



Energy Statement

Reading Scouts and Guides Headquarters, 163 Northcourt Avenue, Reading, RG2 7HG

Reading Scout And Guide Headquarters Joint Management Committee

Report No: PA-ES-NP-RS&GHQ-23-01

Report Date: April 2023

CONTENTS

1. ASSESSMENT INFORMATION	2
2. EXECUTIVE SUMMARY	3
3. INTRODUCTION.....	4
4. PLANNING POLICY	5
4.1 National Planning Policy Framework (NPPF) 2021.....	5
4.2 Local Policy	6
5. ENERGY STRATEGY APPROACH	8
5.1 Energy and Carbon Assessment Methodology	8
6. BASELINE: CO₂ EMISSIONS.....	9
7. PASSIVE DESIGN AND ENERGY EFFICIENT MEASURES (BE LEAN)	10
7.1 Passive design.....	10
7.2 Building Fabric	10
7.3 Energy Efficient Systems	11
7.3.1 Heating and Hot Water	11
7.3.2 Ventilation	11
7.3.3 Lighting	11
7.4 Summary of Building Services Energy Efficiency Measures	11
7.5 Be Lean: CO ₂ Emissions	12
8. SUPPLY ENERGY EFFICIENTLY (BE CLEAN)	13
9. RENEWABLES OR LZC TECHNOLOGY (BE GREEN).....	14
9.1 Photovoltaic Panels (PV)	14
9.2 PV Proposal.....	15
9.3 Be Green: CO ₂ Emissions.....	16
10. BREEAM	17
11. CONCLUSIONS	18
11.1 Development Total CO ₂ Savings	18
12. APPENDICES.....	19
12.1 Appendix A: Alternative Renewable Options	20
12.2 Appendix B: BREEAM Pre-Assessment	22
12.3 Appendix C: BRUKL Output Sheets ("Be Lean").....	23
12.4 Appendix C: BRUKL Output Sheets ("Be Green")	24

LIST OF TABLES

TABLE 1: ENERGY STRATEGY CARBON EMISSIONS SUMMARY	3
TABLE 2: BASELINE CO₂ EMISSIONS	9
TABLE 3: PROPOSED FABRIC SPECIFICATION	10
TABLE 4: SUMMARY OF BUILDING SERVICES	11
TABLE 5: TOTAL 'BE LEAN' CO₂ EMISSIONS	12
TABLE 6: SUMMARY OF PV INCLUDING CO₂ SAVING	15
TABLE 7: TOTAL 'BE GREEN' CO₂ EMISSIONS	16
TABLE 8: SUMMARY OF PROPOSED ENERGY STRATEGY	18
TABLE 9: ENERGY STRATEGY CARBON EMISSIONS SUMMARY	18

LIST OF FIGURES

FIGURE 1: SITE LOCATION PLAN	4
FIGURE 2: INDICATIVE PV PANEL LAYOUT	15

1. ASSESSMENT INFORMATION

Project Name	Reading Scouts and Guides Headquarters
Project Address	Reading Scouts and Guides Headquarters, 163 Northcourt Avenue, Reading, RG2 7HG
Developer	Reading Scout and Guide Headquarters Joint Management Committee
Architect	Rogers Cory Partnership
Architect's Address	The Old School, Old School Road, Hook, Hampshire, RG27 9NJ
Project Description	Demolition of the existing structure on site, and the erection of a two storey 500 sq.m (Use Class F2) building with associated parking and landscaping.

	Author	Date	Email Address
Produced by	MH	27/04/23	mike.hassett@abbey-consultants.com
Reviewed by			

Issue Number	Author	Date	Reason
01	MH	27/04/23	Initial Issue
02			
03			

This document has been prepared for Reading Scout and Guide Headquarters Joint Management Committee only and solely for the purposes expressly defined herein. We owe no duty of care to any third parties in respect of its content. Therefore, unless expressly agreed by us in signed writing, we hereby exclude all liability to third parties, including liability for negligence, save only for liabilities that cannot be so excluded by operation of applicable law. The consequences of climate change and the effects of future changes in climatic conditions cannot be accurately predicted. This report has been based solely on the specific design assumptions and criteria stated herein.

2. EXECUTIVE SUMMARY

This document has been prepared by Abbey Consultants (Southern) Ltd, a specialist environmental and energy consultancy, on behalf of Reading Scout and Guide Headquarters Joint Management Committee, to accompany a planning application for the demolition of the existing structure on site, and the erection of a two storey 500 sq.m (Use Class F2) building with associated parking and landscaping.

The proposed strategy has been based around the relevant planning policies of Reading Borough Council, with the aim of achieving compliance with Building Regulations Part L2 2021.

This report considers sustainability and includes an assessment of the predicted CO₂ demand for the proposed development. In the formulation of this strategy, much consideration has been given to minimising the carbon emissions of the proposed development, and to ensure the development is constructed to rigorous sustainability standards.

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

- A Building Regulation baseline energy assessment for the proposed development.
- Energy conservation measures to be undertaken in the design of the development.
- A calculation of any CO₂ savings that are to be achieved as a result of energy efficiency measures.
- A proposal for the inclusion on-site renewables or low and zero carbon technologies.
- A BREEAM pre-assessment detailing how a 'Very Good' rating can be achieved.

The development will reduce regulated CO₂ emissions by integrating a range of passive design and energy efficiency measures throughout the building. These measures include improving building fabric standards beyond the requirements of Part L of the Building Regulations.

Due to the anticipated nature of the use of this building in operation, it will be necessary to have fast acting space heating for relatively short periods of time, as such, it is proposed that the space heating demands will be met via direct acting electric panel heaters. In terms of hot water, this will be provided via instantaneous point of use electric water heating.

The 'Be Lean' CO₂ emissions are calculated to be significantly higher than the baseline. This is due to the notional building assuming a substantial amount of PV, which means the calculated TER (baseline) is much lower than the 'Be Lean' figures as PV cannot be included at the 'Be Lean' stage of the energy hierarchy. The contribution of PV, or any other renewable technology, could only be included at the 'Be Green' stage.

At the 'Be Green' stage of the energy hierarchy an appraisal was carried out to identify the most suitable renewable and low carbon technology for this scheme. PV was deemed to be the most suitable option. An assessment then followed which concluded that an estimated 35.72 kWp of PV would be required across the development. This estimated PV quantity was influenced by ensuring that compliance is achieved with Building Regulations Part L2 2021.

A summary of the total reduction in the developments regulated carbon emissions, after each stage of the energy hierarchy, has been summarised in the table below.

Table 1: Energy Strategy Carbon Emissions Summary

Stage of Energy Hierarchy	Regulated CO ₂ Emissions (kgCO ₂ /m ² /year)
Total Baseline	268
Total After 'Be Lean'	4,020
Total After 'Be Green'	231
Total CO₂ Saving	37
Total % Improvement	14%

As can be seen from the table above, after all the measures of this energy strategy are accounted for, the total CO₂ figure is lower than the baseline. This means that the energy strategy is compliant with the requirements of Building Regulations Part L2 2021.

In addition, a BREEAM pre-assessment has been carried out detailing how a 'Very Good' rating will be achieved. This adheres to the requirements of Reading Borough Council's Local Plan Policy CC2.

3. INTRODUCTION

This document has been prepared by Abbey Consultants (Southern) Ltd, a specialist environmental and energy consultancy on behalf of Reading Scout and Guide Headquarters Joint Management Committee.

The following report establishes a baseline assessment of the energy demands and associated CO₂ emissions for the development. The energy hierarchy approach of Be Lean, Be Clean and Be Green is then followed to ensure the maximum viable reductions in energy and regulated CO₂ emissions is achieved.

The proposed development is described as:

Demolition of the existing structure on site, and the erection of a two storey 500 sq.m (Use Class F2) building with associated parking and landscaping.

This report takes into consideration the layout, use and requirements for the development to recommend a strategy that integrates the most suitable technologies available that are commercially viable, whilst also adhering to the planning policy requirements of the Reading Borough Council.

Figure 1 presents the proposed site location plan.

Figure 1: Site Location Plan



4. PLANNING POLICY

An effective planning system is required to contribute to achieving sustainable development.

Sustainable development is defined as having the following three overarching objectives which are interdependent and need to be pursued in mutually supportive ways: an economic objective, a social objective, and an environmental objective.

1. Economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;
2. Social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering a well-designed and safe built environment, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and
3. Environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

4.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF) 2021

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

Chapter 14 Meeting the challenge of climate change, flooding and coastal change

The following paragraphs set out the Government's position in response to reducing carbon emissions:

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

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

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

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

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

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

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

- a. not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

4.2 LOCAL POLICY

**Reading Borough Council
Reading Borough Local Plan
Adopted November 2019**

POLICY CC1: PRESUMPTION IN FAVOUR OF SUSTAINABLE DEVELOPMENT

A positive approach to considering development proposals will be taken that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework (NPPF). Where appropriate, the Council will work proactively with applicants jointly to find solutions which mean that proposals can be approved wherever possible.

Planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise. Planning applications that accord with the policies in the development plan (including, where relevant, with policies in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise. Proposed development that conflicts with the development plan will be refused, unless other material considerations indicate otherwise.

Where there are no policies relevant to the application or the policies which are most important to determining the application are out of date at the time of making the decision then permission will be granted unless material considerations indicate otherwise – taking into account whether:

- The application of policies in the NPPF that protect areas or assets of particular importance provides a clear reason for refusing the development proposed; or
- Any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the NPPF taken as a whole.

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 greywater and rainwater harvesting where systems are energy and cost effective.

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.

POLICY CC4: SUSTAINABLE DESIGN AND CONSTRUCTION

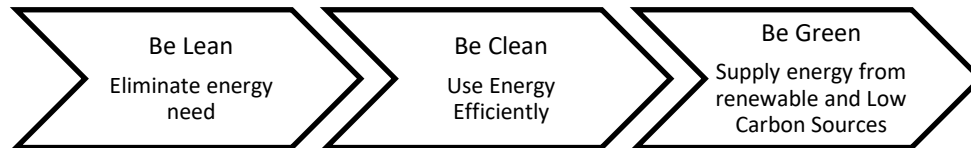
In meeting the sustainability requirements of this plan, developments of the sizes set out below shall demonstrate how consideration has been given to securing energy for the development from a decentralised energy source.

Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq m shall consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.

Where there is existing decentralised energy provision present within the vicinity of an application site, further developments of 10 dwellings or more or non-residential development of 1,000 sq m or more will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible.

5. ENERGY STRATEGY APPROACH

The proposed energy strategy follows the established and widely accepted Energy Hierarchy of eliminate energy need (Be Lean), Use energy efficiently (Be Clean) and supply energy from renewable and low carbon sources (Be Green) to enable the maximum viable reductions in regulated and total CO₂ emissions over the baseline.



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

Using these principles, Reading Scout and Guide Headquarters Joint Management Committee will deliver the following objectives:

- Comply with the relevant regulatory requirements.
- To reduce energy and CO₂ demand through fabric and energy efficiency measures.
- To propose to reduce energy consumption and carbon dioxide emissions further through the use of on-site renewable or low and zero carbon technologies (LZC).
- Ensure that an overall reduction in CO₂ is achieved in order to achieve compliance with the Building Regulations Part L2 2021 standards.

5.1 ENERGY AND CARBON ASSESSMENT METHODOLOGY

An initial assessment of the CO₂ performance of the non-residential space is carried out using the DesignBuilder SBEM software. DesignBuilder SBEM software is an approved tool for calculating compliance with Part L2 2021, which uses the National Calculation Methodology (NCM).

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

6. BASELINE: CO₂ EMISSIONS

In order to assess the energy demand and CO₂ performance of the proposed energy strategy, a baseline needs to be established. This section sets out the approach taken to calculating the baseline CO₂ emissions for the development.

The total baseline CO₂ emissions for the proposed development is defined as regulated CO₂ emissions, which is covered by Building Regulations Part L. Regulated CO₂ emissions are calculated from the CO₂ emissions associated with space heating, hot water and fixed electrical demands (for lights, fans and pumps).

Unregulated CO₂ emissions are those that are associated with appliances. Unregulated CO₂ emissions are not covered by Part L and are therefore not included as part of the assessment detailed within this energy strategy.

CO₂ Conversion Factors have been applied in accordance with the requirements of Building Regulations Part L2 2021.

The CO₂ emissions baseline is determined by the Target Emission Rate (TER). The TER is calculated using the DesignBuilder SBEM software and is based on the calculation of energy consumption of a 'notional' building defined by the National Calculation Methodology (NCM). The DesignBuilder SBEM modelling software produces results in the form of BRUKL reports, and these have been provided within the appendices.

Using the outputs from SBEM, the baseline (TER) regulated energy and carbon figures for the proposed development are detailed in the table below.

Table 2: Baseline CO₂ emissions

Stage of Energy Hierarchy	Regulated CO ₂ Emissions (kgCO ₂ /m ² /year)
Total Baseline	268

7. PASSIVE DESIGN AND ENERGY EFFICIENT MEASURES (BE LEAN)



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

A range of measures to reduce CO₂ emissions and increase resilience to climate change are proposed in the building design including good building fabric standards as well as energy efficient M&E systems and lighting.

7.1 PASSIVE DESIGN

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

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

The building orientation is important to consider. High solar gains are undesirable, as they lead to overheating, however, some solar gain is desirable to reduce the heating and lighting demands.

The glazed areas on each elevation and the thermal properties of the glass and the window system as a whole are fundamental to the building energy consumption and carbon emissions.

The specification of the glass will balance the light it lets through with the proportion of solar gain it reflects away from the building. This balances the use of artificial lighting with the energy needed to keep the internal space at an acceptable temperature. Reducing the amount of artificial lighting leads to significant reductions in energy and subsequent carbon emissions.

7.2 BUILDING FABRIC

Part L2 of the 2021 Building Regulations for non-residential buildings highlights the need for an energy efficient design. The minimum building fabric requirements for Part L2 2021 and the proposed specification for the individual building elements of the non-residential section of this development are detailed in the table below.

Table 3: Proposed Fabric Specification

Element	Part L2 2021 Minimum Fabric Requirements	Proposed Specification
Ground Floor	0.18 W/m ² K	0.12 W/m ² K
External Wall	0.26 W/m ² K	0.18 W/m ² K
Roof	0.16 W/m ² K	0.14 W/m ² K
Windows	1.60 W/m ² K	U = 1.30 W/m ² K G = 0.45
Doors	1.60 W/m ² K	1.40 W/m ² K
Air Permeability	8.0m ³ /h/m ² @50Pa	4.00m ³ /h/m ² @50Pa

Approved construction details for all wall junctions will be specified to minimise the effects of non-repeating thermal bridging and reduce heat loss further. By specifying and ensuring that approved construction detailing is designed into the build, CO₂ emissions can be reduced further. In addition, it is proposed that all openings will have Hi-Therm lintels installed to maximise thermal efficiency.

7.3 ENERGY EFFICIENT SYSTEMS

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

7.3.1 HEATING AND HOT WATER

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

Due to the anticipated nature of the use of this building in operation, it will be necessary to have fast acting space heating for relatively short periods of time, as such, it is proposed that the space heating demands will be met via direct acting electric panel heaters.

In terms of hot water, this will be provided via instantaneous point of use electric water heating.

7.3.2 VENTILATION

The current proposal is for the building to be naturally ventilated through openable windows and doors. Local extract fans will be located in the WCs and Kitchen areas.

To further minimise heat loss through the building envelope, air leakage will be made a priority. The airtightness of the building will be set to a level of $4.00\text{m}^3/\text{h}/\text{m}^2$.

A more detailed ventilation strategy will be developed during detailed design with the aim to specify the most appropriate ventilation systems and achieve a pleasant indoor environment.

7.3.3 LIGHTING

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

- Using energy efficient lamps and luminaires. Low energy lamps and LED's are proposed throughout.
- Having PIR's installed to corridors and occupants store cupboards ensuring when spaces are unoccupied, the lighting automatically switches off.
- Having appropriately commissioned lighting systems.

7.4 SUMMARY OF BUILDING SERVICES ENERGY EFFICIENCY MEASURES

The building services and systems to be employed across the different spaces of the development are summarised in the following tables.

Table 4: Summary of Building Services

Building Service Element	Specification
Heating:	Electric panel heaters
Cooling:	Natural
Hot Water:	Point of use direct electric
Ventilation:	Natural ventilation with local extract fans to WCs and Kitchen area
Lighting:	140 lm/W

7.5 BE LEAN: CO₂ EMISSIONS

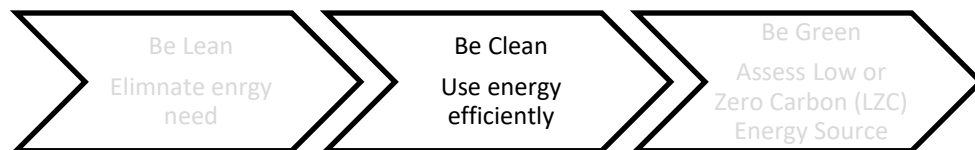
Using the specification detailed and the outputs from SBEM, the 'Be Lean' CO₂ emissions for the development total are detailed in the tables below, along with the baseline.

Table 5: Total 'Be Lean' CO₂ emissions

Stage of Energy Hierarchy	Regulated CO ₂ Emissions (kgCO ₂ /m ² /year)
Total Baseline	268
Total After 'Be Lean'	4,020

As can be seen from the table above, the CO₂ emissions detailed after the 'Be Lean' stage are significantly more than the baseline figures. This is due to the notional building assuming a significant amount of PV, which means the calculated TER (baseline) is much lower than the 'Be Lean' figures as PV cannot be included at the 'Be Lean' stage of the energy hierarchy. The contribution of PV, or any other renewable technology, can only be included at the 'Be Green' stage. This will follow at the latter stage of this energy hierarchy.

8. SUPPLY ENERGY EFFICIENTLY (BE CLEAN)



Combined Heat and Power (CHP)

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

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

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

There are many benefits of decentralised heat generation and Combined Heat and Power (CHP) in terms of cost and CO₂ emissions savings. However, technology such as this is more significant for larger developments, ideally complimented with some residential use of heat and electricity. The scale of the proposed development is at the very low end of what the industry tends to view as viable for such systems.

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

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

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

9. RENEWABLES OR LZC TECHNOLOGY (BE GREEN)



As detailed by the previous stages of this energy hierarchy, a site wide CO₂ reduction against a Building Regulations Part L2 2021 baseline is yet to be achieved. Therefore, it will be necessary to reduce CO₂ emissions further. This can be achieved by integrating low and zero carbon technologies into the development. The following technologies have been considered:

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

The assessment has shown that PV is the most suitable renewable energy technology to implement for this development. A summary of all the renewable energy technology options, and justifications for not including them in this instance, has been included within the appendices of this report.

9.1 PHOTOVOLTAIC PANELS (PV)

Solar PV technology offers advantages over other low carbon and renewable energy technologies for the following reasons:

Density/scale

Solar technologies are modular and can be sized to available space constraints and would easily be integrated into the roofscape of the proposed development.

Solar PV technologies typically require 2-3 times more space to generate the equivalent energy or abate similar emissions as solar thermal panels, but they can be sized to the maximum available roof space.

Technology Integration

Solar technologies can be easily integrated into the built environment using available roof space. Since they are modular and easily fixed to buildings they can access solar irradiation in almost any location. The technologies can be integrated on almost any roof structure or vertical façade without compromising structural or aesthetic requirements.

Solar PV systems are generally connected to the dwelling or block via an inverter and any excess generation not utilised on-site is exported seamlessly to the local grid.

Cost-effectiveness

Solar PV costs have reduced dramatically in the last few years in the UK, due to increasing demand for the technology driven by sustainability requirements and the Government's stimulus package known as the Feed-In Tariffs (FiTs) scheme which rewards renewable electricity generation with premium tariffs.

CO₂ Abatement Capacity

Solar PV generates electricity and abates ~2.5 - 3 times more CO₂ than an alternative renewable energy technology that displaces use of gas (e.g. solar hot water technology and/or biomass boilers). Solar PV is well proven with good historical data showing that its performance credentials generally match or exceed manufacturers' claims/modelled generation profiles.

9.2 PV PROPOSAL

The estimated quantity of PV has been influenced by the necessity to reduce the CO₂ emissions by enough to ensure compliance with Building Regulations Part L2 2021.

An assessment has shown that an estimated 35.72 kWp of PV will be required to the southern facing roof elevation of the building.

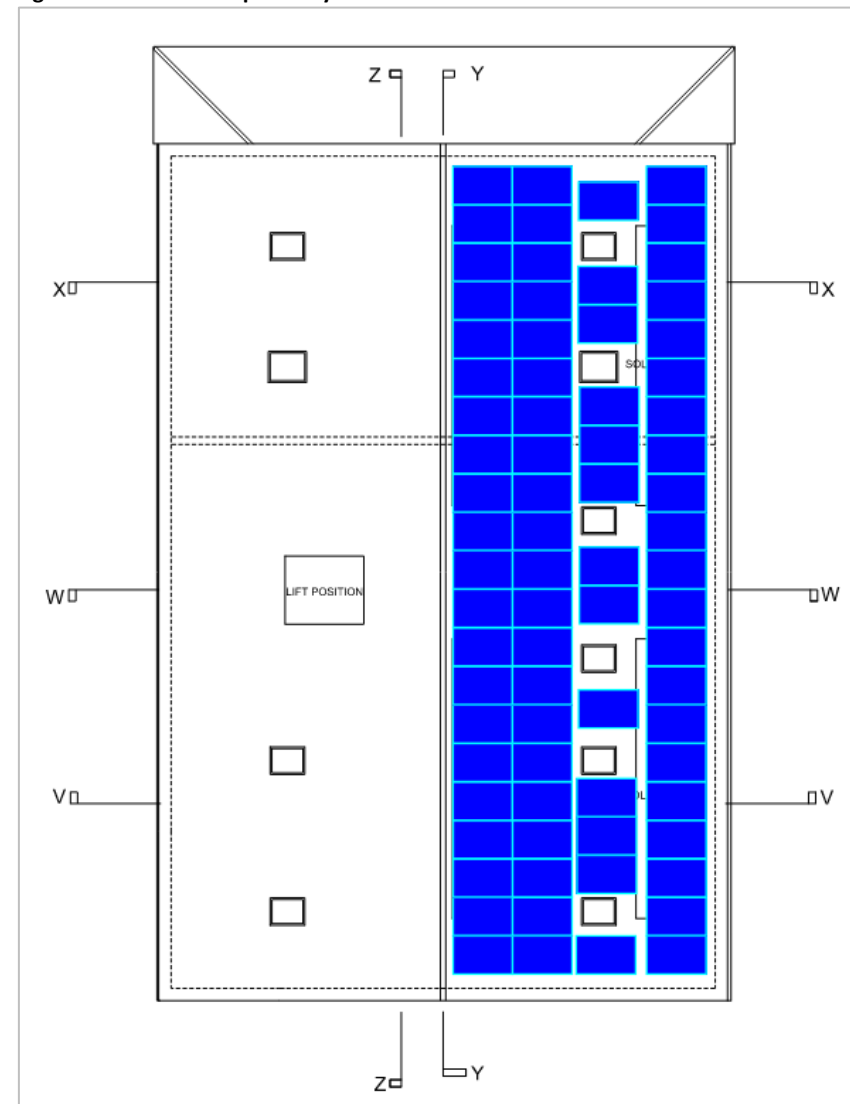
An indicative PV panel layout can be seen in the figure across the page.

A summary of the PV proposal, including anticipated CO₂ savings, is detailed in the table below.

Table 6: Summary of PV including CO₂ saving

Item	Quantity	Metric
Assumed Power of PV Panels	470	Wp
Estimated Total Number of PV Panels	76	No
Total kWp	35.72	kWp
Total CO ₂ saving	3,789	kgCO ₂ /m ² /year

Figure 2: Indicative PV panel layout



9.3 BE GREEN: CO₂ EMISSIONS

Using the specification detailed and the outputs from SBEM, the 'Be Green' carbon figures are detailed in the tables below and have been compared with the previous stages of the energy hierarchy.

Table 7: Total 'Be Green' CO₂ emissions

Stage of Energy Hierarchy	Regulated CO ₂ Emissions (kgCO ₂ /m ² /year)
Total Baseline	268
Total After 'Be Lean'	4,020
Total After 'Be Green'	231
Total CO₂ Saving	37
Total % Improvement	14%

As can be seen from the table above, after the 'Be Green' measures are accounted for, the total CO₂ figure is lower than the baseline. This means that the energy strategy is compliant with the requirements of Building Regulations Part L2 2021.

10. BREEAM

Reading Borough Council's Local Plan Policy CC2 requires that minor non-residential developments to achieve a BREEAM 'Very Good' standard as a minimum.

A BREEAM pre-assessment has been carried out for this development proposal. This has been included within the appendices and details how a 'Very Good' rating will be achieved in order to adhere to the requirements of Reading Borough Council's Local Plan Policy CC2.

11. CONCLUSIONS

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

Table 8: Summary of Proposed Energy Strategy

Element	Strategy
Passive	Optimised design to enable controlled solar gain and improved direct and indirect natural lighting
Fabric	Building fabric U values have been enhanced over and above those detailed with Part L 2021
Heating	Electric panel heaters
Hot Water	Point of use direct electric
Ventilation	Natural ventilation with local extract fans to WCs and Kitchen area
Lighting	Energy efficient LED Lighting where applicable 140 lm/W
Renewables	Estimated 35.72 kWp of PV to the southern facing roof elevation

11.1 DEVELOPMENT TOTAL CO₂ SAVINGS

A summary of the total reduction in the developments regulated carbon emissions, after each stage of the energy hierarchy, has been summarised in the table below.

Table 9: Energy Strategy Carbon Emissions Summary

Stage of Energy Hierarchy	Regulated CO ₂ Emissions (kgCO ₂ /m ² /year)
Total Baseline	268
Total After 'Be Lean'	4,020
Total After 'Be Green'	231
Total CO₂ Saving	37
Total % Improvement	14%

As can be seen from the table above, after all the measures of this energy strategy are accounted for, the total CO₂ figure is lower than the baseline. This means that the energy strategy is compliant with the requirements of Building Regulations Part L2 2021.

In addition, a BREEAM pre-assessment has been carried out detailing how a 'Very Good' rating will be achieved. This adheres to the requirements of Reading Borough Council's Local Plan Policy CC2.

12. APPENDICES

The following pages detail:

- Appendix A: Alternative Renewable Options
- Appendix B: BREEAM Pre-assessment
- Appendix C: BRUKL Output Sheets (“Be Lean”)
- Appendix D: BRUKL Output Sheets (“Be Green”)

12.1 APPENDIX A: ALTERNATIVE RENEWABLE OPTIONS

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

Wind Turbines

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

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

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

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

Biomass Boilers

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

Biomass is considered a technically-viable option for this development scheme as there are no apparent physical constraints on site in terms of installing biomass boilers or storing a sufficient supply. There are, however, concerns regarding a sustainable supply of biomass to the site. In addition, the capital installation cost would also be high which leads us to the conclusion that biomass would not be a commercially-viable option for this development scheme.

Ground Source Heat Pumps (GSHP)

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

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

Discounted on the grounds of excessive costs due to extensive groundworks and excavation required. There are also potential issues with access for maintenance due to pipework being buried below ground.

Solar Thermal

Solar Thermal generates hot water from the sun's radiation. Glycol circulates within either flat plate or evacuated tube panels, absorbing heat from the sun, and transferring this energy to a water cylinder. This technology is deemed unsuitable in this case as there is low carbon reduction efficiency compared to the photovoltaic systems that have been proposed.

Air Source Heat Pumps (ASHP)

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

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

ASHPs are considered not suitable in this instance. This is due to the anticipated nature of the use of this building in operation. It will be necessary for the building to have fast acting space heating for relatively short periods of time. ASHPs are low energy heating systems that are not suited to this kind of usage.

12.2 APPENDIX B: BREEAM PRE-ASSESSMENT

27/04/2023	Target Rating: 'Very Good'	BREEAM New Construction 2018 Initial strategy following review of planning drawings.
Targeted Score	61.93	
Total Required	55.00	

	Credits not Targeted
	Credit requirement is mandatory to achieve BREEAM certification

Red – All Outstanding
Amber – Some Outstanding
Green – None Outstanding

Credit Issue	Description of Credit Issue	Total Credits Available	'Very Good'	Weighted Value of credit	Assessment Criteria	Strategy	Evidence required
Man 01	Project brief and design	1	1	0.80	Stakeholder Consultation	Hold design team meetings with all parties; meeting to identify and define their roles, responsibilities and contributions for each of the key phases of project delivery. Responsibilities as follows must be considered and documented through design team minutes: - End user requirements - Aims of the design and design strategy - Particular installation and construction requirements/limitations - Occupiers budget and technical expertise in maintaining and proposed systems - Maintainability and adaptability of the proposals - Requirements for the production of project and end user documentation - Requirements for commissioning, training and aftercare support	Design team minutes
Man 01	Project brief and design	1	1	0.80	Stakeholder consultation (third party)	Prior to completion of concept design, all relevant third party stakeholders must have been consulted by the design team covering the following: - Functionality, build quality and aesthetics. - Provision of appropriate internal and external facilities - Management and operational implications - Maintenance resources implications - Impacts on the local community e.g. local traffic/transport impact - Opportunities for shared use of facilities and infrastructure with the community - Compliance with statutory consultation requirements - Inclusive and accessible design How the third party feedback has influenced the design will then need to be documented.	Meeting minutes/consultation plan demonstrating third party stakeholders feedback has been considered and implemented where practical.
Man 01	Project brief and design	1	1	0.80	Sustainability Champion (design)	I, as a BREEAM Advisory Professional, will facilitate the setting and achievement of BREEAM performance targets for the project.	BREEAM pre-assessment trackers
Man 01	Project brief and design	1	1	0.80	Sustainability Champion (monitoring progress)	I, as a BREEAM Advisory Professional, will need to monitor the progress of the project against the agreed BREEAM strategy and report progress to the design team.	BREEAM pre-assessment trackers

Man 02	Life cycle cost and service life planning	2	0	0.80	Elemental Life Cycle Cost (LCC)	An outline, entire asset elemental life cycle cost (LCC) plan will need to be carried out at RIBA stage 2 in line with 'Standardised method of life cycle costing for construction procurement' PD 156865:2008. The LCC will need to include service life, maintenance and operation cost estimates and provide an indication of future replacement costs over a set period of analysis as required by the client. Evidence would then be required by the design team to confirm how the LCC has influenced the building and system design/specification to minimise life cycle costs.	Elemental Life Cycle Cost analysis
Man 02	Life cycle cost and service life planning	1	0	0.80	Component level LCC option appraisal	A component level LCC option appraisal will need to be developed by the end of RIBA stage 4 in line with PD 156865:2008 and includes the following component types: - Envelope - Services - Finishes - External space Evidence would then be required by the design team to confirm how the component level LCC has influenced the building and system design/specification to minimise life cycle costs.	Component Life Cycle Cost analysis
Man 02	Life cycle cost and service life planning	1	1	0.80	Capital Cost Reporting	The capital cost of the project will need to be reported in pounds per square metre (£k/m2) and will need to account for the following: - Construction, including preparatory works, materials, equipment and labour - Site management - Insurance and taxes during construction - Inspection and testing Costs relating to land procurement, clearance, design, statutory approvals and post-occupancy aftercare should not be included.	Signed letter
Man 03	Responsible construction practices	0	0	0.80	Legal Timber	All timber and timber based products used on the project must be 'Legally harvested and traded timber' Please note this is a pre-requisite and is required to achieve any BREEAM rating.	Signed design stage letter & PEFC/FSC certification
Man 03	Responsible construction practices	1	1	0.80	Environmental Management	The principal contractor will need to operate an environmental management system (EMS) covering their main operations.	EMS certificate e.g. ISO14001
Man 03	Responsible construction practices	1	1	0.80	BREEAM AP	I, as a BREEAM AP, will need to be involved to enable the following: - Work with the design team to assist in achieving the design targets - Monitor construction progress against the performance targets agreed - Proactively identify risks and opportunities related to the procurement and construction process - Provide feedback to the project team to ensure ongoing compliance with the BREEAM targets	BREEAM pre-assessment trackers
Man 03	Responsible construction practices Mandatory: 1 credit	2	2	0.80	Responsible Construction Management	Registration with the Considerate Constructors Scheme will need to be undertaken and a score of at least 35 with a minimum of 7 in each of the 5 sections, achieving performance beyond compliance and 2 credits.	CCS Certificate
Man 03	Responsible construction practices	1	1	0.80	Monitoring of construction site impacts	The monitoring, recording and reporting of energy and water consumption data resulting from all on-site construction processes will need to be undertaken throughout the build programme. Monitor and record data on principal constructor's and subcontractor's potable water consumption (m3) and energy consumption in kWh (and where relevant, litres of fuel used) as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation.	Water and energy consumption data from throughout the construction phase

Man 03	Responsible construction practices	1	1	0.80	Transport of construction materials and waste	The monitoring, recording and reporting of transport movement and impacts data resulting from the delivery of the majority of construction materials to site and construction waste from site. As a minimum this must cover: - Transport of materials from the factory gate to the building site, including any transport, intermediate storage and distribution - Transport of construction waste from the construction gate to waste disposal processing/recovery centre gate. The data will then need to be collated separately for materials and waste to include the fuel consumption, carbon dioxide emissions and distance travelled.	Transport and fuel consumption data for all deliveries to site.
Man 04	Commissioning and handover	1	1	0.80	Testing and inspecting building fabric	The integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths will need to be quality assured through completion of post construction testing and inspection, including air pressure test and thermographic survey. If any issues are identified they will then need to be remediated.	Air pressure test certificate, Thermal survey certificates and any remediation as required.
Man 04	Commissioning and handover Mandatory: Building User Guide	1	1	0.80	Handover	A Building User Guide (BUG) will need to be developed prior to handover for distribution to the building occupiers and include the following: -Overview of the building and its environmental strategy e.g energy / water / waste efficiency policy / strategy and how users should engage with/deliver the policy strategy - Building services overview -Pre-arrival information for visitors including access and security procedures -Provision of and access to shared facilities -Safety and emergency information instructions – e.g. fire drill and evacuation points -Building related operational procedures -Building related incident reporting / feedback arrangements -Building related training information / links Provision of, and access to, transport facilities, e.g. public transport, cyclist facilities, pedestrian routes. -Re-fit, refurbishment and maintenance arrangements/considerations - Links, references and relevant contact details A training schedule will need to be prepared for the building occupiers, to include the following: - The buildings design intent - The available aftercare provision and aftercare team main contact(s), including and scheduled seasonal commission and post occupancy evaluations - Introduction to, and demonstration of, installed systems and key features, e.g. building management systems, controls and their interfaces - Introduction to the Building user Guide and other relevant building documentation, e.g. design data, technical guides, maintenance strategy, operations and maintenance (O&M) manual, commissioning records, log book etc. - Maintenance requirements, including any maintenance contracts and regimes in place.	Building User Guide Training Schedule
Hea 01	Visual comfort	1	0	1.00	Daylighting	Full daylight calculations will need to be carried out to confirm that 80% of all relevant building areas will need to meet good practice daylight factors or 2% and either, a uniformity ratio of at least 0.3, or view of the sky and compliance with the room depth criterion.	Daylight modelling and calculations
Hea 01	Visual comfort	1	0	1.00	View Out	95% of the floor area in relevant building areas must be within 7m of the wall which has a window or permanent opening that provides an adequate view out. In addition the windows/openings must be greater than or equal to 20% of the surrounding wall area or comply with the values in table 1.0 of BS8206.	Floor plan drawings
Hea 01	Visual comfort	1	1	1.00	External Lighting	External Lighting - All external lighting located within the construction zone is designed to provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately.	Drawings/specification confirming the lighting is compliant

						As such external lighting will need to be specified as per BS5489-1:2013 for the Lighting of Roads and public amenity areas and BS EN 12464-2:2014 Part 2 for the lighting of external workplaces.	
Hea 02	Indoor air quality	1	0	1.00	Indoor Air Quality	An indoor air quality plan will need to be produced that considers: - Removal of contaminant sources - Dilution and control of contaminant sources - Procedures for pre-occupancy flush out - Third party testing and analysis - Maintaining indoor air quality in-use	Indoor Air Quality Plan
Hea 03	Safe containment in laboratories	N/A	0	1.00	N/A	Credits not applicable.	
Hea 04	Thermal comfort	N/A	0	1.00	N/A	Credits not applicable.	Thermal modelling in accordance with CIBSE AM11
Hea 04	Thermal comfort	N/A	0	1.00	N/A	Credits not applicable.	
Hea 05	Acoustic performance	1	1	1.00	Sound Insulation and Ambient Noise Levels	Either a programme of pre-completion acoustic testing will need to be carried out by a compliant test body to ensure that the relevant spaces (as built) comply with the relevant standards for the indoor ambient noise, or an acoustic report will be required confirming that the acoustic requirements would likely be met given a typical fit out.	Pre-completion acoustic test results.
Hea 06	Safety and security	1	0	1.00	Security of Site and Building	A suitably qualified security specialist will need to be appointed to undertake an evidence-based Security Needs Assessment (SNA), the SQSS will then need to develop a set of security controls and recommendations, they will then subsequently need to be implemented into the design where feasible.	Meeting minutes/report confirming the recommendations made by the SQSS and drawings/report confirming they have been implemented where feasible.
Hea 07	Safe and healthy surroundings	1	1	1.00	Safe Access	A dedicated cycle path will need to provide direct access from the site entrance to the cycle store provided. Footpaths will need to provide direct access from the site entrance to the building entrance and connect to public footpaths off-site. Where provided, drop-off areas designed off access roads and provide direct access to the pedestrian footpaths Dedicated pedestrian crossings will need to be provided where pedestrian routes cross vehicle access routes. The lighting for access roads, pedestrian routes and cycle lanes will need to be in accordance with BS 5489-1:2013 Lighting of roads and public amenity areas.	Site plan drawing showing the dedicated cycle path to be provided.
Hea 07	Safe and healthy surroundings	1	1	1.00	Outside Space	An outside space providing the building users with an external amenity area will need to be provided.	Site plan

Ene 01	Reduction of energy use and carbon emissions	9	4	0.73	Energy Performance	4 credits have been targeted, subject to completion of the SBEM calculations.	SBEM BRUKL report
Ene 01	Reduction of energy use and carbon emissions	N/A	0	0.73		Credits not applicable.	
Ene 02	Energy monitoring	N/A	0	0.73		Credits not applicable.	
Ene 03	External lighting	1	1	0.73	External Lighting	The average luminous efficacy of the external light fittings within the construction zone is not less than 70 lumens per circuit Watt. All external light fittings will also need to be automatically controlled for prevention of operation during daylight hours and presence detection of areas of intermittent pedestrian traffic.	Drawings/specification confirming the external lighting specification
Ene 04	Low carbon design	1	0	0.73	Passive design analysis	The first credit within issue Hea 04 Thermal Comfort would need to have been achieved to enable this credit to be targetable. The design team would need to carry out an analysis of the proposed building design/development to influence decisions made during RIBA stage 2 and identify opportunities for the implementation of passive design solutions that reduce demand for energy consuming building services. The building would need to use passive design measures to reduce the total heating, cooling and mechanical ventilation and lighting loads and energy consumption in line with the findings of the passive design analysis and the analysis demonstrates a meaningful reduction in total energy demand as a result.	
Ene 04	Low carbon design	1	0	0.73	Free Cooling	The above passive design analysis credit would need to have been achieved to enable this credit to be targetable. The passive design analysis will need to include a review of free cooling and identify opportunities for the implementation of free cooling solutions, at least 1 of which is subsequently utilised.	

Ene 04	Low carbon design	1	1	0.73	Low and Zero Carbon Technologies	A LZCT feasibility study will need to be undertaken and a minimum reduction in CO2 of 5% through renewables will need to be achieved. The study will need to cover the following: - Energy generated from LAZ energy sources per year - Carbon dioxide savings from LAZ energy sources per year - Life cycle cost of the potential specification, accounting for payback - Local planning criteria, including land use and noise - Feasibility of exporting heat/electricity from the system - Any available grants - All technologies appropriate to the site and energy demand of the development - Reasons for excluding other developments - CHP and possibility of connecting to existing network	Energy statement, including a Low and Zero Carbon technology feasibility study.
Ene 05	Energy efficient cold storage	N/A	0	0.73	N/A	Credits not applicable.	
Ene 06	Energy efficient transportation systems	N/A	0	0.73	N/A	Credits not applicable.	
Ene 07	Energy efficient laboratory systems	N/A	0	0.73	N/A	Credits not applicable.	
Ene 08	Energy efficient equipment	N/A	0	0.73	N/A	Credits not applicable.	
Tra 01	Transport assessment and travel plan	2	2	1.20		A travel plan will need to be developed as part of the feasibility and design stages which considers all types of travel relevant to the building type and its users, taking into account the following: -Where relevant, existing travel patterns and opinions of existing building or site users towards cycling and walking so that constraints and opportunities can be identified. -Travel patterns and transport impact of future building users -Current local environment for walkers and cyclists -Disabled access -Public transport links serving the site -Current facilities for cyclists The travel plan will need to include proposals to increase or improve sustainable modes of transport and movement of people and good during the building's operation and use.	Transport statement confirming the accessibility index for the site Travel Plan
Tra 02	Sustainable transport measures	10	7	1.20		Points achieved: Accessibility index greater than 8 - 1 point Provide electric recharging stations of a minimum of 3kw for at least 10% of the total car parking capacity - 1 point Install compliant cycle storage spaces - 1 point Proximity to amenities - 1 point 5% of parking spaces nearest the site entrance are allocated as care share priority – 1 point As the site is anticipated to have an AI between 25 and 40 the 5 points scored achieves 7 credits.	Local amenities report Drawings confirming cycle storage & parking provision, including electric charging points
Wat 01	Water consumption	N/A	0	0.67		Credit not applicable	
Wat 02	Water monitoring	1	1	0.67		A water meter will need to be installed on the mains water supply. In addition any water consuming plant or building areas, consuming 10% or more of the building's total water demand will need to be fitted with either, sub-meters or have water monitoring equipment integral to the plan or area. The sub meters will need to have pulsed outputs to enable them to be connected to the BMS.	Drawing/specification confirming the water meter installed.

Wat 03	Water leak detection	1	1	0.67	Leak Detection System	A leak detection system capable of detecting major water leaks will need to be installed on the utilities water supply within the build and between the buildings and the utilities water supply. The system will need to comply with the following: - Be a permanent, automated water leak detection system that alters the building occupants to the leak - Activated when the flow of water passing through the meter or data logger is at a flow rate above a pre-set maximum for a pre-set period of time. - Able to identify different flow and therefore leakage rates - Programmable to suit the owner's or occupier's water consumption criteria Where there is no option for a leak detection system between the utilities meter and the building, alternative solutions can be used, provided that a major leak can still be detected.	Drawing/specification confirming the leak detection system installed.
Wat 03	Water leak detection	N/A	0	0.67	N/A	Credits not applicable.	
Wat 04	Water efficient equipment	N/A	0	0.67	N/A	Credits not applicable.	
Mat 01	Environmental impacts from construction products - Building life cycle assessment (LCA)	7	2	1.57		The material specification will be assessed against the BRE LCA tool. Abbey Consultants estimate that 5 credits will be achieved as shown.	Drawings/specification confirming the constructions to be used on site Materials report/calculations
Mat 02	Environmental Impacts from Construction Products - Environmental Product Declarations (EPD)	1	0	1.57		Credits not sought.	
Mat 03	Responsible sourcing of materials	0	0	1.57	Legal Timber	All timber and timber based products used on the project must be 'Legally harvested and traded timber'	Signed letter & PEFC/FSC certification
Mat 03	Responsible sourcing of materials	1	1	1.57	Sustainable procurement plan	Materials will need to be sourced for the project in accordance with a documented sustainable procurement plan, which sets out a clear framework for the responsible sourcing of materials to guide procurement throughout the project and covers the following: - Risk and opportunities are identified against a broad range of social environmental and economic issued - Aims, objectives and targets to guide sustainable procurement activities - The strategic assessment of sustainably sourced materials available locally and nationally, prioritising local materials where possible. - Procedures to check and verify the procurement plan is being implemented/adhered to.	Sustainable procurement plan
Mat 03	Responsible sourcing of materials	3	2	1.57	Responsible Sourcing of Materials	The majority of materials used within the development will need to have responsible sourcing certification, which will be assessed against the BREEAM criteria; it is currently anticipated that 2 credits will be achieved.	Materials responsible sourcing certification e.g. BES 6001

Mat 04	Insulation	N/A	0	1.57	N/A	Credit not longer assessed separately under 2018.	
Mat 05	Designing for durability and resilience	1	1	1.57		The design will need to incorporate suitable durability and protection measures to prevent damage to vulnerable parts of the internal and external building, e.g. - Protection from the effects of high pedestrian traffic in main entrance and thoroughfares - Protection against an internal vehicular/trolley movement within 1m of the internal building fabric. - Protection against or prevention from, any potential vehicular collision where parking or manoeuvring occurs within 1m of the external building facade (2m for delivery areas). Provide convenient access to the roof and facade for cost-effective cleaning, replacement and repair. Design the roof and facade to prevent water damage, ingress and detrimental ponding.	Drawings confirming where vehicular movement is within 1m of the external façade suitable protection measures have been implemented. Specification confirming internal durability measures implemented
Mat 06	Material efficiency	1	0	1.57		Opportunities will need to be identified and appropriate measures investigated and implemented to optimise the use of materials in building design, procurement, construction, maintenance and end of life. The above is carried out by the design team in consultation with the all relevant parties at each of the following RIBA stages: - Preparation and Brief - Concept Design - Developed Design - Technical Design - Construction	Analysis/report confirming that opportunities have been identified and implemented to optimise the use of materials in building design, procurement, construction, maintenance and end of life.
Wst 01	Construction waste management	1	1	0.80	Pre-Demolition Audit	A pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition will need to be carried out at Concept Design stage to guide the design through: - Considering materials for reuse and set targets for waste management - Engaging all contractors in the process of maximising high grade reuse and recycling opportunities - Compare actual waste arisings and waste management routes used with those forecast and investigate significant deviations from planned targets.	Pre-demo audit
Wst 01	Construction waste management	3	3	0.80	Construction Resource Efficiency	Non-hazardous construction waste (excluding demolition and excavation waste) generated by the buildings design and construction will need to meet or better 3.4m3 or 3.2 tonnes per 100m2 gross internal floor area.	Waste report confirming the construction waste generated
Wst 01	Construction waste management	1	1	0.80	Diversion of Resources from Landfill	70% by volume and 80% by weight of non-hazardous construction waste will need to be diverted from landfill.	Waste report confirming the percentage of waste diverted from landfill
Wst 02	Recycled aggregates	1	0	0.80		Credit not targeted.	

Wst 03	Operational waste Mandatory: 1 credit	1	1	0.80	Operational Waste	There is dedicated space(s) to cater for the segregation and storage of operational recyclable waste volumes generated by the assessed building/unit, its occupants and activities. The space must be: -Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams -Accessible to building occupants/facilities operators for the deposit of materials and collections by waste management contractors -Of a capacity appropriate to the building type, size and predicted volume of waste that will arise from daily/weekly operational activities and occupancy rates. A minimum of 2m2 per 1000m2 of net floor area.	Drawing confirming the bin store is sufficiently sized
Wst 04	Speculative floor and ceiling finishes	N/A	0	0.80	N/A	Credit not applicable.	
Wst 05	Adaption to climate change	N/A	0	0.80	N/A	Credit not applicable.	
Wst 06	Design for disassembly and adaptability	1	0	0.80	Design for Disassembly and Functional adaptability - recommendations	A building specific functional adaptation and disassembly strategy study will need to be undertaken by RIBA stage 2 which includes recommendations for measures to be incorporated to facilitate future adaptation, covering the following: - The potential for major refurbishment, including replacing a facade - Design aspects that facilitate the replacement of all major plant within the life of the building - The degree of adaptability of the internal environment to accommodate changes in working practices - The degree of adaptability of the internal physical space and external shell to accommodate change in use - The extent of accessibility to local services, such as local power and data infrastructure Functional adaptation measures would need to have been adopted in the design by RIBA stage 4 in accordance with the functional adaptation strategy recommendations, where practical and cost effective.	
Wst 06	Design for disassembly and adaptability	1	0	0.80	Design for Disassembly and Functional adaptability - implementation	Documentation would be required to confirm how the recommendations or solutions proposed as a result of the above study have been implemented, where practical and cost effective. A building adaptability and disassembly guide to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants would need to be produced.	
LE 01	Site selection	1	1	1.46	Previously occupied land	At least 75% of the proposed development's footprint is on an area of land which has previously been occupied.	Site plan and existing site survey
LE 01	Site selection	1	0	1.46	Contaminated land	Where the site has been deemed to be significantly contaminated as confirmed by a contaminated land specialist's site investigation, risk assessment and appraisal, which identifies: -The degree of contamination -The contaminant source/types -The options for remediating sources of pollution which present an unacceptable risk to the site.	
LE 02	Ecological value of site and protection of ecological features	1	1	1.46	Survey and Evaluation	A suitably qualified ecologist will need to carry out a survey and evaluation to determine the ecological baseline of the site, taking account of the zone of influence to establish: - Current and potential ecological value and condition of the site and related areas within the zone of influence. - Direct and indirect risks to current ecological value - Capacity and feasibility for enhancement of the ecological value of the site.	Ecology report

LE 02	Ecological value of site and protection of ecological features	1	1	1.46	Determining the ecological outcomes for the site	During concept design, the project team will need to identify and consider ecological outcomes for the site at an early stage to influence key project planning decisions, in accordance with the following hierarchy: - Avoidance - Protection - Reduction or limitation of negative impacts - On site compensation - Enhancement, considering the capacity and feasibility within the site.	Ecology report
LE 03	Minimising impact on existing site ecology	1	1	1.46	Planning, Liaison, Implementation and Data	Site preparation and construction works have been planned for and are implemented at an early project stage to optimise benefits and outputs.	Ecology report
LE 03	Minimising impact on existing site ecology	2	1	1.46	Managing Negative Impacts of the Project	Negative impacts from site preparation and construction works have been managed according to the hierarchy and no overall loss of ecological value has occurred.	Ecology report
LE 04	Change and enhancement of ecological value	1	1	1.46	Liaison, Implementation and Data Collation	Solutions and measures previously identified will need to be implemented that enhances the ecological value of the site.	Ecology report
LE 04	Enhancing site ecology	3	0	1.46	Enhancement of Ecology	No net loss in ecological value will need to be achieved as a result of the development.	Ecology report
LE 05	Long term impact on biodiversity	2	1	1.46		The Ecologist will need to confirm that all relevant UK and EU legislation relating to the protection and enhancement of ecology has been complied with during the design and construction process. A landscape and habitat management plan will need to be produced covering the first five years after project completion in accordance with BS 42020:2013 section 11.1. The Ecologist will need to highlight which of the BREEAM additional measures for the improvement of long term biodiversity are relevant and the application measures will need to be implemented.	Ecology report
Pol 01	Impact of refrigerants	N/A	0	0.85		Credits not applicable	
Pol 02	Local air pollution	N/A	0	0.85		Credits not applicable	
Pol 03	Surface water run-off	5	5	0.85	Surface Water Run-Off	Drainage measures will need to be specified to ensure that the peak rate of run-off and total volume of run-off from the site to the watercourses is no greater post than pre-development and should also comply with the 1 and 100 year return period events for peak rates and the 100 year 6 hour rainfall event for volume. The calculations will also need to include an allowance for climate change, in line with current best practice guidance. In addition flooding of the building must not occur as a result of local drainage system failure caused by either extreme rainfall or lack of maintenance. In addition there would need to be no discharge from site for the first 5mm of rainfall events.	Flood Risk Assessment Drainage report/calculations

Pol 04	Reduction of night time light pollution	1	0	0.85	Reduction of Night Time Light Pollution	All external lighting will need to be designed to reduce light pollution by complying with the following: - All external lighting has been designed in compliance with Table 2 of the ILP Guidance notes for the reduction of obtrusive light, 2011 - All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. - Where safety and security lighting is provided and will be used between 23:00 and 07:00, this element of the lighting system will need to comply with the lower levels of lighting recommended during these hours in Table 2 of the ILP's guidance notes.	Specification confirming the external lighting meets the criteria
Pol 05	Reduction of noise pollution	N/A	0	0.85		Credit not applicable	

12.3 APPENDIX C: BRUKL OUTPUT SHEETS (“BE LEAN”)

Project name

Shell and Core

Scout Hut

As designed

Date: Thu Apr 27 11:27:46 2023

Administrative information

Building Details

Address:

Certifier details

Name: Matt Fitzpatrick

Telephone number: 01923 274427

Address: 2 Dronken House 43A High Street, Kings
Langley, WD4 8FG

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.d.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.1.3

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 609.06The CO₂ emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	0.44
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	6.6
Target primary energy rate (TPER), kWh/m ² annum	0
Building primary energy rate (BPER), kWh/m ² annum	67.9
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	Ground Floor - Main Store_W_6
Floors	0.18	0.12	0.12	Ground Floor - Main Store_S_3
Pitched roofs	0.16	0.14	0.16	Ground Floor - Main Hall_R_17
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.3	1.3	Ground Floor - Main Hall_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.4	1.4	Ground Floor - Shop_D_8
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Panel Heater

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

1- Instant Hot Water

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
	ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
Ground Floor - Disabled WC		0.2	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - WC		0.2	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - WC 2		0.2	-	-	-	-	-	-	-	-	-	N/A
First Floor - WCs		0.2	-	-	-	-	-	-	-	-	-	N/A
First Floor - Kitchenette		0.2	-	-	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
Ground Floor - Main Store	NO
Ground Floor - Main Hall	NO
Ground Floor - Lobby	NO
Ground Floor - Small Hall	NO
Ground Floor - Store 1	NO
Ground Floor - Stair Core	NO
Ground Floor - Store	NO
Ground Floor - Disabled WC	NO
Ground Floor - Kitchen	NO
Ground Floor - Lift	NO

Shell and core configuration

Zone	Assumed shell?
Ground Floor - Shop	NO
Ground Floor - Office	NO
Ground Floor - WC	NO
Ground Floor - WC 2	NO
Ground Floor - Store 2	NO
First Floor - Store 2	NO
First Floor - Store 3	NO
First Floor - Seating Area	NO
First Floor - WCs	NO
First Floor - Lift Core	NO
First Floor - Lobby	NO
First Floor - Kitchenette	NO
First Floor - Store	NO
First Floor - Office	NO
First Floor - Stair Core	NO
First Floor - Meeting 2	NO
First Floor - Store 4	NO
First Floor - Meeting 1	NO

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
Ground Floor - Main Store	140	-	-
Ground Floor - Main Hall	140	-	-
Ground Floor - Lobby	140	-	-
Ground Floor - Small Hall	140	-	-
Ground Floor - Store 1	140	-	-
Ground Floor - Stair Core	140	-	-
Ground Floor - Store	140	-	-
Ground Floor - Disabled WC	140	-	-
Ground Floor - Kitchen	140	-	-
Ground Floor - Lift	140	-	-
Ground Floor - Shop	140	140	1.071
Ground Floor - Office	140	-	-
Ground Floor - WC	140	-	-
Ground Floor - WC 2	140	-	-
Ground Floor - Store 2	140	-	-
First Floor - Store 2	140	-	-
First Floor - Store 3	140	-	-
First Floor - Seating Area	140	-	-
First Floor - WCs	140	-	-
First Floor - Lift Core	140	-	-
First Floor - Lobby	140	-	-
First Floor - Kitchenette	140	-	-
First Floor - Store	140	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
First Floor - Office		140	-	-
First Floor - Stair Core		140	-	-
First Floor - Meeting 2		140	-	-
First Floor - Store 4		140	-	-
First Floor - Meeting 1		140	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground Floor - Main Hall	NO (-29.1%)	NO
Ground Floor - Small Hall	YES (+30.6%)	NO
Ground Floor - Shop	NO (-62.1%)	NO
First Floor - Office	NO (-58.8%)	NO
First Floor - Meeting 2	NO (-55.4%)	NO
First Floor - Meeting 1	NO (-62.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	609.1	609.1
External area [m ²]	1123.2	1123.2
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	3
Average conductance [W/K]	252.43	330.87
Average U-value [W/m ² K]	0.22	0.29
Alpha value* [%]	9.28	19.37

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
9	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
91	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	34.11	22.48
Cooling	0	0
Auxiliary	0.09	0.18
Lighting	7.17	7.64
Hot water	2.09	2.09
Equipment*	12.11	12.11
TOTAL **	43.46	32.38

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	33.37
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>33.37</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	150.4	156.58
Primary energy [kWh/m ²]	67.9	-0.03
Total emissions [kg/m ²]	6.6	0.44

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Natural Gas									
Actual	98.2	52.2	34.1	0	0.1	0.8	0	1	0
Notional	108.4	48.2	22.5	0	0.2	1.34	0	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type

12.4 APPENDIX C: BRUKL OUTPUT SHEETS (“BE GREEN”)

Project name

Shell and Core

Scout Hut

As designed

Date: Thu Apr 27 11:26:38 2023

Administrative information

Building Details

Address:

Certifier details

Name: Matt Fitzpatrick

Telephone number: 01923 274427

Address: 2 Dronken House 43A High Street, Kings
Langley, WD4 8FG

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.d.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v7.1.3

BRUKL compliance module version: v6.1.d.0

Foundation area [m²]: 609.06The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	0.44
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	0.38
Target primary energy rate (TPER), kWh/m ² annum	0
Building primary energy rate (BPER), kWh/m ² annum	-3.27
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	Ground Floor - Main Store_W_6
Floors	0.18	0.12	0.12	Ground Floor - Main Store_S_3
Pitched roofs	0.16	0.14	0.16	Ground Floor - Main Hall_R_17
Flat roofs	0.18	-	-	No heat loss flat roofs
Windows** and roof windows	1.6	1.3	1.3	Ground Floor - Main Hall_G_6
Rooflights***	2.2	-	-	No external rooflights
Personnel doors^	1.6	1.4	1.4	Ground Floor - Shop_D_8
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

U_{a-Limit} = Limiting area-weighted average U-values [W/(m²K)]U_{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]U_{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Panel Heater

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

1- Instant Hot Water

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	-
Standard value	1	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1			
Ground Floor - Disabled WC	0.2	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - WC	0.2	-	-	-	-	-	-	-	-	-	-	N/A
Ground Floor - WC 2	0.2	-	-	-	-	-	-	-	-	-	-	N/A
First Floor - WCs	0.2	-	-	-	-	-	-	-	-	-	-	N/A
First Floor - Kitchenette	0.2	-	-	-	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
Ground Floor - Main Store	NO
Ground Floor - Main Hall	NO
Ground Floor - Lobby	NO
Ground Floor - Small Hall	NO
Ground Floor - Store 1	NO
Ground Floor - Stair Core	NO
Ground Floor - Store	NO
Ground Floor - Disabled WC	NO
Ground Floor - Kitchen	NO
Ground Floor - Lift	NO

Shell and core configuration

Zone	Assumed shell?
Ground Floor - Shop	NO
Ground Floor - Office	NO
Ground Floor - WC	NO
Ground Floor - WC 2	NO
Ground Floor - Store 2	NO
First Floor - Store 2	NO
First Floor - Store 3	NO
First Floor - Seating Area	NO
First Floor - WCs	NO
First Floor - Lift Core	NO
First Floor - Lobby	NO
First Floor - Kitchenette	NO
First Floor - Store	NO
First Floor - Office	NO
First Floor - Stair Core	NO
First Floor - Meeting 2	NO
First Floor - Store 4	NO
First Floor - Meeting 1	NO

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
Ground Floor - Main Store		140	-	-
Ground Floor - Main Hall		140	-	-
Ground Floor - Lobby		140	-	-
Ground Floor - Small Hall		140	-	-
Ground Floor - Store 1		140	-	-
Ground Floor - Stair Core		140	-	-
Ground Floor - Store		140	-	-
Ground Floor - Disabled WC		140	-	-
Ground Floor - Kitchen		140	-	-
Ground Floor - Lift		140	-	-
Ground Floor - Shop		140	140	1.071
Ground Floor - Office		140	-	-
Ground Floor - WC		140	-	-
Ground Floor - WC 2		140	-	-
Ground Floor - Store 2		140	-	-
First Floor - Store 2		140	-	-
First Floor - Store 3		140	-	-
First Floor - Seating Area		140	-	-
First Floor - WCs		140	-	-
First Floor - Lift Core		140	-	-
First Floor - Lobby		140	-	-
First Floor - Kitchenette		140	-	-
First Floor - Store		140	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
First Floor - Office		140	-	-
First Floor - Stair Core		140	-	-
First Floor - Meeting 2		140	-	-
First Floor - Store 4		140	-	-
First Floor - Meeting 1		140	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Ground Floor - Main Hall	NO (-29.1%)	NO
Ground Floor - Small Hall	YES (+30.6%)	NO
Ground Floor - Shop	NO (-62.1%)	NO
First Floor - Office	NO (-58.8%)	NO
First Floor - Meeting 2	NO (-55.4%)	NO
First Floor - Meeting 1	NO (-62.4%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	609.1	609.1
External area [m ²]	1123.2	1123.2
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	3
Average conductance [W/K]	252.43	330.87
Average U-value [W/m ² K]	0.22	0.29
Alpha value* [%]	9.28	19.37

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area Building Type

9 Retail/Financial and Professional Services

Restaurants and Cafes/Drinking Establishments/Takeaways
 Offices and Workshop Businesses
 General Industrial and Special Industrial Groups
 Storage or Distribution
 Hotels
 Residential Institutions: Hospitals and Care Homes
 Residential Institutions: Residential Schools
 Residential Institutions: Universities and Colleges
 Secure Residential Institutions
 Residential Spaces

91 Non-residential Institutions: Community/Day Centre

Non-residential Institutions: Libraries, Museums, and Galleries
 Non-residential Institutions: Education
 Non-residential Institutions: Primary Health Care Building
 Non-residential Institutions: Crown and County Courts
 General Assembly and Leisure, Night Clubs, and Theatres
 Others: Passenger Terminals
 Others: Emergency Services
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	34.11	22.48
Cooling	0	0
Auxiliary	0.09	0.18
Lighting	7.17	7.64
Hot water	2.09	2.09
Equipment*	12.11	12.11
TOTAL **	43.46	32.38

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	48.33	33.37
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>48.33</i>	<i>33.37</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	150.4	156.58
Primary energy [kWh/m ²]	-3.27	-0.03
Total emissions [kg/m ²]	0.38	0.44

HVAC Systems Performance									
System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Natural Gas									
Actual	98.2	52.2	34.1	0	0.1	0.8	0	1	0
Notional	108.4	48.2	22.5	0	0.2	1.34	0	----	----

Key to terms

- Heat dem [MJ/m2] = Heating energy demand
- Cool dem [MJ/m2] = Cooling energy demand
- Heat con [kWh/m2] = Heating energy consumption
- Cool con [kWh/m2] = Cooling energy consumption
- Aux con [kWh/m2] = Auxiliary energy consumption
- Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
- Cool SSEER = Cooling system seasonal energy efficiency ratio
- Heat gen SSEFF = Heating generator seasonal efficiency
- Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
- ST = System type
- HS = Heat source
- HFT = Heating fuel type
- CFT = Cooling fuel type