovery Storage System	No					
Solar Panel	No					
Water use <= 125 litres/person/day	Yes					
Cold Water Source	From mains					
Bath Count	2					
Immersion Only Heating Hot Water	No					

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

28.3 Waste Water Heat Recovery System						
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29.0 Hot Water Cylinder	Hot Water Cylinder					
Cylinder Stat	No					
Cylinder In Heated Space	Yes					
Independent Time Control	No					
Insulation Type	Measured Loss					
Cylinder Volume	200.00					
Loss	1.65					
Pipes insulation	Fully insulated primary pipework					

L
kWh/day

31.0 Thermal Store	None					
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32.0 Photovoltaic Unit	One Dwelling					
Export Capable Meter?	Yes					

Summary for Input Data



Connected To Dwelling	Yes
Diverter	No
Battery Capacity [kWh]	2.00

PV Cells kWp	Orientation	Elevation	Overshading	FGHRS	MCS Certificate	Overshading Factor	MCS Certificate Reference	Panel Manufacturer
2.00	South West	30°	None Or Little		No	1.00		

34.0 Small-scale Hydro

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

Lower cost measures

None

Further measures to achieve even higher standards

	Typical Cost	Typical savings per year	Ratings after improvement	
			SAP rating	Environmental Impact
Solar water heating	£4,000 - £7,000	£115	C 74	A 95
Photovoltaic			0	0
Wind turbine			0	0