ENERGY AND SUSTAINABILITY STRATEGY

FOR:
Shinfield Park, Reading

A PROJECT FOR:
Wrenbridge (FRELD Reading) LLP

AUTHOR:
C Parrott

STATUS:
P4 - Planning Issue

01908 320 099 | WWW.MBA-CONSULTANTS.CO.UK | ENQUIRIES@MBA-CONSULTANTS.CO.UK

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24-114 Wrenbridge - Shinfield Park, Reading Unit 1-5	
Prepared By:	**Checked By:**
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EXECUTIVE SUMMARY

1. MBA Consulting Engineers Ltd. has been commissioned by Wrenbridge (FRELD Reading) LLP to produce an energy and sustainability strategy report in support of the Full Planning Application for the proposed development known as Shinfield Park, Shinfield Road, Reading, RG2 9FW.

2. The planning application proposes:
"Redevelopment of site for flexible employment use (Use Class E(g)(ii)- (iii)/B2/B8) together with associated servicing areas, parking, landscaping and other associated works."

3. The energy strategy report outlines the key measures to be incorporated within the design in regard to sustainability, carbon emissions, renewable energy and the environmental impact of the development, in accordance with the relevant national regulations, regional and local policy.

4. To comply with policy requirements, the following targets have been established for the development:

   - Achieve EPC A
   - Achieve a minimum BREEAM rating of "Excellent"
   - Secure at least 10% of the expected energy demand from renewable or low carbon sources.
   - Minimum 10% reduction in carbon emissions over part L baseline through the use of renewable energy sources.

5. The principal objectives are to reduce the site contribution to the causes of climate change by reducing the developments energy demand and by providing a portion of the demand through clean, renewable sources. The recommendations within this report are based on the proposed Stage 2 Design, however it is understood that the design may continue to evolve as the project progresses.

6. It is demonstrated within the results produced by the energy modelling that the proposed development complies with all the relevant policies addressed within this document and can achieve carbon and energy reductions through the inclusion of energy efficient measures and Low and Zero Carbon (LZC) technologies.

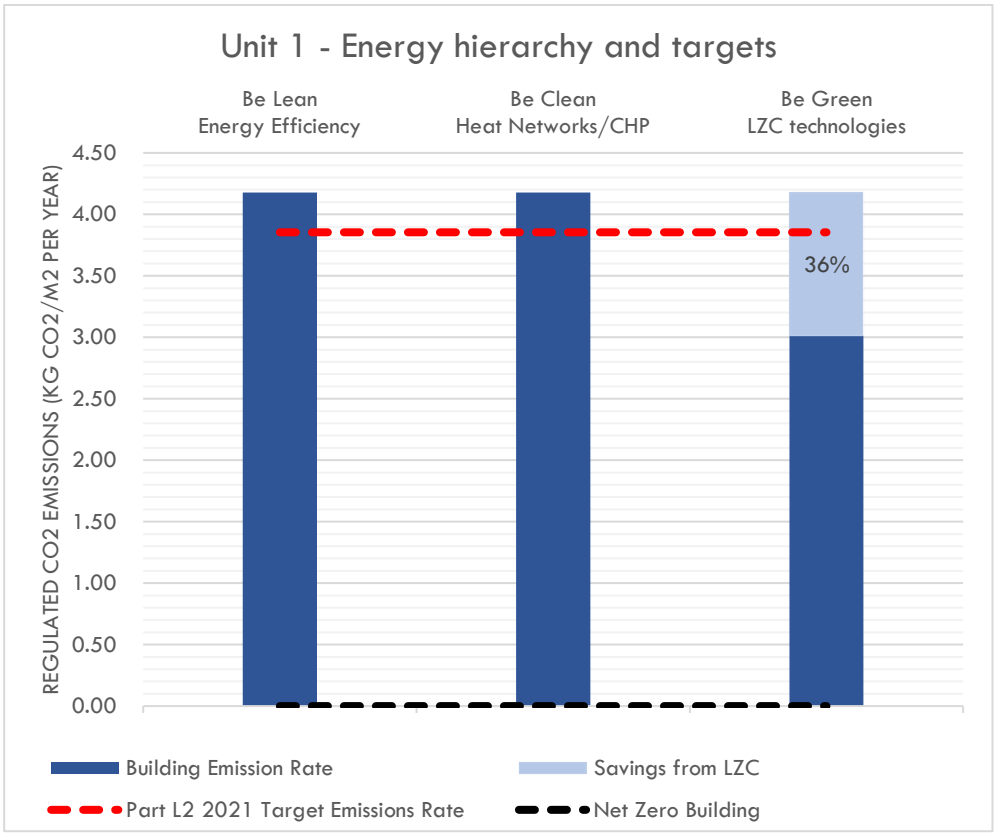

Figure 1 – Energy Hierarchy and targets – Unit 1

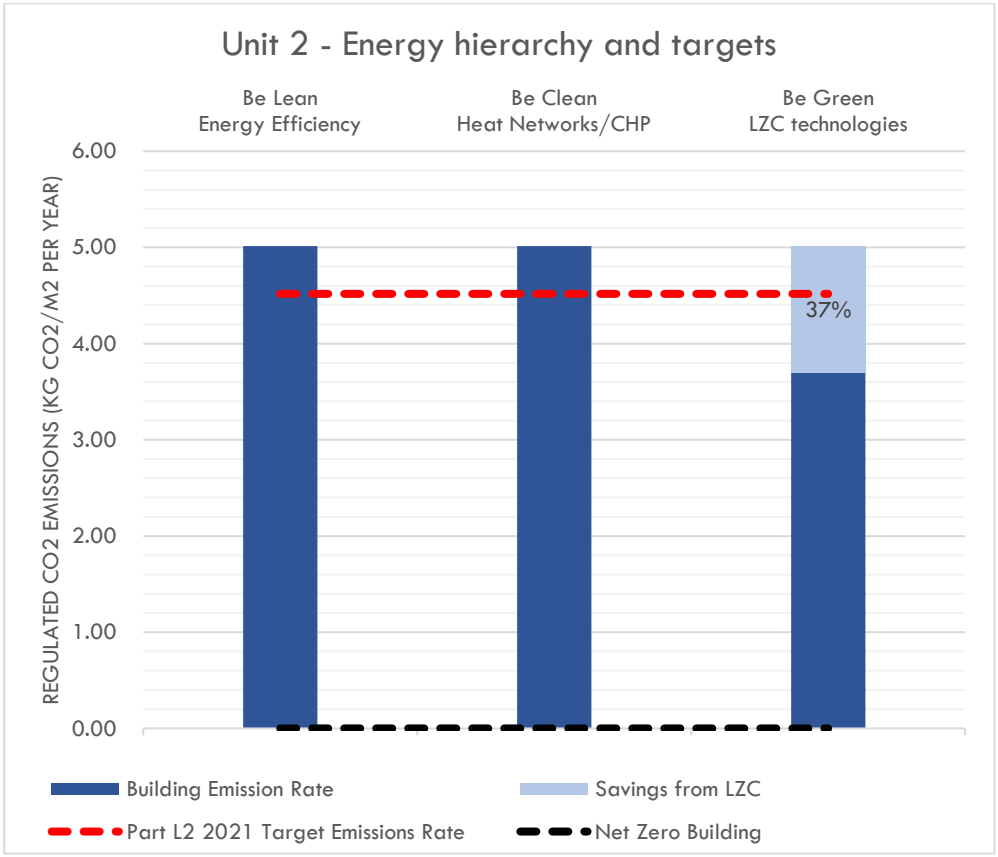

Figure 2 – Energy Hierarchy and targets – Unit 2

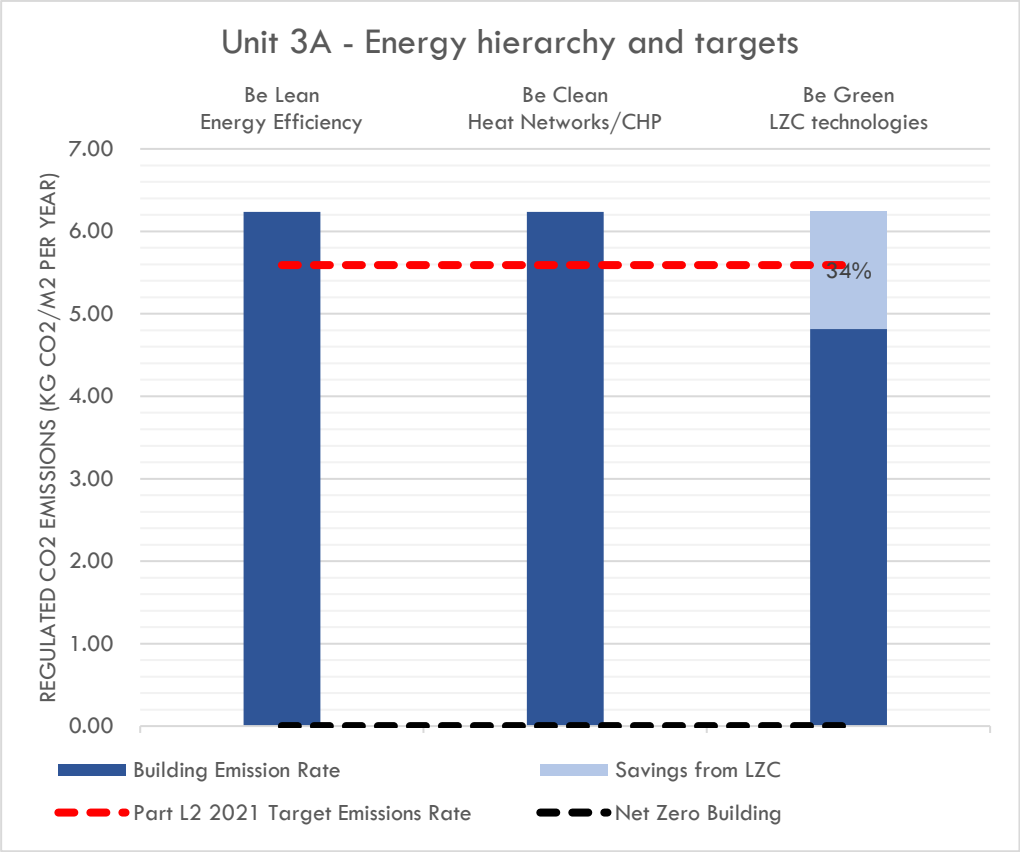

Figure 3 – Energy Hierarchy and targets – Unit 3A

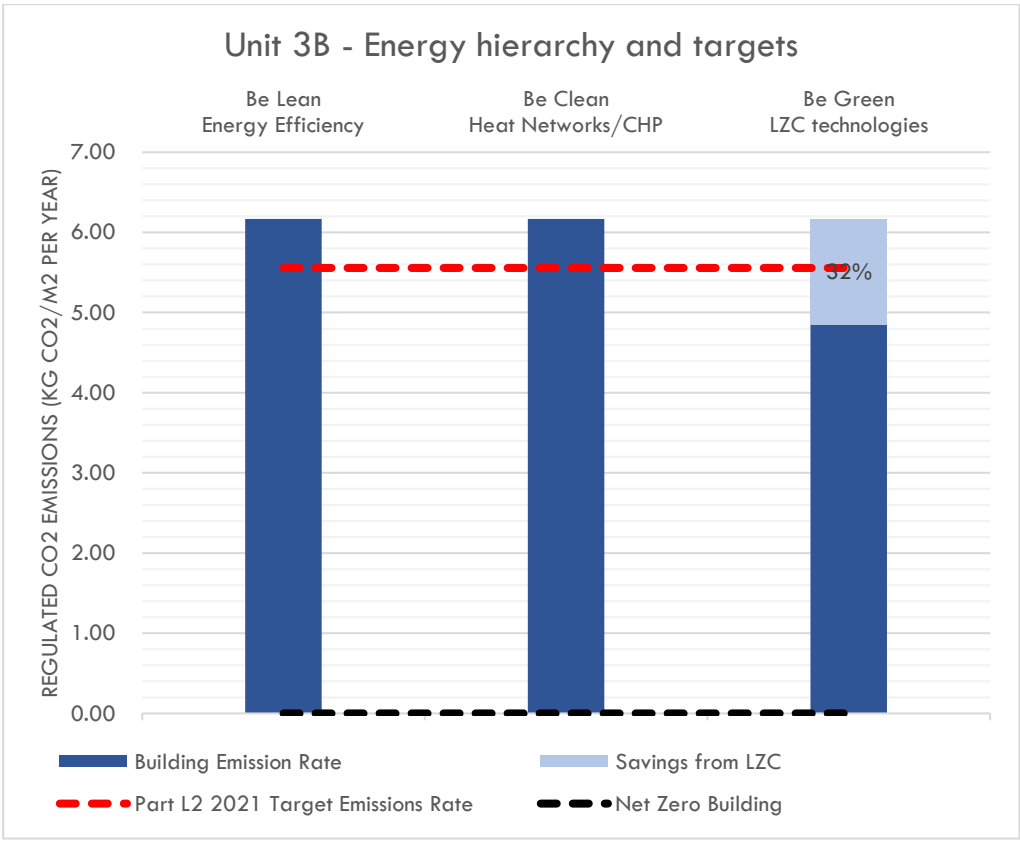

Figure 4 – Energy Hierarchy and targets – Unit 3B

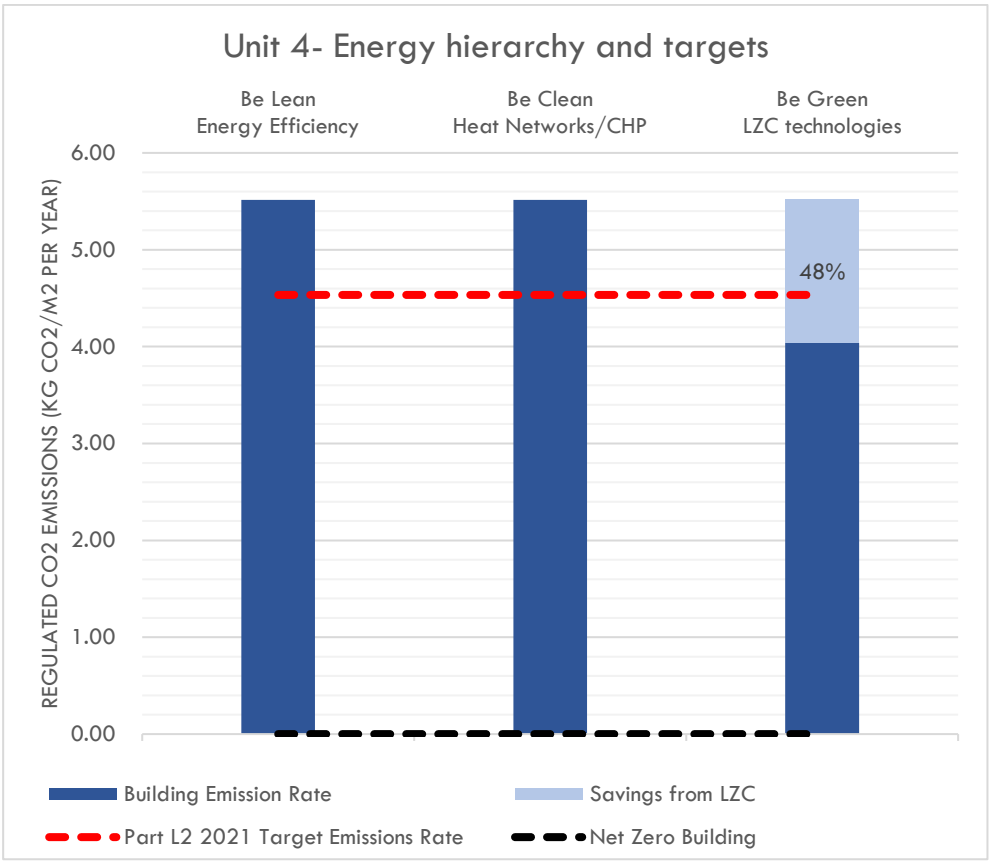

Figure 5 – Energy Hierarchy and targets – Unit 4

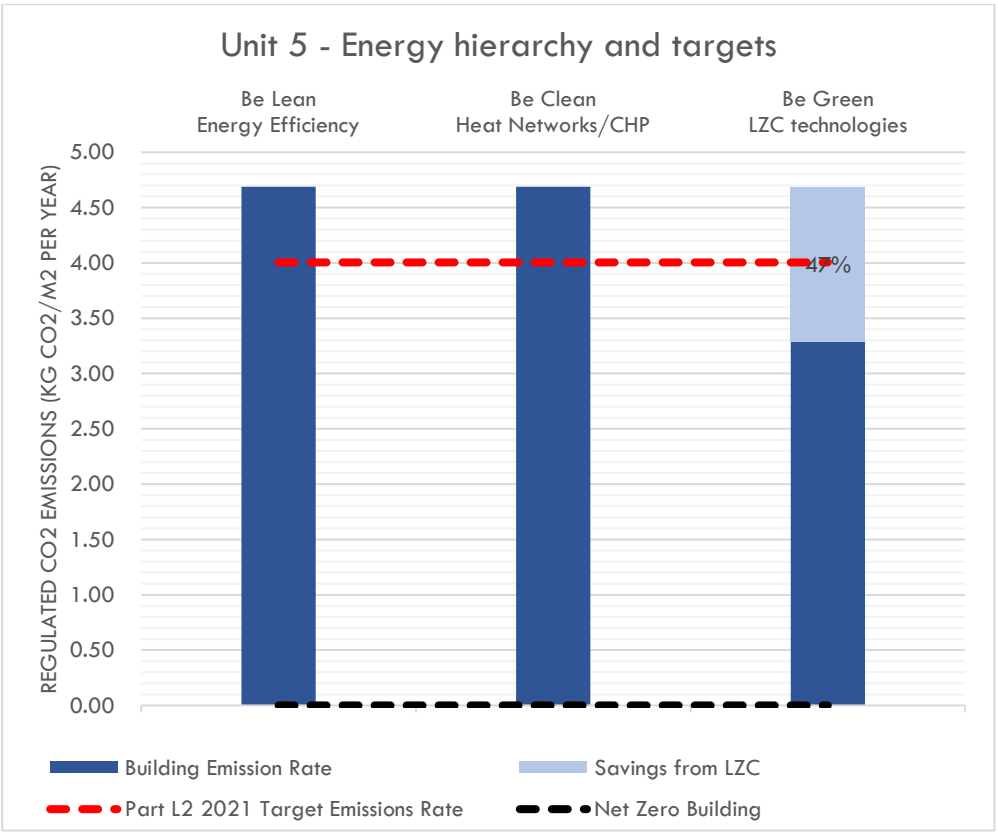

Figure 6 – Energy Hierarchy and targets – Unit 5

7. The results in Figure 1-6 reflect the savings for each stage of the energy hierarchy. It can be seen that the Low Zero Carbon Technologies (ASHP, PVs) contribute to approx. 32-48% reduction in CO_2 emissions.

8. Table 1 below shows the improvement in CO_2 savings for the proposed development compared to Part L2 target rates. The development achieves a total of 11-22% reduction in regulated CO_2 emissions through building fabric enhancements, inclusion of energy efficient measures, introduction of ASHP and or renewable technologies within the design.

UNIT	ENERGY HIERARCHY STAGE	PART L2 (2021) - TARGET EMISSION RATE (TER) $KGCO_2/M^2$	PART L2 (2021) - BUILDING EMISSION RATE (BER) $KGCO_2/M^2$	% IMPROVEMENT VS. PART L2 (2021) TER
Unit 1	Be Lean	3.85	4.18	-8%
	Be Clean	3.85	4.18	-8%
	Be Green	3.85	3.01	22%
Unit 2	Be Lean	4.52	5.01	-11%
	Be Clean	4.52	5.01	-11%
	Be Green	4.52	3.70	18%
Unit 3A	Be Lean	5.59	6.24	-12%
	Be Clean	5.59	6.24	-12%
	Be Green	5.59	4.81	14%
Unit 3B	Be Lean	5.56	6.17	-11%
	Be Clean	5.56	6.17	-11%
	Be Green	5.56	4.85	13%
Unit 4	Be Lean	4.53	5.52	-22%
	Be Clean	4.53	5.52	-22%
	Be Green	4.53	4.04	11%
Unit 5	Be Lean	4.00	4.69	-17%
	Be Clean	4.00	4.69	-17%
	Be Green	4.00	3.29	18%

Table 1 – CO_2 emission rates - Building Regulations Part L2 (England incorporating 2023 amendments)

9. The development achieves the minimum 4no. credits required for a BREEAM (New Construction V6.1) Excellent rating under the Ene 01 credit issue. Please refer to Appendix E for BREEAM calculation results.

10. A BREEAM pre-assessment has been carried out for the development in line with policy requirements. The scheme is targeting an 'Excellent' rating.

11. Table 2 below shows the expected energy demand for each unit and the proportion of this that will be met by the proposed PV arrays outlined in this Energy Strategy. The expected energy demand has been calculated

from the part L BRUKL results and includes both regulated and unregulated energy usage. Each unit has more than 10% of the expected energy demand met via renewable energy.

UNIT	EXPECTED ENERGY DEMAND (KWH/YR)	TARGET PV GENERATION (KWH/YR)	PERCENTAGE MET BY RENEWABLES
Unit 1	662,802	73,663	11.1%
Unit 2	317,582	38,177	12.0%
Unit 3A	111,204	12,382	11.1%
Unit 3B	110,983	11,557	10.4%
Unit 4	224,446	29,330	13.1%
Unit 5	287,615	37,654	13.1%

Table 2 – Proportion of expected energy demand met by renewables

12. Table 3 below shows the improvement in CO_2 savings for the proposed development compared to Part L2 target rates. The CO_2 savings from the PV system has been calculated from the part L BRUKL results and includes both regulated and unregulated energy usage. Each unit demonstrates an overall greater than 10% reduction in regulated CO_2 emissions. The decentralised renewable energy sources contribute 22-33% reductions in CO_2 emissions compared to the building regulations CO_2 target emission rate.

UNIT	TER $KGCO_2/M^2$	BER $KGCO_2/M^2$	$\%CO_2$	PV EMISSIONS REDUCTION $KGCO_2/M^2$	PV $\%CO_2$ REDUCTION OVER TER
Unit 1	3.85	3.01	21.8%	-1.14	-29.7%
Unit 2	4.52	3.70	18.1%	-1.29	-28.5%
Unit 3A	5.59	4.81	13.9%	-1.32	-23.6%
Unit 3B	5.56	4.85	12.8%	-1.23	-22.1%
Unit 4	4.53	4.04	10.9%	-1.47	-32.5%
Unit 5	4.00	3.29	17.8%	-1.36	-33.9%

Table 3 - Proportion of CO2 Emissions savings met by renewables

CONTENTS

1.0 INTRODUCTION

1. MBA Consulting Engineers Ltd. has been commissioned by Wrenbridge (FRELD Reading) LLP to produce an energy and sustainability strategy report in support of the Full Planning Application for the proposed development known as Shinfield Park, Shinfield Road, Reading, RG2 9FW.

2. The proposal development is described as:

"Redevelopment of site for flexible employment use (Use Class E(g)(ii)- (iii)/B2/B8) together with associated servicing areas, parking, landscaping and other associated works."

Figure 7 – Site Layout Plan – 5704-CA-ZZ-00-DR-A-01051 - PROPOSED SITE LAYOUT MASTERPLAN_VE-T13

3. The proposed development energy strategy has been developed in accordance with the following complimentary local Borough planning policies:

- Wokingham Borough Local Development Framework Adopted Core Strategy Development Plan Document, January 2010:
  - Policy CP1: Sustainable Development
- Wokingham Borough Managing Development Delivery Document (Local Plan), Adopted February 2014:
  - Policy CC04: Sustainable Design and Construction
  - Policy CC05: Renewable energy and decentralised energy networks
- Sustainable Design and Construction SPD (May 2010) and Companion Document (May 2010)

4. The principal objectives are to reduce the site contribution to the causes of climate change by reducing the energy demand and by providing a portion of the demand through clean, renewable sources. The

recommendations within this report are based on the proposed Stage 2 Design, however it is understood that the design may continue to evolve as the project progresses.

5. All units within the development will achieve an EPC rating of A. The EPC rating at this stage is indicative and subject to the parameters outlined within this report. Any changes as the design progresses and at fit-out could impact the potential EPC rating.

2.0 PLANNING POLICY AND LEGISLATION

1. For a major development, it is key to adopt the Energy Hierarchy (Be Lean, Be Clean, Be Green) and to meet Building Regulation Part L2.

2. Details of the national, regional and local planning policies that are relevant to this development in terms of energy and sustainability are detailed below.

2.1 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

1. The National Planning Policy Framework (NPPF), updated on December 2024 (updated February 2025),, sets out government's planning policies for England and how these should be applied.

2. The NPPF supports the transition to a low carbon future in a changing climate, accounting for flood risk, coastal change. It helps shape places in ways that contribute to radical reductions in greenhouse gas emissions, encourages the reuse of existing resources, including conversion of existing buildings, and supports the use of renewable resources and low carbon energy and associated infrastructure.

3. Paragraph 164 states that new development should be planned for in ways that:

   - 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 incorporating green infrastructure and sustainable drainage systems; and
   - 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.

4. Paragraph 166 states that in determining planning applications, local planning authorities should expect new development to:

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

5. Paragraph 168 states that when determining planning applications for renewable and low carbon development, local planning authorities should:

   - Not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the

proposal's contribution to a net zero future;
- Recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;
- in the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.

2.2 BUILDING REGULATION PART L2 (2021 EDITION INCORPORATING 2023 AMENDMENTS)

1. Whilst is not a planning policy, the Building Regulations set out the requirements for energy and carbon performance. Periodic updates to these national regulations will drive the energy efficiency and carbon reduction improvements.

2. To comply with UK building regulations, all buildings on the site must show compliance at design stage with the following criteria from Approved Document L, Conservation of fuel and power, Volume 2: Buildings other than dwellings (2021):

   - The Building Primary Energy Rate (BPER) must not exceed the Target Primary Energy Rate (TPER), i.e. BPER ≤ TPER.
   - The Building Emission Rate (BER) must not exceed the Target Emission Rate (TER), i.e. BER ≤ TER.
   - Building fabric, airtightness and HVAC systems have a minimum specified performance
   - Limits to Solar Gain: any zone in the actual building that is an occupied space is subject to further analysis to mitigate the risk of overheating
   - Lighting has a minimum specified average luminaire efficacy
   - Where a building is erected, it must be a nearly zero-energy building

3. Building Regulations Part L does not require that high-efficiency alternative systems or other low or zero carbon systems are installed. Regulation 25A is met in a new building by analysing the feasibility of installing high-efficiency alternative systems.

4. Reasonable provision shall be made for the conservation of fuel and power in buildings by:

   - Limiting heat gains and losses through thermal elements and other parts of the building fabric; and from pipes, ducts and vessels used for space heating, space cooling and hot water services.
   - Providing fixed building services which are energy efficient to a reasonable standard; have effective controls; and are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances.

5. For each space in the building that is occupied or mechanically cooled, the solar gains through the glazing should be no greater than would occur through the relevant reference glazing systems with a defined total solar energy transmittance (g-value) calculated according to BS EN 410. In this context, an occupied space means a space that is intended to be occupied by the same person for a substantial part of the day. This excludes circulation spaces and other areas of transient occupancy, such as toilets.

2.3 ENERGY PERFORMANCE CERTIFICATES (EPCS)

1. EPCs are an asset rating and a measure of building quality: the higher the rating the worse the building is, and the greater the opportunity to reduce carbon emissions and improve the building itself. However, the asset rating provides no information about how the building is operated in practice. An asset rating models the theoretical, as-designed energy efficiency of a particular building, based on the performance potential of the

building itself (the fabric) and its services (such as heating, ventilation and lighting). The building quality (provided by the asset rating) has a large impact on the total emissions but does not explain all emissions. Other factors such as unregulated loads (e.g. IT, plug-in appliances) or building user behaviour also create emissions, which are reflected in the operational energy usage. The asset rating is intended to inform people on first occupancy, i.e. at the point of construction, sale or rent, in order to help purchasers or occupiers in selecting the right building. EPCs are for compliance and as a result have "standard driving conditions", such as occupancy patterns and densities; set points etc., to allow them to be compared.

2. The EPC will be completed after the implementation of the Minimum Energy Efficiency Standards (MEESs). Under the Minimum Energy Efficiency Standards (MEES) in the UK, the minimum required Energy Performance Certificate (EPC) rating for a non-residential building is E. If a building has an EPC rating of F or G, it will not meet the MEES and will need improvements to bring it up to the required standard.

3. The UK government's proposal for non-residential buildings is to achieve a minimum EPC rating of B by 2030. This is part of the government's long-term strategy to improve the energy efficiency of buildings and reduce carbon emissions, aligning with broader environmental and sustainability goals.

4. The proposed developments achieve an EPC rating of A. The EPC rating at this stage is indicative and subject to the parameters outlined within this report. Any changes as the design progresses and at fit-out could impact the potential EPC rating.

5. As the developments include shell Warehouse areas, the EPCs included in this energy strategy are representative of the worst-case lighting in these areas as per the EPC conventions. These areas include for 95 lm/W lighting, no lighting controls and the minimum NCM illuminance level as per guidance received from CIBSE.

6. The EPCs included in the report indicate what could be achieved at base build, once the shell areas have been fitted out, the updated EPC would include for what is installed in the shell areas.

2.4 WOKINGHAM BOROUGH LOCAL DEVELOPMENT FRAMEWORK ADOPTED CORE STRATEGY DEVELOPMENT PLAN DOCUMENT

1. The Wokingham Borough Local Development Framework Adopted Core Strategy Development Plan Document, Adopted January 2010 forms the basis for planning policy on this project. The relevant policies that cover and address energy requirements, and those that touch on the wider sustainability objectives are provided below.

2. Policy CP1: Sustainable Development

- Planning permission will be granted for development proposals that contribute towards the goals of reaching zero-carbon developments as soon as possible by:
  - Including appropriate on-site renewable energy features; and
  - Minimising energy and water consumption by measures including the use of appropriate layout and orientation, building form, design and construction, and design to take account of microclimate so as to minimise carbon dioxide emissions through giving careful consideration to how all aspects of development form.

2.5 WOKINGHAM BOROUGH MANAGING DEVELOPMENT DELIVERY DOCUMENT (LOCAL PLAN)

1. The Wokingham Borough Managing Development Delivery Document (Local Plan), Adopted February 2014 also forms part of the adopted Development Plan, the relevant policies that cover and address energy requirements, and those that touch on the wider sustainability objectives are provided below.

2. Policy CC04: Sustainable Design and Construction

   - Planning permission will only be granted for proposals that seek to deliver high quality sustainably designed and constructed developments by: All new non-residential proposals of more than 100 sq m gross non-residential floorspace shall at least:
     - Achieve the necessary mandatory Building Research Establishment Assessment Method (BREEAM) requirements or any future national equivalent

3. Policy CC05: Renewable energy and decentralised energy networks

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

2.6 SUSTAINABLE DESIGN AND CONSTRUCTION SPD

1. The Sustainable Design and Construction Supplementary Planning Document, Adopted May 2010 and Companion Document, Adopted May 2010, are also a material consideration in the determination of planning applications. The relevant guidance that cover and address energy requirements, and those that touch on the wider sustainability objectives are provided below.

2. Sustainability Issue 1: Adhering to national codes on construction standards

   - All non-residential development (including new and/or replacement of new non-residential floorspace) must meet the necessary mandatory BREEAM Level requirements at the time of their construction.
   - Renewable energy/ low carbon technology can be used as part of reaching BREEAM standards.

3. Sustainability Issue 3: On-site decentralised/ renewable/ low carbon Energy Generation

   - All developments 1,000m^2 or more gross non-residential floorspace (major developments) will be expected to secure at least 10% of their expected energy demand from decentralised, renewable or low carbon sources.

3.0 ENERGY STRATEGY SCOPE

1. In accordance with best practice, the energy strategy has been developed through the application of an energy hierarchy approach. In doing so, the energy strategy demonstrates how the proposed development can meet the planning requirements and Building Regulations Part L2 (2021 Edition incorporating 2023 amendments).

2. To comply with policy requirements, the following targets have been established for the development:

   - Achieve EPC A

- Achieve a minimum BREEAM rating of "Excellent"
- Secure at least 10% of the expected energy demand from renewable or low carbon sources.
- Minimum 10% reduction in carbon emissions over part L baseline through the use of renewable energy sources.

3. The energy hierarchy describes a set of principles to guide design development and decisions regarding energy, balanced with the need to optimise environmental and economic benefits. The energy hierarchy for England is:

   - Be lean: use less energy.
   - Be clean: supply energy efficiently.
   - Be green: use renewable energy.
   - Off set.

   These guiding principles can be summarised as follows:

   - Using less energy, in particular by adopting sustainable design and construction measures; and
   - Utilise low and zero carbon energy.

4. Key features affecting sustainability that will be applied to the development include:

   - High thermal performance building fabric: low U-values and air permeability to ensure heating and cooling demand and resulting energy costs are controlled for end users
   - The use of air source heat pumps to generate thermal energy efficiently
   - Use of both natural and mechanical ventilation to provide the most efficient means of providing fresh air suitably for the conditions
   - An array of photovoltaic panels on the roof, to generate clean electricity for the development and help to reduce its carbon footprint

3.1 METHODOLOGY

1. A dynamic simulation model using TAS version 9.5.7 has been produced to predict the proposed development's energy demand usage. To calculate the regulated energy use associated with the proposed development, the National Calculation Methodology (NCM) internal condition templates are assigned to each distinct internal space to account for the NCM defined energy factors that are unique to each type of space.

2. The annual unregulated emissions for the development are estimated to be approximately 48-51kWh/m^2 as per the Part L 'equipment load' provided in the BRUKL report. The estimated unregulated energy is calculated in the 2021 Part L assessment, but is not factored within the final BRUKL results which is standard protocol as the calculations are reliant on standard Part L assumptions which are located in NCMs SBEM Technical Manual v6.1.2.

3. To assist at this stage, it is possible to extract the information from the BRUKLs in the appendices of the Energy Strategy (Appendix B) and provide the unregulated consumption from the Part L assessment, however it should be noted that this may not reflect the final fitted-out building.

4. The Energy Strategy has been developed based on the building form and orientation as detailed on Chetwoods Architects plans and elevation drawings. A list of drawings used to build the energy model are listed in Appendix D.

5. Figures 8-12 below show images of the proposed development from the dynamic simulation model:

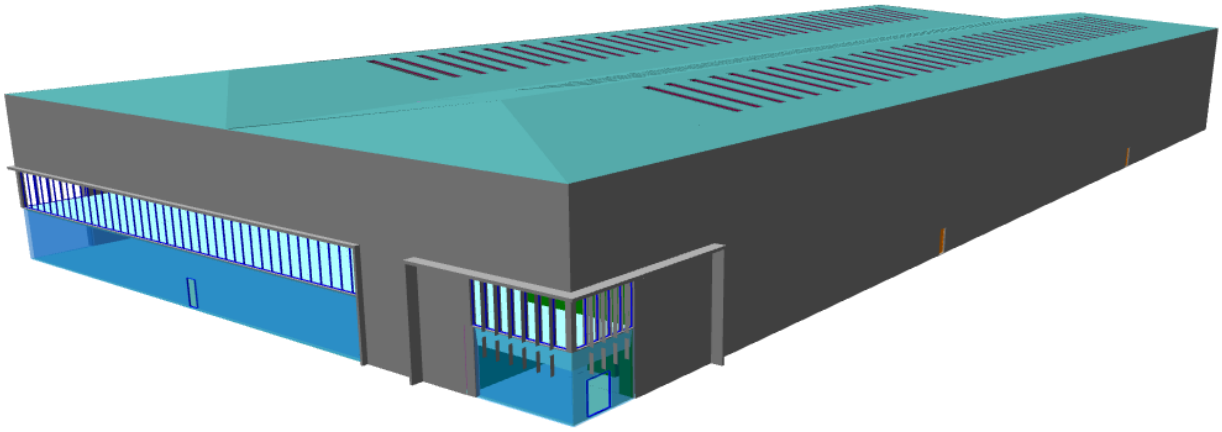

Figure 8 – TAS model of site – Unit 1

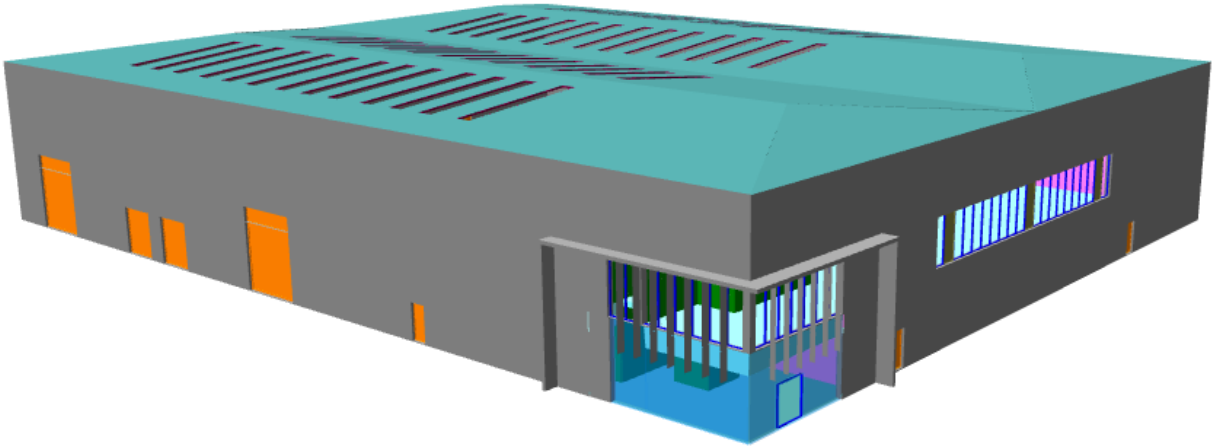

Figure 9 – TAS model of site – Unit 2

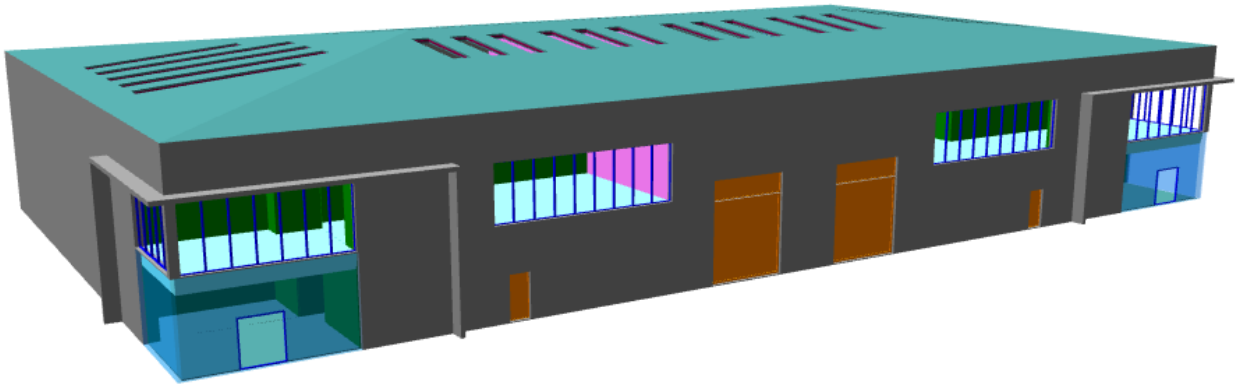

Figure 10 – TAS model of site – Units 3A & 3B

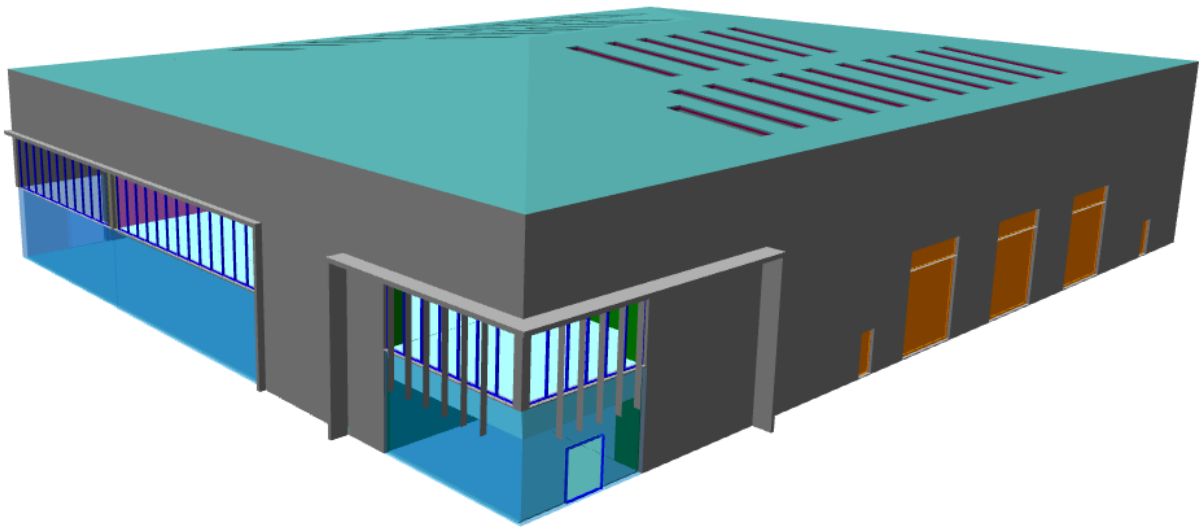

Figure 11 – TAS model of site – Unit 4

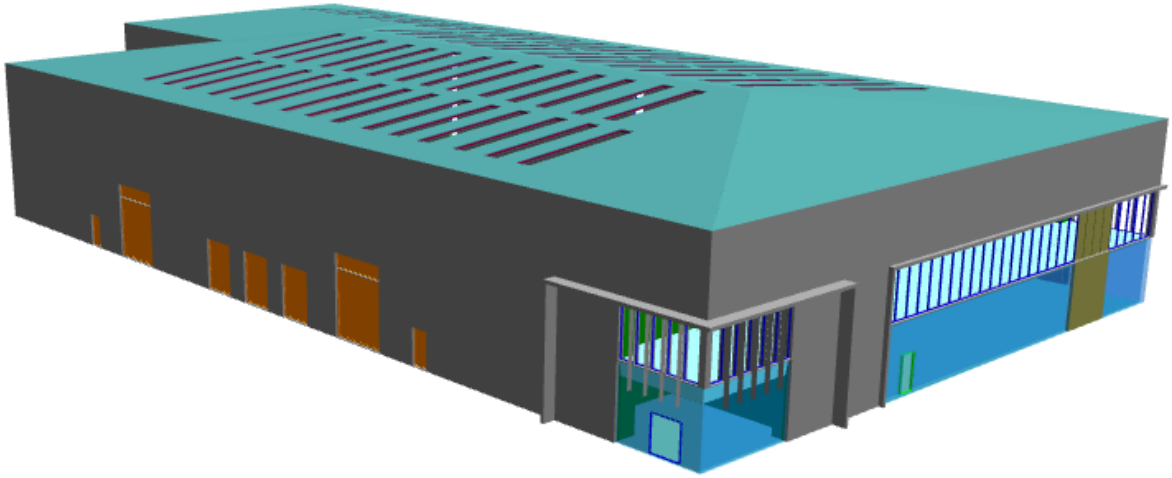

Figure 12 – TAS model of site – Unit 5

6. The calculations in this document are indicative of system size and carbon emissions based on guidance documents, approved software and practical experience. They are not design calculations but establish the viability and feasibility of various technologies for the proposed development suited to Class E(g)(iii), B2 / B8 building use types.

7. Each stage of the energy hierarchy has been addressed in the proceeding sections of this report. The associated energy strategy calculation/output is included in the following Appendices for reference:

   - Appendix B - Part L2 (2021 England Edition) BRUKL reports for each relevant stage of the energy hierarchy.
   - Appendix C – Part L2 (2021 England Edition) draft EPC report.

8. All total development CO_2 emissions reported are based on the outputs from the BRUKL report. Total development figures are then calculated on an area weighted average basis.

9. The areas given in the results tables within this document are as per the DSM model and as reported in the BRUKL reports appended as opposed to the Development GIA quoted elsewhere. The DSM model has been constructed in compliance with the National Calculation Methodology, and therefore includes minor geometric simplifications that may result in a slight variance in floor area.

4.0 DEMAND REDUCTION (BE LEAN)

1. In accordance with the energy hierarchy a range of energy efficiency measures are implemented at Be Lean Stage, which encompasses the adoption of a fabric first approach (passive design measures) and energy efficient building servicing (active design measures).

2. The proposed development has been designed to reduce CO_2 emissions at Be Lean Stage, as far as practicable, through utilising passive and active design measures within the design. The energy efficient measures incorporated in the energy strategy are detailed below.

4.1 PASSIVE MEASURES

1. In order to achieve a building that complies with Building regulations Part L2 (2021 England edition incorporating 2023 amendments) and improve upon the baseline Target Emission Rate (TER), the following passive design measures are incorporated into the design:

- Efficient building envelope with enhanced U-values beyond the Part L2 (2021 England incorporating 2023 amendments)
- Enhanced air permeability to reduce heating demand in the winter months, and reduce heat losses through infiltration further
- Consideration for the extent of glazed area, balanced between factors such as thermal efficiency, overheating and daylighting.
- Glazed façades throughout to provide natural daylighting and reduce reliance on artificial lighting.
- Solar control glazing
- Balanced g-value for translucent elements to ensure optimised internal conditions in the winter and summer months.
- Solar shading has been incorporated via bris-soleil to highly glazed sough facing facades.

2. The current Building Regulations Part L2 (2021edition incorporating 2023 amendments) for England specify that all non-domestic developments must have U-Values limited to the levels included within table below. The proposed development will have enhanced building envelope, wherever possible, as shown in Table 4 below.

ELEMENT	LIMITING U-VALUE AS PER PART L2 2021 (W/M^2.K)	PROPOSED U-VALUE FOR THE DEVELOPMENT (W/M^2.K)	NOTES
Walls (external)	0.26	0.26	With metal cladding, to match part L limiting values
Insulated white wall between office core and shell warehouse	0.26	0.26	To match part L limiting values

ELEMENT	LIMITING U-VALUE AS PER PART L2 2021 (W/M².K)	PROPOSED U-VALUE FOR THE DEVELOPMENT (W/M².K)	NOTES
Ground floors	0.18	0.18	To match part L limiting values
Insulated floor/ceiling between office core and shell warehouse	0.18	0.18	To match part L limiting values
Roof (flat)	0.18	N/A	N/A
Roofs (pitched)	0.16	0.16	With metal cladding, to match part L limiting values
Windows	1.6	1.6 g-value 0.30 LTV 0.60	To match part L limiting values
Roof-lights	2.2	1.3 g-value 0.35 LTV 0.46	To match part L limiting values
Personnel Doors	1.6	1.6	To match part L limiting values
Vehicle access & similar large doors	1.3	1.3	To match part L limiting values
High usage entrance doors	3.0	N/A	N/A

Table 4 – Proposed U-Value and limits as per Building Regulations Part L2 (2021 edition incorporating 2023 amendments)

3. Due to the high percentage of glazing in the Reception/Entrance Areas, it is assumed that the glazing will have solar control to ward off excess sunlight, glare and heat from the sun. (U value 1.3, g value of 0.30, LTV 60)

4. The above figures are based on maximising the passive measures (U-values) at the Be Lean stage, wherever possible. Based on the final use of the development (warehouse) the U-values cannot be lowered further as lower U-values will result in higher construction thickness which are difficult to construct. This will in turn have major embodied carbon implications which Wrenbridge (FRELD Reading) LLP is committed to reduce.

4.2 AIR PERMEABILITY

1. The proposed development will have an improved air permeability to a maximum of 2.5 $m^3/(h.m^2)$ @50Pa, which is an improvement upon the standard Part L2 (2021, England edition incorporating 2023 amendments) value of 8 $m^3/(h.m^2)$ @50Pa.

4.3 ACTIVE DESIGN MEASURES (ENERGY EFFICIENT SERVICES)

1. To ensure that planning targets and Building Regulations are met and exceeded, the proposed development will be designed and constructed to operate with a very high level of energy efficiency, and consequently a low level of carbon emissions. The design and installation of the mechanical and electrical services will make a significant contribution towards this.

2. Approved Document Part F (Ventilation, 2021, English edition) has introduced a minimum fresh air rate per m^2, and the requirement to ventilate common parts such as corridors and lobbies in commercial buildings.

3. The following active design measures are incorporated into the design:

- Dedicated high efficiency Mechanical Ventilation Heat Recovery (MVHR) systems to serve office areas.
- High efficiency LED lighting to reduce electrical consumption and heat gains from lighting.
- Passive Infra-Red (PIR) presence detection and daylight dimming control for lighting within the office core and warehouse space.
- Energy sub-metering to BREEAM standards to enable monitoring of energy usage.

4. A summary of the active design measures proposed within the design are listed within Table 5 below:

FIXED BUILDING SERVICES	ZONE	DESCRIPTION/PERFORMANCE
Space heating and Comfort Cooling	Office/reception areas	ASHP with reverse cycle to provide heating and cooling. SCOP 3.50; SEER 5.00
	Toilets/circulation/ locker/shower areas	Electric panel heaters. Efficiency 1
	Warehouse	Modelled as unconditioned area.
Ventilation	Office/locker areas	MVHR with plate heat exchanger. SFP 1.4W/l/s; Heat recovery Efficiency: 75% (Plate heat exchanger)
	Toilets	Remote Extract system SFP 0.5W/l/s
	Warehouse /circulation/reception areas	Natural Ventilation
Domestic Hot Water	All Areas	Instantaneous electric water heaters. Efficiency 1
Lighting	Office areas	Lighting will comprise of LED with average illuminance of 100lm/W; Design Lighting Level 500lux office areas; 200lux for reception area; Presence detection Auto On/Auto Off; Daylight control Photocell Control Dimming;
	Toilets	Lighting will comprise of LED with average illuminance of 95lm/W; Design Lighting Level as NCM; Presence detection Auto On/Auto Off; Daylight control None;
	Warehouse	Lighting will comprise of LED with average illuminance of 120lm/W; Design Lighting Level 200lux; Presence detection Auto On/Auto Off; Daylight control On/Off;
Others	throughout	Power factor correction <0.9 Automatic Monitoring and targeting with alarms for out-of-range values has been included on the HVAC usage but not the lighting usage. No demand control on the ventilation system. No constant illuminance control

Table 5 – Summary of active design measures

5. It is highlighted that the warehouse will be offered to the market as a shell. There are reasonable expectations for the warehouse to be unheated and to have a high energy efficient lighting system with photoelectric controls to take advantage of the daylight entering the space via rooflights and/or the side windows. Therefore, the calculation of the energy demand and carbon emissions includes for the associated usage.

6. The CO_2 emissions and primary energy rates improvements at Be Lean stage are reflected in Table 6 below:

UNIT	TER KGCO$_2$/M^2	BER KGCO$_2$/M^2	%CO$_2$	TPER KWH/M^2	BPER KWH/M^2	%PER
Unit 1	3.85	4.18	-8%	41.77	45.24	-8%
Unit 2	4.52	5.01	-11%	48.95	54.32	-11%
Unit 3A	5.59	6.24	-12%	60.58	67.32	-11%
Unit 3B	5.56	6.17	-11%	60.2	66.63	-11%
Unit 4	4.53	5.52	-22%	48.84	59.71	-22%
Unit 5	4.00	4.69	-17%	43.26	50.59	-17%

Table 6 – CO2 emission and primary energy rates – Be Lean Stage

5.0 COOLING HIERARCHY AND OVERHEATING RISK

1. Dynamic overheating modelling using CIBSE guidance (TM52 in this case) is required as part of the submission of the energy strategy and should account for the limits that Approved Document Part O (2021, English edition) places on the choices available when undertaking a CIBSE assessment. Part O applies to new residential buildings only and so is not applicable in this case.

   The following interactions with Part L will be considered:

   - Solar gains in winter can reduce the amount of space heating required to be delivered by the heating system. Reducing summer overheating by limiting glazing areas will impact winter solar gains and therefore increase the need for space heating.
   - Poorly insulated pipework, particularly in community heating schemes, can be a major contributor to overheating. Control of heat losses from pipework is dealt with under Part L of the Building Regulations and the guidance in Approved Document L should be followed.

2. Approved Document Part F (Ventilation, 2021, English edition) has introduced a minimum fresh air rate per m^2, and the requirement to ventilate common parts such as corridors and lobbies in commercial buildings.

3. To reduce the risk of overheating the following measures have been considered as part of the design.

   - For mechanically ventilated areas (primarily main office accommodation), ensure that the ventilation system allows for a bypass function to mitigate the impact of excess heat recirculation in warmer periods.
   - Due to the high percentage of glazing in the Reception/Entrance Areas, it is assumed that the glazing will have solar control to ward off excess sunlight, glare and heat from the sun.
   - Solar shading has been incorporated via bris-soleil to the highly glazed south facing facades.
   - Within warehouse areas, a combination of roof lights and wall lights will be utilised to achieve a balance

between limiting overheating potential and maximising the benefit of natural daylighting.

6.0 HEATING INFRASTRUCTURE (BE CLEAN)

1. The next stage of the energy hierarchy, the Be Clean stage, requires consideration of the most appropriate approach for building energy systems to supply energy efficiently and reduce CO_2 emissions.

2. Given that the warehouse (representing approx. 90% of the GIA) is unheated, there is only heating demand for the offices. Therefore, the proposed development is deemed unsuitable as a site for connection to community or site-wide energy networks.

3. The Offices will be provided with both heating and cooling and therefore a dedicated VRF heat recovery system capable of providing heating and cooling is proposed to serve these areas. The heating demand will therefore be met by air source heat pumps.

4. The domestic hot water is to be from local instantaneous electric water point, this will avoid the need for hot water storage with associated storage losses.

7. The CO_2 emissions and primary energy rates improvements at Be Clean stage are reflected in Table 7 below. Since there is no proposed connection to district heating for this site, the results have not changed from Be Lean Stage.

UNIT	TER $KGCO_2/M^2$	BER $KGCO_2/M^2$	$\%CO_2$	TPER KWH/M^2	BPER KWH/M^2	%PER
Unit 1	3.85	4.18	-8%	41.77	45.24	-8%
Unit 2	4.52	5.01	-11%	48.95	54.32	-11%
Unit 3A	5.59	6.24	-12%	60.58	67.32	-11%
Unit 3B	5.56	6.17	-11%	60.2	66.63	-11%
Unit 4	4.53	5.52	-22%	48.84	59.71	-22%
Unit 5	4.00	4.69	-17%	43.26	50.59	-17%

Table 7 – CO2 emission and primary energy rates – Be Clean Stage

7.0 RENEWABLE ENERGY (BE GREEN)

1. This Stage of the energy hierarchy relates to the generation of on-site low carbon renewable energy to further reduce carbon emissions.

2. A reduction in carbon emissions through the use of on-site renewable energy may be achieved through several technologies to generate heat or power. In determining the most suitable technology consideration has been given to:

- Carbon reduction effectiveness.
- Cost feasibility.
- Practicality.

- Planning restrictions.
- Site related constraints and
- User desirability.

3. A feasibility assessment of the Low and Zero Carbon (LZC) technologies has been conducted to determine the suitability and feasibility for use within the development. This can be found in Appendix A of this report.

4. The assessment provided gives an indication of the technologies that would be feasible for the site. The assessment includes consideration for wind turbines, solar thermal collectors, biomass heating and ground source heat pumps.

5. The most suitable technologies for the site were found to be photovoltaic panels and air source heat pumps. These technologies are described below.

7.1 PHOTOVOLTAIC (PV) ARRAY

7.1.1 Technology Description

1. Solar Photovoltaics (PVs) are solar panels, which generate electricity through photon-to-electron energy transfer, which takes place in the dielectric materials that make up the cells. The cells are made up from layers of semi-conducting silicon material which, when illuminated by the sun, produces an electrical field which generates an electrical current.

2. PVs can generate electricity even on overcast days, requiring daylight, rather than direct sunlight. This makes them viable even in the UK, although peak output is obtained at midday on a sunny summer's day. PVs offer a simple, proven solution to generating renewable electricity.

3. The main types of commercially available PV panels on offer in the UK are constructed from crystalline cells as described below.

    - Crystalline silicon cells are the most efficient of the PV technologies with a conversion efficiency of between 18-20% (available solar energy to electricity produced). They are cut from single ingots of silicon, have an unbroken crystal lattice and are the most expensive of PV systems.
    - Thin film cells have a conversion efficiency of between 5-10%. These are less efficient than silicone derived cells. Thin films can be mounted on folded or curved surfaces and are used extensively in Building Integrated PV products.

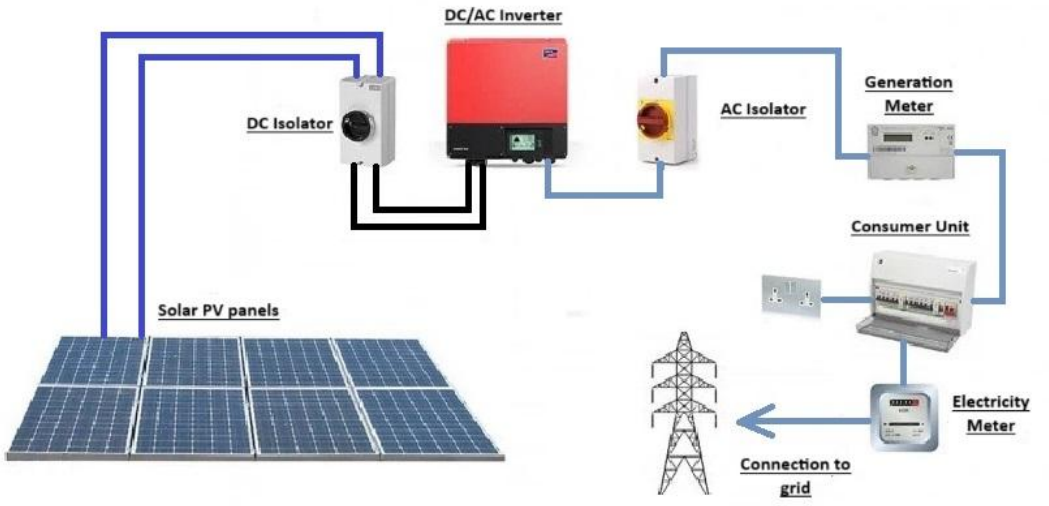

Figure 13 – Photovoltaic Panels – Typical Diagram

7.1.2 Feasibility for Site

1. The proposed development has unshaded roof areas which are suitable for mounting solar PV panels. Photovoltaic arrays are proposed for the development for generation of partial power of the buildings. This would be to typically offset the energy used in the operation of equipment and lighting.

2. There are no foreseen land use issues attributed to the system, and it is anticipated that there will be no local planning issues which will impact the feasibility of the implementation of this technology. There is also no noise impact associated with this technology.

3. A solar PV system is proposed to meet a proportion of the energy requirements of the development. It is not anticipated that there will be a restriction on PV system generation or export back to the grid.

4. The estimated minimum annual output of the PV arrays proposed for the development, subject to detailed design, are presented within Table 8 below, in terms of estimated kWp output, area and the specific required target annual generation output in kWh in order to meet the targets for the site. The final PV arrays required to meet the generation targets are dependent upon a number of factors, including types of panels selected, panel efficiency and orientation. The estimated system capacity and area are shown for guidance only.

5. The final specification of PV arrays would therefore be confirmed at a detailed design stage and verified by subsequent BRUKL calculations.

6. A life-cycle cost exercise has been carried out based upon the results from the initial energy modelling. The associated estimated costs and payback periods for this LZC technology are outlined in Table 8 below.

UNIT	MIN EST'D TOTAL PV AREA (M^2)	EST'D PV OUTPUT (KWP)	TARGET PV GENERATION (KWH/YR)	CO_2 SAVING (T/YR)	CAPITAL COST EST'D. (£)	MAINTENANCE (£/YR)	ANNUAL SAVING (£)	SIMPLE PAYBACK (YRS)
Unit 1	425	78.8	73,663	10.22	64,996	630	21,068	3.2
Unit 2	225	40.8	38,177	5.30	33,685	327	10,919	3.2
Unit 3A	75	13.2	12,382	1.72	10,926	106	3,541	3.2
Unit 3B	70	12.4	11,557	1.60	10,197	99	3,305	3.2
Unit 4	170	31.4	29,330	4.07	25,880	251	8,388	3.2
Unit 5	215	40.3	37,654	5.23	33,224	322	10,769	3.2

Table 8 – PV energy generation and life cycle cost

7. In terms of Grants, there a currently none available to support the deployment of solar PV, and the Feed-In Tariff scheme for solar PV closed in April 2019. Depending on the final design of the scheme, the development may benefit from the 'Smart Export Guarantee'. This would need to be coordinated as the design progresses.

8. In terms of glint and glare, any potential issues are anticipated to be limited, since Solar PV panels are designed to absorb, not reflect, irradiation. At the detailed design PV panels, frames and supports with suitable anti-reflective finishes can be specified to reduce any impacts.

7.2 AIR SOURCE HEAT PUMPS

7.2.1 Technology Description

1. Air Source Heat Pumps (ASHP) work on the same principle as Ground Source Heat Pumps (GSHP). The difference is the medium in which the heat is extracted is the external air rather than the ground. An ASHP can be used for both heating and cooling and can also be used to provide simultaneous heating and cooling to different rooms as required.

2. A typical light industrial building would have a layout that would support the use of air-to-air heat pumps instead of a more typical boiler plant and an air conditioning system. The calculation below demonstrates that an electric ASHP system becomes more efficient than a 90% gas boiler system when the Co-efficient Of Performance (COP) is above 0.595.

$$\frac{CO2\ Emissions\ from\ Electricity\ x\ Boiler\ Efficiency}{CO2\ Emissions\ from\ Gas\ per\ unit} = \text{Break Even COP}$$

$$\frac{0.1388kgCO2\ x\ 0.9\%}{0.21kgCO2} = 0.595$$

3. Air Source Heat Pumps (ASHPs) are considered an alternative to Ground Source Heat Pumps despite the latter having a COP of around 4 as GSHPs have a significantly high installation cost making them unattractive for this development.

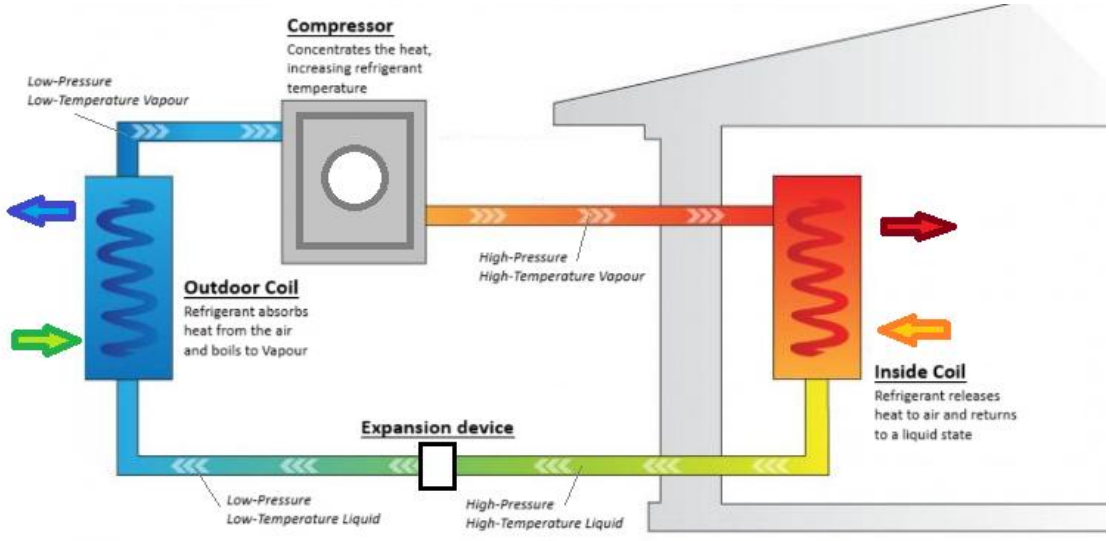

Figure 14 – Air Source Heat Pump – Typical Diagram

7.2.2 Feasibility for Site

1. Air Source Heat Pumps are proposed to provide heating and cooling to the office areas of the proposed units.
2. The system will be sized suitably to meet the demand for the site therefore exporting of energy would not be appropriate.
3. An ASHP system with a reasonable COP has a medium-term time payback period.
4. ASHP can be installed either at the roof or ground level depending on the design for the site. In this case, the ASHPs would be installed within dedicated internal plant space for Unit 1 and dedicated external plant space adjacent to the unit it serves for units 2-5.
5. To mitigate any potential noise impact, mitigation measures can be taken to reduce the noise levels associated with an external ASHP system such as suitable enclosures if required. Systems are typically circa 85dB at 1.0m.
6. As the system will be designed to include for cooling, it is considered that this would not be suitable for the RHI or grants available for LZC technologies.
7. Table 9 below shows the predicted annual energy generation for heating from the proposed ASHP and the anticipated CO_2 savings when compared to a direct electric heating system for the equivalent amount of energy generation.
8. A typical payback for this indicative system tends to be greater than 25 years when compared to a gas boiler system for heating only. As the design progresses and a specific system is identified costs can be accurately calculated.

UNIT	HEATING DEMAND MET BY ASHP (KWH/YR)	RENEWABLE ENERGY (KWH/YR)	CO_2 SAVING (KG/YR)	ESTIMATED CAPITAL COST EST'D. (£)	ESTIMATED ANNUAL SAVING (£)	ESTIMATED PAYBACK (YRS)
Unit 1	11,572	8,266	1147.30	73,412	2,364	>25
Unit 2	7,316	5,226	725.38	44,051	1,495	>25
Unit 3A	8,877	6,341	880.13	16,795	1,814	10
Unit 3B	7,944	5,675	787.62	16,781	1,623	11
Unit 4	616	440	61.07	31,159	126	>25
Unit 5	9,748	6,963	966.47	37,149	1,991	19

Table 9 – Predicted ASHP Energy Generation, Carbon savings and costs

9. The renewable proportion of energy from the ASHP considered as renewable has been calculated using the equation outlined in ANNEX VII of Directive 2009/28/EC.

10. The estimated capital cost has been based on the sized unit from assumptions from published guidance at this stage, and it's meant as an approximate cost to calculate payback years and shouldn't be used as a predicted cost for fitting out the building.

11. Annual and peak heating loads from the Part L assessment may not be accurate for the actual running of the building.

12. The CO_2 emissions and primary energy rates improvements at Be Green stage are reflected in Table 10 below:

UNIT	TER $KGCO_2/M^2$	BER $KGCO_2/M^2$	$\%CO_2$	TPER KWH/M^2	BPER KWH/M^2	%PER
Unit 1	4.27	3.59	16%	46.19	38.13	17%
Unit 2	5.96	5.24	12%	64.61	55.87	14%
Unit 3A	6.71	6.06	10%	72.49	64.29	11%
Unit 3B	6.42	5.81	10%	69.4	61.7	11%
Unit 4	6.91	6.4	7%	74.83	68.3	9%
Unit 5	6.01	5.38	10%	65.04	57.28	12%

Table 10 – CO_2 emission and primary energy rates – Be Green Stage

8.0 CONCLUSION

1. The energy strategy outlines the key measures to be incorporated within the design in regard to sustainability, carbon emissions, renewable energy and the environmental impact of the development, in accordance with the relevant national regulations, regional and local policy.

2. To comply with policy requirements, the following targets have been established for the development:

- Achieve EPC A
- Achieve a minimum BREEAM rating of "Excellent"
- Secure at least 10% of the expected energy demand from renewable or low carbon sources.
- Minimum 10% reduction in carbon emissions over part L baseline through the use of renewable energy sources.

3. It is demonstrated within the results produced by the draft energy modelling that the proposed development complies with all the relevant policies addressed within this document and can achieve carbon and energy reductions through the inclusion of energy efficient measures and Low and Zero Carbon (LZC) technologies.

4. It is demonstrated within the results produced by the draft energy modelling that the proposed development complies with all the relevant policies addressed within this document and can achieve carbon and energy reductions through the inclusion of energy efficient measures and Low and Zero Carbon (LZC) technologies.

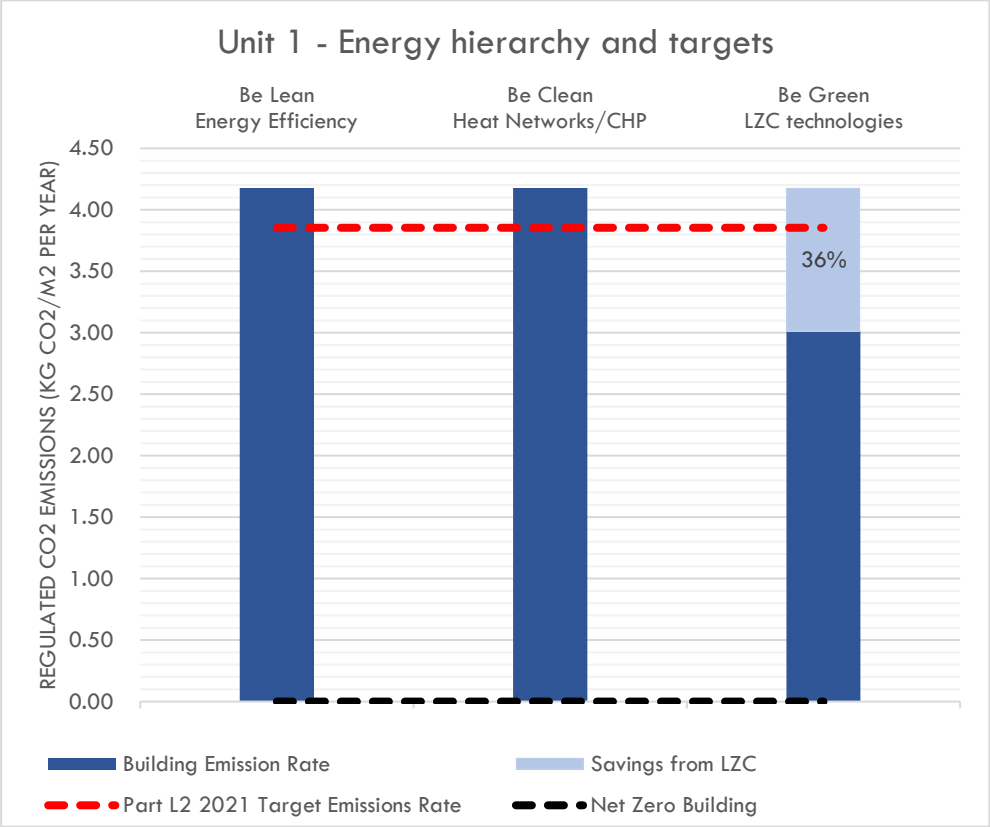

Figure 15 – Energy Hierarchy and targets – Unit 1

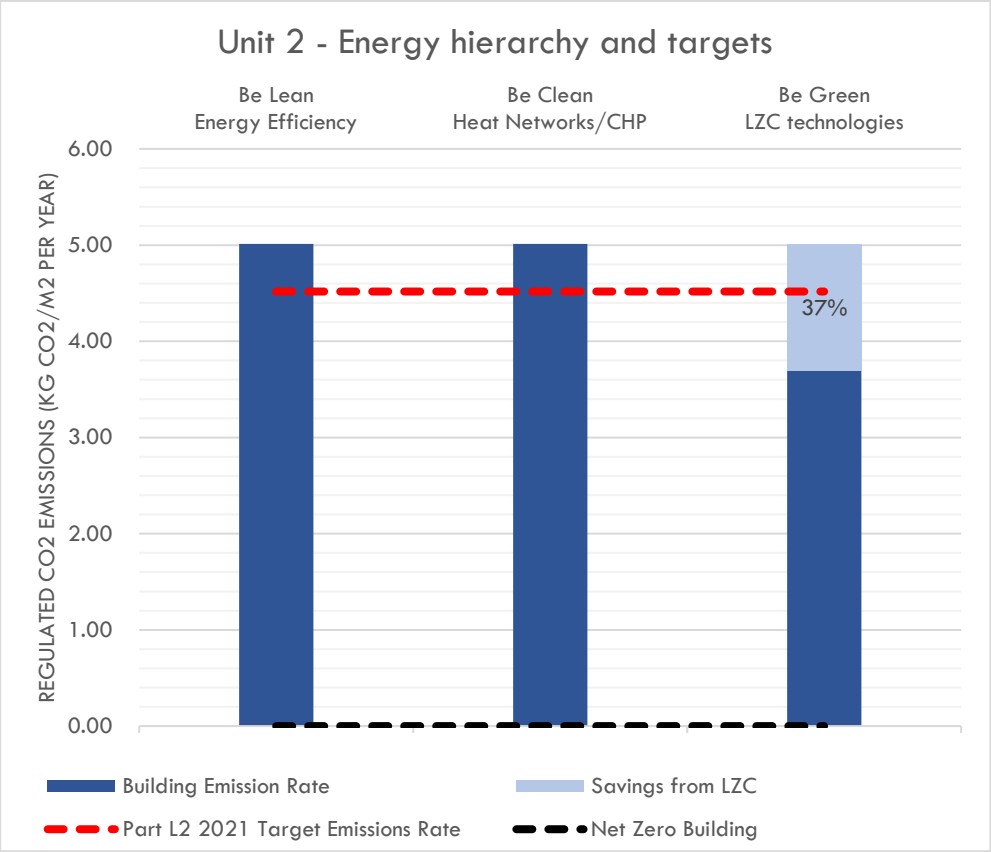

Figure 16 – Energy Hierarchy and targets – Unit 2

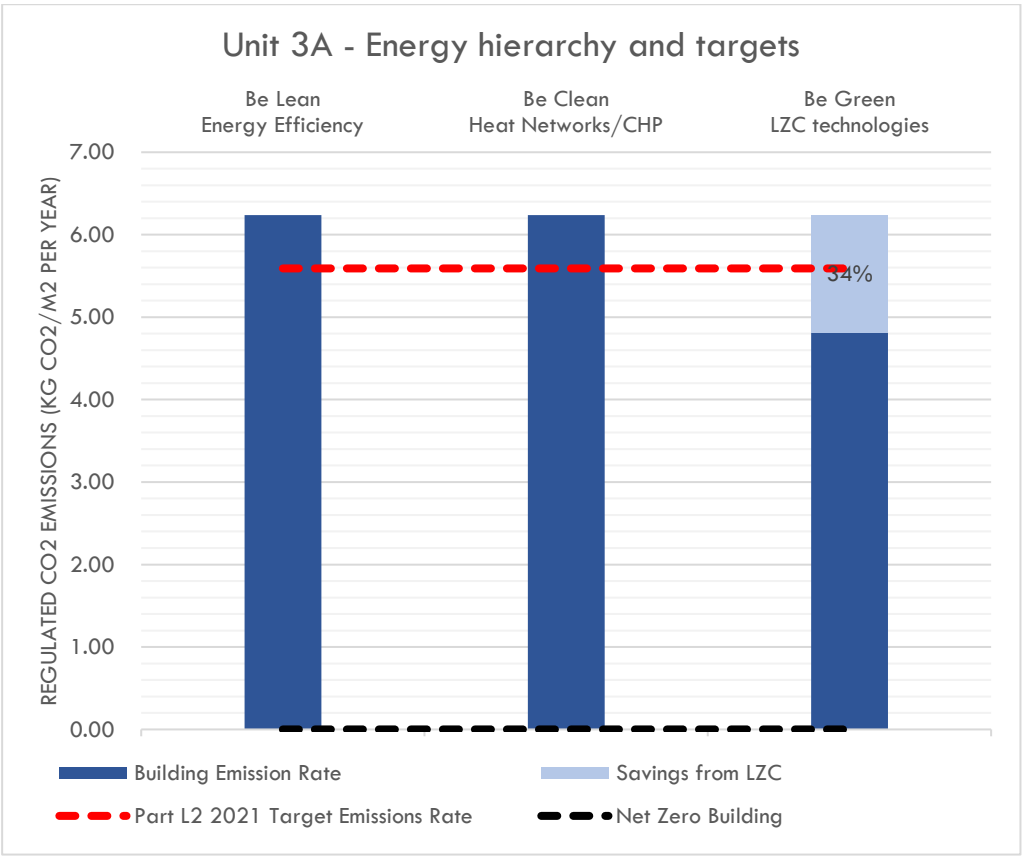

Figure 17 – Energy Hierarchy and targets – Unit 3A

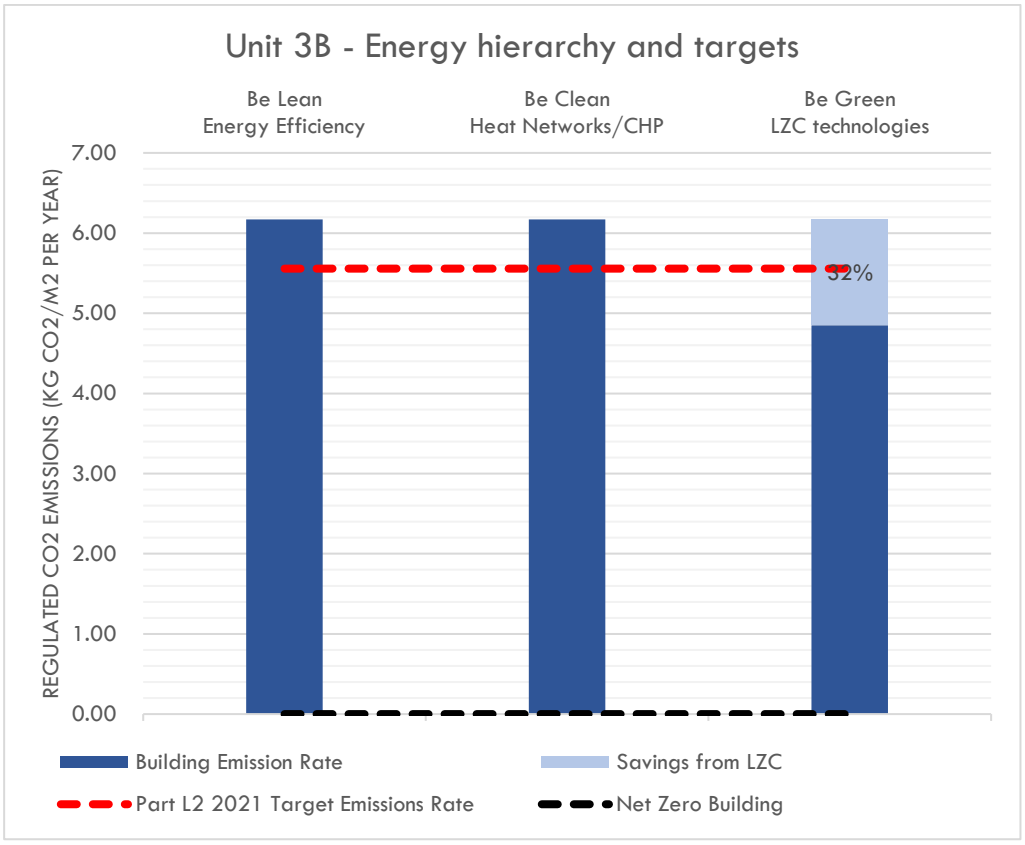

Figure 18 – Energy Hierarchy and targets – Unit 3B

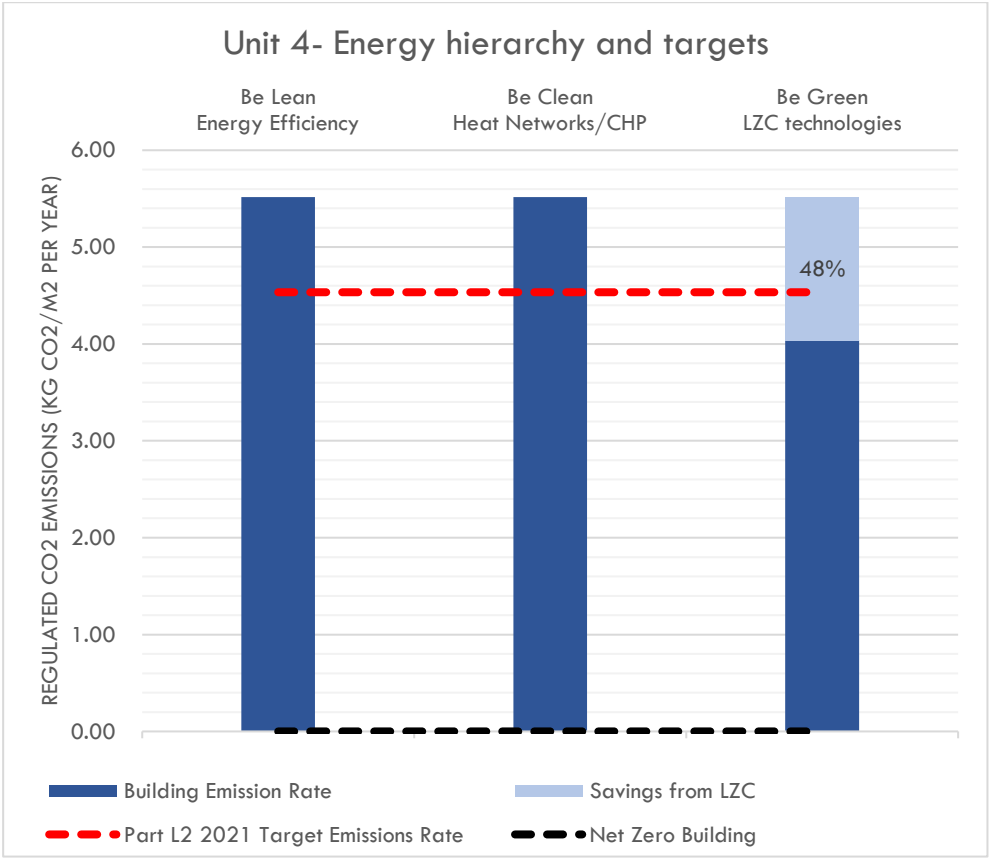

Figure 19 – Energy Hierarchy and targets – Unit 4

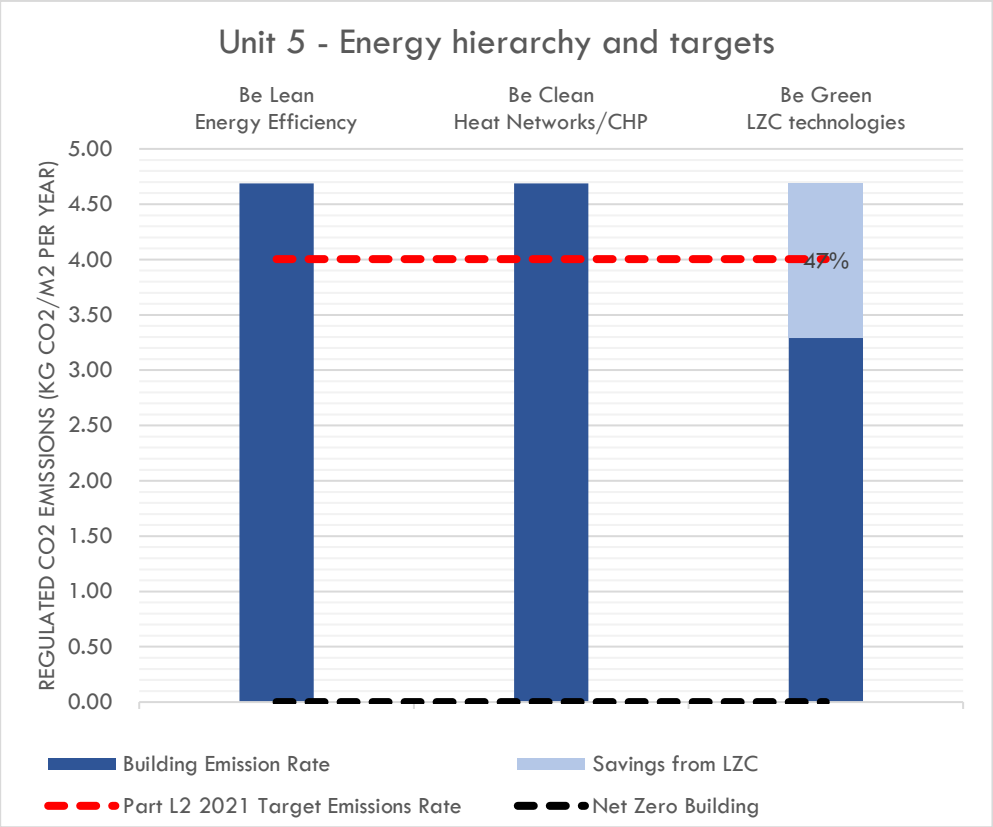

Figure 20 – Energy Hierarchy and targets – Unit 5

5. The results in Figures 15-20 above reflect the savings for each stage of the energy hierarchy. It can be seen that the Low Zero Carbon Technologies (ASHP, PVs) contribute to approx. 32-48% reduction in CO_2 emissions.

6. Table 11 below shows the improvement in CO_2 savings for the proposed building compared to Part L2 target rates. The development achieves a total of 11-22% reduction in regulated CO_2 emissions through building fabric enhancements, inclusion of energy efficient measures, introduction on ASHP and renewables within the design.

UNIT	ENERGY HIERARCHY STAGE	PART L2 (2021) - TARGET EMISSION RATE (TER) $KGCO_2/M^2$	PART L2 (2021) - BUILDING EMISSION RATE (BER) $KGCO_2/M^2$	% IMPROVEMENT VS. PART L2 (2021) TER
Unit 1	Be Lean	3.85	4.18	-8%
	Be Clean	3.85	4.18	-8%
	Be Green	3.85	3.01	22%
Unit 2	Be Lean	4.52	5.01	-11%
	Be Clean	4.52	5.01	-11%
	Be Green	4.52	3.70	18%
Unit 3A	Be Lean	5.59	6.24	-12%
	Be Clean	5.59	6.24	-12%

UNIT	ENERGY HIERARCHY STAGE	PART L2 (2021) - TARGET EMISSION RATE (TER) $KGCO_2/M^2$	PART L2 (2021) - BUILDING EMISSION RATE (BER) $KGCO_2/M^2$	% IMPROVEMENT VS. PART L2 (2021) TER
	Be Green	5.59	4.81	14%
Unit 3B	Be Lean	5.56	6.17	-11%
	Be Clean	5.56	6.17	-11%
	Be Green	5.56	4.85	13%
Unit 4	Be Lean	4.53	5.52	-22%
	Be Clean	4.53	5.52	-22%
	Be Green	4.53	4.04	11%
Unit 5	Be Lean	4.00	4.69	-17%
	Be Clean	4.00	4.69	-17%
	Be Green	4.00	3.29	18%

Table 11 – CO_2 emission rates - Building Regulations Part L2 (England incorporating 2023 amendments)

7. The development achieves the minimum 4no. credits required for a BREEAM (New Construction V6.1) Excellent rating under the Ene 01 credit issue. Please refer to Appendix E for BREEAM calculation results. The results are based on a Shell and Core building and checked under Version V6.1.

8. Table 12 below shows the expected energy demand for each unit and the proportion of this that will be met by the proposed PV arrays outlined in this Energy Strategy. The expected energy demand has been calculated from the part L BRUKL results and includes both regulated and unregulated energy usage. Each unit has more than 10% of the expected energy demand met via renewable energy

UNIT	EXPECTED ENERGY DEMAND (KWH/YR)	TARGET PV GENERATION (KWH/YR)	PERCENTAGE MET BY RENEWABLES
Unit 1	662,802	73,663	11.1%
Unit 2	317,582	38,177	12.0%
Unit 3A	111,204	12,382	11.1%
Unit 3B	110,983	11,557	10.4%
Unit 4	224,446	29,330	13.1%
Unit 5	287,615	37,654	13.1%

Table 12 – Proportion of expected energy demand met by renewables

9. Table 13 below shows the improvement in CO_2 savings for the proposed development compared to Part L2 target rates. The CO_2 savings from the PV system has been calculated from the part L BRUKL results and includes both regulated and unregulated energy usage. Each unit demonstrates an overall greater than 10% reduction in regulated CO_2 emissions. The decentralised renewable energy sources contribute 22-33% reductions in CO_2 emissions compared to the building regulations CO_2 target emission rate.

UNIT	TER $KGCO_2/M^2$	BER $KGCO_2/M^2$	$\%CO_2$	PV EMISSIONS REDUCTION $KGCO_2/M^2$	PV $\%CO_2$ REDUCTION OVER TER
Unit 1	3.85	3.01	21.8%	-1.14	-29.7%
Unit 2	4.52	3.70	18.1%	-1.29	-28.5%
Unit 3A	5.59	4.81	13.9%	-1.32	-23.6%
Unit 3B	5.56	4.85	12.8%	-1.23	-22.1%
Unit 4	4.53	4.04	10.9%	-1.47	-32.5%
Unit 5	4.00	3.29	17.8%	-1.36	-33.9%

Table 13 - Proportion of CO2 Emissions savings met by renewables

APPENDIX A – LOW AND ZERO CARBON FEASIBILITY ASSESSMENT SUMMARY

1.0 LOW AND ZERO CARBON TECHNOLOGIES

1.1 WIND GENERATION

1.1.1 Technology Description

1. Wind turbines are an established means of capturing wind energy and converting it into usable electricity. Wind turbines come in various sizes depending on requirements. A wind turbine usually consists of a nacelle containing a generator connected, sometimes via a gearbox, to a rotor consisting of three blades.

2. The two main types of commercially available wind turbines on offer in the UK are described below:

   - Horizontal Axis Wind Turbines (HAWT) are traditionally the most common form of wind turbines installed in the UK. They are usually formed of three blades and work best when provided with a constant laminar air flow; and
   - Vertical Axis Wind Turbines (VAWT) are less efficient compared to HAWTs but have the advantage that they can cope with variable wind flows as they do not have to 'face' the wind.

3. Wind turbines can also be classified according to their size:

   - Micro-wind: under 15kW rated capacity;
   - Small-scale wind: between 15kW to 100kW rated capacity;
   - Medium-scale wind: between 100kW to 500kW rated capacity; and
   - Large-scale wind: greater than 500kW rated capacity.

1.1.2 Feasibility for Site

1. Referring to the NOABL (Numerical Objective Analysis of Boundary Layer) wind speed database as adopted by the Business, Energy, and Industrial Strategy (BEIS), the site experiences an average wind speed of 5.0 m/s assuming a rotor height at around 10m above ground level, but it is unlikely that average speeds will meet this estimate.

Average Wind Speeds (estimates from NOABL - https://www.rensmart.com/Maps)

- At 10m above ground level 5.0 m/s
- At 25m above ground level 5.7 m/s.
- At 45m above ground level 6.2 m/s.

Figure 21 – Average Wind Speeds (source: NOABL)

2. As demonstrated in Figure 21 above, taking a turbine with a rotor at 45m above ground level may increase wind speeds to 6.2 m/s, but given the local environment, it is unlikely that average speeds will meet this estimate.

3. Irrespective of wind speeds, freestanding horizontal axis wind turbines require a large area of land, which would have a detrimental effect on the viability of the site.

4. Smaller freestanding vertical axis wind turbines have smaller operational footprints. However, anticipated wind turbulence at low level rules out their application. However, anticipated wind turbulence at low level

also rules out their application. Although these turbines can also be installed at roof level, this can have a significant effect on the total height of the building, and is not considered appropriate for this development.

5. Roof mounted wind turbines can generate small but valuable amounts of electricity. Turbines specifically designed to make best use of the wind flows around a building and mounted on the roof edge can often be appropriate for urban environments.

6. However, wind turbines place additional forces on structures and the effect of potential noise, vibration and visual intrusion would all need careful analysis before deployment. A roof mounted system would have a significant effect on the total height of the building, and is not considered appropriate for this development.

7. Due to the above and the wind speed available, this technology has not been considered further.

2.1 SOLAR THERMAL EVACUATED TUBE PANELS

2.1.1 Technology Description

1. Solar thermal panels are used to produce hot water and consist of roof mounted collector panels that make use of heat energy from the sun and use it to heat water circulating in a closed loop. Usually, this heat is transferred via a heat exchanger into a hot water storage tank that is also heated by a gas or other boiler.

Figure 22 – Evacuated Tube Solar Collector

2. Two main types of solar water heating system are used in the UK:

- Flat plate collectors circulate water around a black coloured receiver plate that is heated by direct sunlight and to some extent by indirect light; heat being retained by a thermally glazed panel above.
- Evacuated glass heat tubes are more efficient, particularly in the UK, as they can work more effectively at low solar radiation levels. However, they are more expensive than flat plate collectors. They consist of rows of parallel transparent glass tubes, each containing an absorber tube which converts the sunlight into heat energy

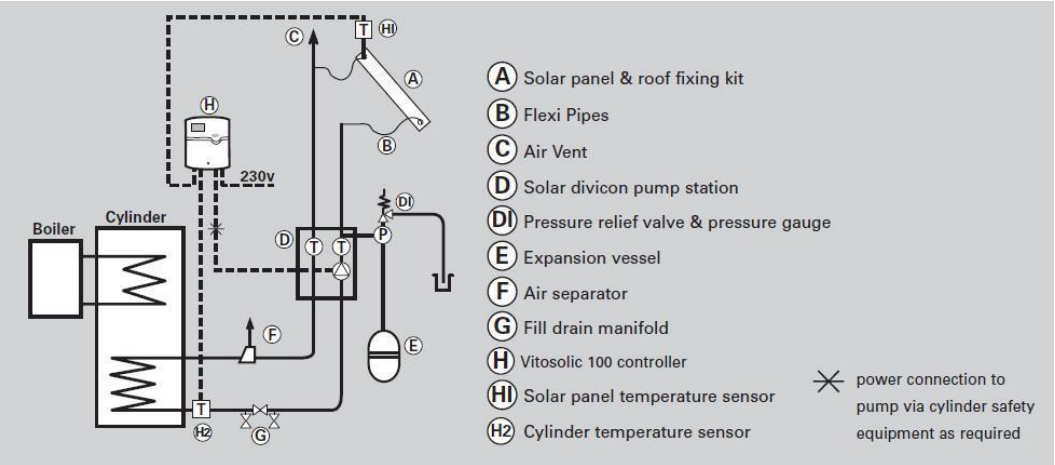

Figure 23 – Evacuated Tube Solar Collector Typical Schematic Diagram

2.1.2 Feasibility for Site

1. The site will have a low anticipated requirement for hot water except for hand wash sinks in toilets and tea-making areas and occasional shower usage.

2. The BRUKL calculations have been undertaken without the use of solar thermal installations. It is proposed that domestic hot water is produced using highly energy efficient electric water heaters.

3. Priority on the roof has been given to providing photovoltaic panels and roof lights.

4. Solar thermal water heating has not been considered further for this assessment.

3.1 GEOTHERMAL HEAT PUMP

3.1.1 Technology Description

1. Ground Source Heat Pumps (GSHP) extract heat from the ground. GSHPs work on the principle that the below ground temperature is more constant compared to above ground. In the winter months, the below-ground temperature is warmer than above ground and the heat carrier fluid circulating within the absorber pipes absorbs the heat. This heat energy is then raised by a compressor (using the compression cycle) and through a heat exchanger, distributed via a low temperature distribution system such as under floor heating, to satisfy a proportion of space heating requirements.

2. In the summer months, the below-ground temperature is colder than above ground and the heat carrier fluid circulating within the absorber pipes rejects building's heat. This heat rejecting capacity is then raised by a compressor (using the compression cycle) and through a heat exchanger, distributed via a chilled water distribution system to satisfy a proportion of space cooling requirements. GSHP systems are not suitable for satisfying high temperature hot water demands.

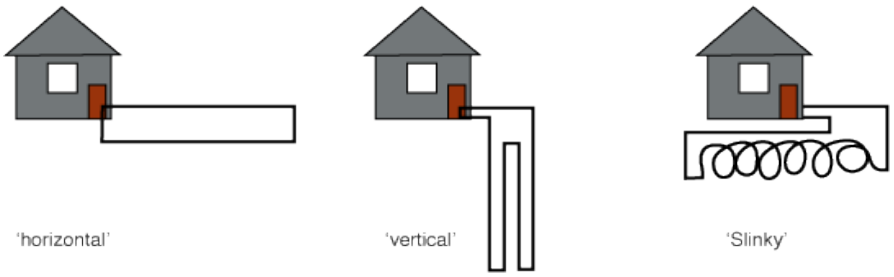

Figure 24 – Ground Source Heat Pump Loop Arrangements

3. As Figure 24 above indicates, there are a number of configurations for GSHP systems. A vertical collector system is considered the most appropriate in the context of the proposed development given the scale of the system and limited area available for horizontal collectors. Vertical collectors can be between 15–180m deep with minimum spacing between adjacent boreholes should be maintained at 5-15m to prevent thermal interference.

4. A key component of this technology is the heat exchanger. Larger heat exchangers deliver greater heat transfer and are, therefore, more efficient but they have a higher capital cost.

3.1.2 Feasibility for Site

1. As outlined previously, a typical warehouse building has little requirement for heat as much of the building will be maintained at ambient temperature or refrigerated. This technology will therefore not be suitable.

2. The costs involved in installing a GSHP, particularly the drilling of boreholes will make it economically unviable for the development. Ground source heat pumps are therefore not considered further as part of this assessment.

3.2 ENERGY STORAGE

3.2.1 Technology Description

1. Energy storage works by capturing energy produced by both renewable and non-renewable resources and storing it for discharge when required. The solution allows users to come off the grid and switch to stored energy, at a time most beneficial, giving greater flexibility and control of electrical usage.

2. At times of low demand, when there is excess supply energy it can be stored for use at times of high demand, with low supply, thus adjusting to provide the required balance between supply and demand. This approach is especially effective with renewable generation, which is intermittent by its nature. Solar and wind, for example, generate little amounts of power in the absence of sunshine or wind. Energy storage is able to smooth out the supply from these sources to provide a more reliable supply that matches demand.

3. Energy storage systems provide a wide array of technological approaches to managing power supplies in order to create a more resilient energy infrastructure and bring cost savings to utilities and consumers. The diverse approaches currently being deployed around the world can be divided into six main categories:

    - Solid State Batteries - a range of electrochemical storage solutions, including advanced chemistry batteries and capacitors
    - Flow Batteries - batteries where the energy is stored directly in the electrolyte solution for longer cycle life, and quick response times

- Flywheels - mechanical devices that harness rotational energy to deliver instantaneous electricity
- Compressed Air Energy Storage - utilising compressed air to create an energy reserve
- Thermal - capturing heat and cold to create energy on demand
- Pumped Hydro-Power - creating large-scale reservoirs of energy with water

3.2.2 Feasibility for Site

1. Energy storage is not included as part of the current design, the PV system is suitably sized for the development, and it is anticipated there would be limited requirement for storage. However, this could be considered by the future Tennant depending on their energy requirement.

2. The viability for energy storage will be dependent on the final building operational profile which is unknown at this stage. The electrical infrastructure on site will be designed to facilitate installation of energy storage in the form of solid-state batteries in future.

3.3 LOW ZERO CARBON RECOMMENDATIONS

1. In line with the above findings, it is recommended that the proposed development includes the incorporation of solar PV and ASHP to serve heating and cooling demand within the office accommodation areas.

2. As shown in Tables 14-16 below, the recommended LZC technologies collectively would provide a significant reduction in terms of both energy and carbon. The following percentage savings from LZC technologies are achievable compared to building regulated energy and carbon baseline.

UNIT	AREA	TOTAL REGULATED ENERGY CONSUMPTION (KWH/M^2)	TOTAL REGULATED ENERGY CONSUMPTION (KWH/ANNUM)
Unit 1	8224	29.68	244050
Unit 2	3769	35.61	134206
Unit 3A	1187	43.60	51741
Unit 3B	1188	43.23	51371
Unit 4	2539	39.30	99784
Unit 5	3552	33.02	117256

Table 14 – Percentage regulated energy & carbon savings from LZC & renewable technologies (Part 1)

UNIT	ASHP HEATING ENERGY OUTPUT (KWH/ANNUM)	ASHP RENEWABLE PROPORTION (KWH/ANNUM)	PROPORTION OF REGULATED ENERGY GENERATED BY LZC	PV ENERGY OUTPUT (KWH/ANNUM)	PROPORTION OF REGULATED ENERGY GENERATED BY RENEWABLES
Unit 1	11572.20	8265.86	3.4%	73663	30.2%
Unit 2	7316.47	5226.05	3.9%	38177	28.4%
Unit 3A	8877.42	6341.01	12.3%	12382	23.9%
Unit 3B	7944.31	5674.51	11.0%	11557	22.5%

UNIT	ASHP HEATING ENERGY OUTPUT (KWH/ANNUM)	ASHP RENEWABLE PROPORTION (KWH/ANNUM)	PROPORTION OF REGULATED ENERGY GENERATED BY LZC	PV ENERGY OUTPUT (KWH/ANNUM)	PROPORTION OF REGULATED ENERGY GENERATED BY RENEWABLES
Unit 4	615.95	439.97	0.4%	29330	29.4%
Unit 5	9748.22	6963.01	5.9%	37654	32.1%

Table 15 – Percentage regulated energy & carbon savings from LZC & renewable technologies (Part 1)

UNIT	TOTAL ENERGY GENERATED BY LZC & RENEWABLES(KWH/ANNUM)	PROPORTION OF REGULATED ENERGY GENERATED BY LZC & RENEWABLES	CARBON EMISSIONS SAVINGS FROM ASHP (TCO_2/ANNUM)	CARBON EMISSIONS SAVINGS FROM PV (TCO_2/ANNUM)	TOTAL CARBON EMISSIONS SAVING FROM LZC & RENEWABLES (TCO_2/ANNUM)
Unit 1	**81928**	**33.6%**	1.15	10.22	**11.37**
Unit 2	**43403**	**32.3%**	0.73	5.30	**6.02**
Unit 3A	**18723**	**36.2%**	0.88	1.72	**2.60**
Unit 3B	**17231**	**33.5%**	0.79	1.60	**2.39**
Unit 4	**29770**	**29.8%**	0.06	4.07	**4.13**
Unit 5	**44617**	**38.1%**	0.97	5.23	**6.19**

Table 16– Percentage regulated energy & carbon savings from LZC & renewable technologies (Part 3)

APPENDIX B – BRUKL REPORTS (FOR EACH ENERGY HIERARCHY STAGE)

BE LEAN STAGE

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 1 - For Planning

As designed

Date: Fri Jan 09 10:11:13 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 1 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 502.43

The CO_2 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	3.85	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	4.18	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	41.77	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	45.24	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Curtain Wall Frame
Rooflights***	2.2	2.2	2.2	Rooflight
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door FF
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- Extractor + EPH (6 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- MVHR + VRF (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	1.4	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + VRF (GF Reception DL)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

4- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MV + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	1.4	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Electric DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC Disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Staff shower	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Disable shower	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Office DL3	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Office NDL2	-	-	-	-	1.4	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC Disabled	NO
FF WC Female	NO
FF WC Male	NO
GF Lockers (no shower)	NO
FF Office NDL	NO
GF Reception DL	NO
GF Lobby	NO
Staircase	NO
GF Staff shower	NO
GF Disable shower	NO
Ships ladder	NO
FF Lobby WC female	NO
FF Lobby WC male	NO
FF WC Disabled	NO
FF Corridor	NO
FF Office DL2	NO
FF Office DL3	NO
FF Office NDL2	NO

Shell and core configuration

Zone	Assumed shell?
FF Lobby WC disabled	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
Warehouse	120	-	-
WH Undercroft NDL	120	-	-
GF WC Disabled	95	-	-
FF WC Female	95	-	-
FF WC Male	95	-	-
FF Cleaners storage	95	-	-
Plant room	95	-	-
GF Lockers (no shower)	100	-	-
FF Office NDL	100	-	-
GF Reception DL	100	95	-
GF Lobby	95	-	-
Staircase	95	-	-
GF Staff shower	95	-	-
GF Disable shower	95	-	-
Ships ladder	95	-	-
FF Lobby WC female	95	-	-
FF Lobby WC male	95	-	-
FF WC Disabled	95	-	-
FF Corridor	95	-	-
WH Undercroft DL	120	-	-
FF Office DL2	100	-	-
FF Office DL3	100	-	-
FF Office NDL2	100	-	-
FF Lobby WC disabled	95	-	-
GF Cleaners Store	95	-	-

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?
Warehouse	YES (+52%)	NO
WH Undercroft NDL	NO (-68%)	NO
GF Lockers (no shower)	N/A	N/A
FF Office NDL	NO (-8%)	NO
GF Reception DL	YES (+20%)	NO
WH Undercroft DL	YES (+127%)	NO
FF Office DL2	YES (+10%)	NO
FF Office DL3	NO (-13%)	NO
FF Office NDL2	NO (-77%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	8224	8224
External area [m^2]	19388	19388
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	6775	6343
Average U-value [W/m^2K]	0.35	0.33
Alpha value* [%]	18.14	3.14

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
98	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
2	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	0.93	0.53
Cooling	0.7	1.07
Auxiliary	1.34	0.84
Lighting	17.32	17.37
Hot water	9.52	9.33
Equipment*	50.92	50.92
TOTAL**	**29.8**	**29.14**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	0.89
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0.89*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	19.87	21.78
Primary energy [kWh_{PE}/m^2]	45.24	41.77
Total emissions [kg/m^2]	4.18	3.85

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	57.6	0	16	0	28.2	1	0	1	0
	Notional	57.5	0	11.9	0	33.9	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	32.9	135.8	3.5	7.5	11.7	2.64	5	2.64	5
	Notional	6.5	184.1	0.7	11.6	5.7	2.64	4.4	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	402.6	43.4	42.4	2.4	0	2.64	5	2.64	5
	Notional	426.5	40.7	44.9	2.6	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	49.8	0	13.8	0	0	1	0	1	0
	Notional	49.9	0	10.4	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	60.7	0	16.9	0	11.7	1	0	1	0
	Notional	62	0	12.9	0	11	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 2 - For Planning

As designed

Date: Thu Jan 08 10:43:24 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 2 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 307

The CO_2 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), $kgCO_2/m^2.annum$	4.52	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.01	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	48.95	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	54.32	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Spandrel Panel
Rooflights***	2.2	2.2	2.2	Rooflight (horizontal)
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (3 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- MVHR + VRF (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- EOL + EPH (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Elec DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL 1	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL 2	-	-	-	-	1.4	-	-	-	-	-	N/A
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
FF WC Male	NO
FF WC Female	NO
FF WC disabled	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL 1	NO
Reception DL	NO
Staircase south	NO
GF Changing (shower)	NO
FF Lobby WC male	NO
FF Lobby WC female	NO
FF Corridor North	NO
FF Corridor South	NO
FF Roof access	NO
Office DL2	NO
Reception Atria	NO
Reception NDL	NO
Office NDL 2	NO
GF WC disabled	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
Warehouse	120	-	-
Warehouse Undercroft NDL	120	-	-
FF WC Male	95	-	-
FF WC Female	95	-	-
FF WC disabled	95	-	-
1F Cleaners	95	-	-
GF Lockers (no shower)	100	-	-
Office DL1	100	-	-
Office NDL 1	100	-	-
Reception DL	100	95	-
Staircase south	95	-	-
GF Changing (shower)	95	-	-
FF Lobby WC male	95	-	-
FF Lobby WC female	95	-	-
FF Corridor North	95	-	-
FF Corridor South	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
GF Cleaners	95	-	-
Reception Atria	100	95	-
Reception NDL	100	95	-
Office NDL 2	100	-	-
GF WC disabled	95	-	-

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?
Warehouse	YES (+31%)	NO
Warehouse Undercroft NDL	NO (-83%)	NO
GF Lockers (no shower)	N/A	N/A
Office DL1	YES (+5%)	NO
Office NDL 1	NO (-82%)	NO
Reception DL	YES (+29%)	NO
Office DL2	NO (-4%)	NO
Reception Atria	NO (-7%)	NO
Reception NDL	NO (-69%)	NO
Office NDL 2	NO (-80%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3769	3769
External area [m^2]	9175	9175
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	2964	2981
Average U-value [W/m^2K]	0.32	0.32
Alpha value* [%]	19.02	4.02

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
96	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
4	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.54	1.18
Cooling	0.84	1.33
Auxiliary	1.67	1.09
Lighting	19.58	19.13
Hot water	12.15	11.91
Equipment*	48.65	48.65
TOTAL**	**35.78**	**34.64**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	1.53
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.53*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	26.1	31.28
Primary energy [kWh_{PE}/m^2]	54.32	48.95
Total emissions [kg/m^2]	5.01	4.52

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	238.7	56.8	25.1	3.2	0	2.64	5	2.64	5
	Notional	393.8	51.9	41.4	3.3	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	29.6	132.6	3.1	7.4	11.7	2.64	5	2.64	5
	Notional	4.4	187.8	0.5	11.9	5.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	60.4	0	16.8	0	0	1	0	1	0
	Notional	60.7	0	12.6	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	76.6	0	21.3	0	28.1	1	0	1	0
	Notional	77	0	16	0	33.7	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	44.3	0	12.3	0	11.7	1	0	1	0
	Notional	45.8	0	9.5	0	10	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park Unit 3A - For Planning

As designed

Date: Fri Jan 09 17:53:51 2026

Administrative information

Building Details

Address: Shinfield Park Unit 3A - For Planning, Reading, RG2 9FW

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 132.29

The CO_2 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	5.59	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	6.24	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	60.58	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	67.32	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Curtain Wall Frame
Rooflights***	2.2	2.2	2.2	Rooflight 8v
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (Reception lobby)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- EOL + EPH (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + VRF (3 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- New HWS Circuit

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Uni	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Uni	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception lobby	NO
Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Roof access	NO
Office DL2	NO
FF WC disabled	NO
FF Lobby WC	NO

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
Warehouse	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-

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
FF WC Uni	95	-	-
Cleaners storage	95	-	-
GF Lockers (no shower)	95	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception lobby	100	95	-
Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
FF WC disabled	95	-	-
FF Lobby WC	95	-	-

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?
Warehouse	YES (+42%)	NO
Warehouse Undercroft NDL	NO (-69%)	NO
Cleaners storage	N/A	N/A
GF Lockers (no shower)	N/A	N/A
Office DL1	NO (-9%)	NO
Office NDL	NO (-55%)	NO
Reception lobby	YES (+8%)	NO
Office DL2	YES (+18%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1187	1187
External area [m^2]	2919	2919
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	1060	940
Average U-value [W/m^2K]	0.36	0.32
Alpha value* [%]	21.15	6.15

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
91	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
9	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	4.09	2.22
Cooling	0.8	1.27
Auxiliary	1.85	1.27
Lighting	20.65	20.39
Hot water	16.88	16.88
Equipment*	50.1	50.1
TOTAL**	**44.26**	**42.03**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	1.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.07*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	47.38	39.92
Primary energy [kWh_{PE}/m^2]	67.32	60.58
Total emissions [kg/m^2]	6.24	5.59

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	480	38.2	50.5	2.1	0	2.64	5	2.64	5
	Notional	418.1	35.1	44	2.2	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	46.1	0	12.8	0	0	1	0	1	0
	Notional	46.5	0	9.6	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	156.6	0	43.5	0	27.7	1	0	1	0
	Notional	156.8	0	32.5	0	33.2	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	59.5	0	16.5	0	11.7	1	0	1	0
	Notional	62.6	0	13	0	10.4	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	94.3	120	9.9	6.7	11.7	2.64	5	2.64	5
	Notional	9.8	173.6	1	11	5.7	2.64	4.4	----	----

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield ParkUnit 3B - For Planning

As designed

Date: Mon Jan 12 09:20:15 2026

Administrative information

Building Details

Address: Shinfield ParkUnit 3B - For Planning, Reading, RG2 9FW

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 132.26

The CO_2 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	5.56	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	6.17	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	60.2	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	66.63	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Curtain Wall Frame
Rooflights***	2.2	2.2	2.2	Rooflight 8v
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (Reception lobby)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- EOL + EPH (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + VRF (3 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Electric DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Uni	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Uni	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception lobby	NO
Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Roof access	NO
Office DL2	NO
FF WC disabled	NO
FF Lobby WC	NO

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
Warehouse	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-

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
FF WC Uni	95	-	-
Cleaners storage	95	-	-
GF Lockers (no shower)	95	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception lobby	100	95	-
Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
FF WC disabled	95	-	-
FF Lobby WC	95	-	-

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?
Warehouse	YES (+43%)	NO
Warehouse Undercroft NDL	NO (-67%)	NO
Cleaners storage	N/A	N/A
GF Lockers (no shower)	N/A	N/A
Office DL1	YES (+4%)	NO
Office NDL	NO (-60%)	NO
Reception lobby	YES (+35%)	NO
Office DL2	YES (+22%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1188	1188
External area [m^2]	2926	2926
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	1060	938
Average U-value [W/m^2K]	0.36	0.32
Alpha value* [%]	21.08	6.08

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
90	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
10	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	3.78	2.24
Cooling	0.83	1.26
Auxiliary	1.83	1.26
Lighting	20.36	20.08
Hot water	17.02	17.02
Equipment*	50.16	50.16
TOTAL**	**43.82**	**41.86**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	1.16
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.16*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	45	39.92
Primary energy [kWh_{PE}/m^2]	66.63	60.2
Total emissions [kg/m^2]	6.17	5.56

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	406.8	43.5	42.8	2.4	0	2.64	5	2.64	5
	Notional	408.9	36.1	43	2.3	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	46.2	0	12.8	0	0	1	0	1	0
	Notional	46.5	0	9.6	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	157	0	43.6	0	27.6	1	0	1	0
	Notional	156.9	0	32.5	0	33.2	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	59.7	0	16.6	0	11.7	1	0	1	0
	Notional	62.5	0	13	0	10.4	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	87.9	124.6	9.3	6.9	11.7	2.64	5	2.64	5
	Notional	9.4	173.8	1	11	5.7	2.64	4.4	----	----

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 4 - For Planning

As designed

Date: Fri Jan 09 09:24:29 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 4 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 239.55

The CO_2 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	4.53	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	5.52	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	48.84	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	59.71	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated soffit (between warehouse and o
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Spandrel Panel
Rooflights***	2.2	2.2	2.2	Rooflight 6.97
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large top
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (2 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- MVHR + VRF (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- EOL + EPH (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL2	-	-	-	-	1.4	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Male	NO
FF WC Female	NO
FF WC disabled	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception DL	NO
GF Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Lobby WC male	NO
FF Lobby WC female	NO
FF Corridor	NO
FF Roof access	NO
Office DL2	NO
Office NDL2	NO
FF Staircase	NO
Reception NDL	NO

Shell and core configuration

Zone	Assumed shell?
FF Circ WCS	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
Warehouse	120	-	-
Warehouse Undercroft DL1	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-
FF WC Male	95	-	-
FF WC Female	95	-	-
FF WC disabled	95	-	-
GF Cleaners	95	-	-
GF Lockers (no shower)	100	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception DL	100	95	-
GF Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Lobby WC male	95	-	-
FF Lobby WC female	95	-	-
FF Corridor	95	-	-
FF Roof access	95	-	-
Warehouse DL2	120	-	-
Office DL2	100	-	-
Office NDL2	100	-	-
FF Staircase	95	-	-
Warehouse DL3	120	-	-
Reception NDL	100	95	-
FF Cleaners	95	-	-
FF Circ WCS	95	-	-

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?
Warehouse	YES (+25%)	NO
Warehouse Undercroft DL1	YES (+78%)	NO
Warehouse Undercroft NDL	NO (-60%)	NO
GF Lockers (no shower)	N/A	N/A
Office DL1	YES (+25%)	NO
Office NDL	NO (-75%)	NO
Reception DL	YES (+26%)	NO
Warehouse DL2	YES (+257%)	NO
Office DL2	NO (-8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Office NDL2	NO (-70%)	NO
Warehouse DL3	YES (+415%)	NO
Reception NDL	NO (-23%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2539	2539
External area [m^2]	6499	6499
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	2274	2085
Average U-value [W/m^2K]	0.35	0.32
Alpha value* [%]	19.76	4.76

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
93	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
7	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.3	2.44
Cooling	1.34	2.19
Auxiliary	1.79	1.27
Lighting	21.18	19.72
Hot water	12.72	12.46
Equipment*	49.1	49.1
TOTAL**	**39.32**	**38.08**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	5.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*5.07*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	34.6	54.04
Primary energy [kWh_{PE}/m^2]	59.71	48.84
Total emissions [kg/m^2]	5.52	4.53

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	30.3	103.1	3.2	5.7	0	2.64	5	2.64	5
	Notional	393.3	169.6	41.4	10.7	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0.5	206.9	0.1	11.5	11.7	2.64	5	2.64	5
	Notional	0	293.3	0	18.5	5.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	66	0	18.3	0	0	1	0	1	0
	Notional	66.1	0	13.7	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	79.6	0	22.1	0	28.8	1	0	1	0
	Notional	79.5	0	16.5	0	34.6	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	72.2	0	20	0	11.7	1	0	1	0
	Notional	75.3	0	15.6	0	9.7	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 5 - For Planning

As designed

Date: Tue Jan 13 15:28:15 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 5 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 271.14

The CO_2 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	4	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	4.69	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	43.26	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	50.59	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Spandrel Panel
Rooflights***	2.2	2.2	2.2	Rooflight (vertical)
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large upper
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (Reception lobby)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- MVHR + VRF (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	2.64	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- EOL + EPH (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL3	-	-	-	-	1.4	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
Office NDL2	-	-	-	-	1.4	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Male	NO
FF WC Female	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception lobby	NO
GF Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Lobby WC male	NO
FF Lobby WC female	NO
FF Corridor	NO
FF Roof access	NO
Office DL2	NO
Office DL3	NO
FF Corridor 2	NO
FF WC disabled	NO

Shell and core configuration

Zone	Assumed shell?
FF Staircase	NO
Office NDL2	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
Warehouse	120	-	-
Warehouse Undercroft DL1	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-
FF WC Male	95	-	-
FF WC Female	95	-	-
FF Cleaners Store	95	-	-
GF Lockers (no shower)	95	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception lobby	100	95	-
GF Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Lobby WC male	95	-	-
FF Lobby WC female	95	-	-
FF Corridor	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
Office DL3	100	-	-
FF Corridor 2	95	-	-
FF WC disabled	95	-	-
Warehouse Undercroft DL2	120	-	-
FF Staircase	95	-	-
Office NDL2	100	-	-
GF Cleaners Store	95	-	-

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?
Warehouse	YES (+79%)	NO
Warehouse Undercroft DL1	YES (+93%)	NO
Warehouse Undercroft NDL	NO (-45%)	NO
GF Lockers (no shower)	N/A	N/A
Office DL1	NO (-12%)	NO
Office NDL	NO (-70%)	NO
Reception lobby	YES (+57%)	NO
Office DL2	YES (+25%)	NO
Office DL3	YES (+12%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Warehouse Undercroft DL2	YES (+265%)	NO
Office NDL2	NO (-57%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3552	3552
External area [m^2]	9161	9161
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	3491	2938
Average U-value [W/m^2K]	0.38	0.32
Alpha value* [%]	19.07	4.07

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
95	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
5	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.72	1.67
Cooling	0.74	1.07
Auxiliary	1.54	1.04
Lighting	19.36	18.58
Hot water	8.89	8.71
Equipment*	47.97	47.97
TOTAL**	**33.26**	**31.07**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	0	1.85
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*1.85*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	30.53	29.7
Primary energy [kWh_{PE}/m^2]	50.59	43.26
Total emissions [kg/m^2]	4.69	4

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	156.3	75.5	16.4	4.2	0	2.64	5	2.64	5
	Notional	393.3	75.5	41.4	4.8	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	73.8	127.2	7.8	7.1	11.7	2.64	5	2.64	5
	Notional	10.5	164.3	1.1	10.4	5.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	71.3	0	19.8	0	0	1	0	1	0
	Notional	71.5	0	14.8	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	77.8	0	21.6	0	28.6	1	0	1	0
	Notional	77.7	0	16.1	0	34.3	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	81.5	0	22.6	0	11.7	1	0	1	0
	Notional	84.5	0	17.5	0	9.9	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

BE GREEN STAGE

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 1 - For Planning

As designed

Date: Wed Jan 07 15:40:26 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 1 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 502.43

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.85	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.01	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	41.77	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	31.89	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Curtain Wall Frame
Rooflights***	2.2	2.2	2.2	Rooflight
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door FF
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- Extractor + EPH (6 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

2- MVHR + VRF (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	1.4	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + VRF (GF Reception DL)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

4- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MV + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	1.4	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Electric DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC Disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF Cleaners storage	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Staff shower	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Disable shower	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Office DL3	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Office NDL2	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Cleaners Store	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC Disabled	NO
FF WC Female	NO
FF WC Male	NO
GF Lockers (no shower)	NO
FF Office NDL	NO
GF Reception DL	NO
GF Lobby	NO
Staircase	NO
GF Staff shower	NO
GF Disable shower	NO
Ships ladder	NO
FF Lobby WC female	NO
FF Lobby WC male	NO
FF WC Disabled	NO
FF Corridor	NO
FF Office DL2	NO

Shell and core configuration

Zone	Assumed shell?
FF Office DL3	NO
FF Office NDL2	NO
FF Lobby WC disabled	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
Warehouse	120	-	-
WH Undercroft NDL	120	-	-
GF WC Disabled	95	-	-
FF WC Female	95	-	-
FF WC Male	95	-	-
FF Cleaners storage	95	-	-
Plant room	95	-	-
GF Lockers (no shower)	100	-	-
FF Office NDL	100	-	-
GF Reception DL	100	95	-
GF Lobby	95	-	-
Staircase	95	-	-
GF Staff shower	95	-	-
GF Disable shower	95	-	-
Ships ladder	95	-	-
FF Lobby WC female	95	-	-
FF Lobby WC male	95	-	-
FF WC Disabled	95	-	-
FF Corridor	95	-	-
WH Undercroft DL	120	-	-
FF Office DL2	100	-	-
FF Office DL3	100	-	-
FF Office NDL2	100	-	-
FF Lobby WC disabled	95	-	-
GF Cleaners Store	95	-	-

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?
Warehouse	YES (+52%)	NO
WH Undercroft NDL	NO (-68%)	NO
GF Lockers (no shower)	N/A	N/A
FF Office NDL	NO (-8%)	NO
GF Reception DL	YES (+20%)	NO
WH Undercroft DL	YES (+127%)	NO
FF Office DL2	YES (+10%)	NO
FF Office DL3	NO (-13%)	NO
FF Office NDL2	NO (-77%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	8224	8224
External area [m^2]	19388	19388
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	6775	6343
Average U-value [W/m^2K]	0.35	0.33
Alpha value* [%]	18.14	3.14

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
98	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
2	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	0.8	0.53
Cooling	0.7	1.07
Auxiliary	1.34	0.84
Lighting	17.32	17.37
Hot water	9.52	9.33
Equipment*	50.92	50.92
TOTAL**	**29.68**	**29.14**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	8.96	0.89
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*8.96*	*0.89*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	19.87	21.78
Primary energy [kWh_{PE}/m^2]	31.89	41.77
Total emissions [kg/m^2]	3.01	3.85

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	57.6	0	16	0	28.2	1	0	1	0
	Notional	57.5	0	11.9	0	33.9	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	32.9	135.8	2.6	7.5	11.7	3.5	5	3.5	5
	Notional	6.5	184.1	0.7	11.6	5.7	2.64	4.4	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	402.6	43.4	32	2.4	0	3.5	5	3.5	5
	Notional	426.5	40.7	44.9	2.6	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	49.8	0	13.8	0	0	1	0	1	0
	Notional	49.9	0	10.4	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	60.7	0	16.9	0	11.7	1	0	1	0
	Notional	62	0	12.9	0	11	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 2 - For Planning

As designed

Date: Thu Jan 08 10:33:50 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 2 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 307

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	4.52	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	3.7	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	48.95	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	39.19	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Spandrel Panel
Rooflights***	2.2	2.2	2.2	Rooflight (horizontal)
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (3 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- MVHR + VRF (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- EOL + EPH (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Elec DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
1F Cleaners	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL 1	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Cleaners	-	-	0.5	-	-	-	-	-	-	-	N/A
Office NDL 2	-	-	-	-	1.4	-	-	-	-	-	N/A
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
FF WC Male	NO
FF WC Female	NO
FF WC disabled	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL 1	NO
Reception DL	NO
Staircase south	NO
GF Changing (shower)	NO
FF Lobby WC male	NO
FF Lobby WC female	NO
FF Corridor North	NO
FF Corridor South	NO
FF Roof access	NO
Office DL2	NO
Reception Atria	NO
Reception NDL	NO

Shell and core configuration

Zone	Assumed shell?
Office NDL 2	NO
GF WC disabled	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
Warehouse	120	-	-
Warehouse Undercroft NDL	120	-	-
FF WC Male	95	-	-
FF WC Female	95	-	-
FF WC disabled	95	-	-
1F Cleaners	95	-	-
GF Lockers (no shower)	100	-	-
Office DL1	100	-	-
Office NDL 1	100	-	-
Reception DL	100	95	-
Staircase south	95	-	-
GF Changing (shower)	95	-	-
FF Lobby WC male	95	-	-
FF Lobby WC female	95	-	-
FF Corridor North	95	-	-
FF Corridor South	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
GF Cleaners	95	-	-
Reception Atria	100	95	-
Reception NDL	100	95	-
Office NDL 2	100	-	-
GF WC disabled	95	-	-

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?
Warehouse	YES (+31%)	NO
Warehouse Undercroft NDL	NO (-83%)	NO
GF Lockers (no shower)	N/A	N/A
Office DL1	YES (+5%)	NO
Office NDL 1	NO (-82%)	NO
Reception DL	YES (+29%)	NO
Office DL2	NO (-4%)	NO
Reception Atria	NO (-7%)	NO
Reception NDL	NO (-69%)	NO
Office NDL 2	NO (-80%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3769	3769
External area [m^2]	9175	9175
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	2964	2981
Average U-value [W/m^2K]	0.32	0.32
Alpha value* [%]	19.02	4.02

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
96	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
4	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.36	1.18
Cooling	0.84	1.33
Auxiliary	1.67	1.09
Lighting	19.58	19.13
Hot water	12.15	11.91
Equipment*	48.65	48.65
TOTAL**	**35.61**	**34.64**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	10.13	1.53
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*10.13*	*1.53*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	26.1	31.28
Primary energy [kWh_{PE}/m^2]	39.19	48.95
Total emissions [kg/m^2]	3.7	4.52

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	238.7	56.8	19	3.2	0	3.5	5	3.5	5
	Notional	393.8	51.9	41.4	3.3	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	29.6	132.6	2.4	7.4	11.7	3.5	5	3.5	5
	Notional	4.4	187.8	0.5	11.9	5.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	60.4	0	16.8	0	0	1	0	1	0
	Notional	60.7	0	12.6	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	76.6	0	21.3	0	28.1	1	0	1	0
	Notional	77	0	16	0	33.7	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	44.3	0	12.3	0	11.7	1	0	1	0
	Notional	45.8	0	9.5	0	10	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park Unit 3A - For Planning

As designed

Date: Fri Jan 09 17:46:24 2026

Administrative information

Building Details

Address: Shinfield Park Unit 3A - For Planning, Reading, RG2 9FW

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 132.29

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.59	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.81	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	60.58	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	51	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Curtain Wall Frame
Rooflights***	2.2	2.2	2.2	Rooflight 8v
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (Reception lobby)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- EOL + EPH (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + VRF (3 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- New HWS Circuit

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Uni	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Uni	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception lobby	NO
Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Roof access	NO
Office DL2	NO
FF WC disabled	NO
FF Lobby WC	NO

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
Warehouse	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-

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
FF WC Uni	95	-	-
Cleaners storage	95	-	-
GF Lockers (no shower)	95	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception lobby	100	95	-
Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
FF WC disabled	95	-	-
FF Lobby WC	95	-	-

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?
Warehouse	YES (+42%)	NO
Warehouse Undercroft NDL	NO (-69%)	NO
Cleaners storage	N/A	N/A
GF Lockers (no shower)	N/A	N/A
Office DL1	NO (-9%)	NO
Office NDL	NO (-55%)	NO
Reception lobby	YES (+8%)	NO
Office DL2	YES (+18%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1187	1187
External area [m^2]	2919	2919
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	1060	940
Average U-value [W/m^2K]	0.36	0.32
Alpha value* [%]	21.15	6.15

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
91	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
9	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	3.43	2.22
Cooling	0.8	1.27
Auxiliary	1.85	1.27
Lighting	20.65	20.39
Hot water	16.88	16.88
Equipment*	50.1	50.1
TOTAL**	**43.6**	**42.03**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	10.43	1.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*10.43*	*1.07*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	47.38	39.92
Primary energy [kWh_{PE}/m^2]	51	60.58
Total emissions [kg/m^2]	4.81	5.59

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	480	38.2	38.1	2.1	0	3.5	5	3.5	5
	Notional	418.1	35.1	44	2.2	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	46.1	0	12.8	0	0	1	0	1	0
	Notional	46.5	0	9.6	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	156.6	0	43.5	0	27.7	1	0	1	0
	Notional	156.8	0	32.5	0	33.2	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	59.5	0	16.5	0	11.7	1	0	1	0
	Notional	62.6	0	13	0	10.4	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	94.3	120	7.5	6.7	11.7	3.5	5	3.5	5
	Notional	9.8	173.6	1	11	5.7	2.64	4.4	----	----

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield ParkUnit 3B - For Planning

As designed

Date: Mon Jan 12 09:14:03 2026

Administrative information

Building Details

Address: Shinfield ParkUnit 3B - For Planning, Reading, RG2 9FW

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 132.26

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.56	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.85	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	60.2	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	51.46	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Curtain Wall Frame
Rooflights***	2.2	2.2	2.2	Rooflight 8v
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (Reception lobby)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- EOL + EPH (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + VRF (3 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- Electric DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Uni	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Uni	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception lobby	NO
Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Roof access	NO
Office DL2	NO
FF WC disabled	NO
FF Lobby WC	NO

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
Warehouse	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-

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
FF WC Uni	95	-	-
Cleaners storage	95	-	-
GF Lockers (no shower)	95	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception lobby	100	95	-
Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
FF WC disabled	95	-	-
FF Lobby WC	95	-	-

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?
Warehouse	YES (+43%)	NO
Warehouse Undercroft NDL	NO (-67%)	NO
Cleaners storage	N/A	N/A
GF Lockers (no shower)	N/A	N/A
Office DL1	YES (+4%)	NO
Office NDL	NO (-60%)	NO
Reception lobby	YES (+35%)	NO
Office DL2	YES (+22%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	1188	1188
External area [m^2]	2926	2926
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	1060	938
Average U-value [W/m^2K]	0.36	0.32
Alpha value* [%]	21.08	6.08

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
90	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
10	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	3.19	2.24
Cooling	0.83	1.26
Auxiliary	1.83	1.26
Lighting	20.36	20.08
Hot water	17.02	17.02
Equipment*	50.16	50.16
TOTAL**	**43.23**	**41.86**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	9.72	1.16
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*9.72*	*1.16*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	45	39.92
Primary energy [kWh_{PE}/m^2]	51.46	60.2
Total emissions [kg/m^2]	4.85	5.56

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	406.8	43.5	32.3	2.4	0	3.5	5	3.5	5
	Notional	408.9	36.1	43	2.3	0	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	46.2	0	12.8	0	0	1	0	1	0
	Notional	46.5	0	9.6	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	157	0	43.6	0	27.6	1	0	1	0
	Notional	156.9	0	32.5	0	33.2	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	59.7	0	16.6	0	11.7	1	0	1	0
	Notional	62.5	0	13	0	10.4	1.34	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	87.9	124.6	7	6.9	11.7	3.5	5	3.5	5
	Notional	9.4	173.8	1	11	5.7	2.64	4.4	----	----

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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 4 - For Planning

As designed

Date: Fri Jan 09 09:09:21 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 4 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 239.55

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	4.53	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	4.04	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	48.84	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	42.72	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated soffit (between warehouse and o
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Spandrel Panel
Rooflights***	2.2	2.2	2.2	Rooflight 6.97
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large top
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (2 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- MVHR + VRF (4 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- EOL + EPH (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Cleaners	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL2	-	-	-	-	1.4	-	-	-	-	-	N/A
FF Cleaners	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Male	NO
FF WC Female	NO
FF WC disabled	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception DL	NO
GF Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Lobby WC male	NO
FF Lobby WC female	NO
FF Corridor	NO
FF Roof access	NO
Office DL2	NO
Office NDL2	NO

Shell and core configuration

Zone	Assumed shell?
FF Staircase	NO
Reception NDL	NO
FF Circ WCS	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
Warehouse	120	-	-
Warehouse Undercroft DL1	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-
FF WC Male	95	-	-
FF WC Female	95	-	-
FF WC disabled	95	-	-
GF Cleaners	95	-	-
GF Lockers (no shower)	100	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception DL	100	95	-
GF Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Lobby WC male	95	-	-
FF Lobby WC female	95	-	-
FF Corridor	95	-	-
FF Roof access	95	-	-
Warehouse DL2	120	-	-
Office DL2	100	-	-
Office NDL2	100	-	-
FF Staircase	95	-	-
Warehouse DL3	120	-	-
Reception NDL	100	95	-
FF Cleaners	95	-	-
FF Circ WCS	95	-	-

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?
Warehouse	YES (+25%)	NO
Warehouse Undercroft DL1	YES (+78%)	NO
Warehouse Undercroft NDL	NO (-60%)	NO
GF Lockers (no shower)	N/A	N/A
Office DL1	YES (+25%)	NO
Office NDL	NO (-75%)	NO
Reception DL	YES (+26%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Warehouse DL2	YES (+257%)	NO
Office DL2	NO (-8%)	NO
Office NDL2	NO (-70%)	NO
Warehouse DL3	YES (+415%)	NO
Reception NDL	NO (-23%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2539	2539
External area [m^2]	6499	6499
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	2274	2085
Average U-value [W/m^2K]	0.35	0.32
Alpha value* [%]	19.76	4.76

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
93	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
7	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.28	2.44
Cooling	1.34	2.19
Auxiliary	1.79	1.27
Lighting	21.18	19.72
Hot water	12.72	12.46
Equipment*	49.1	49.1
TOTAL**	**39.3**	**38.08**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	11.55	5.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*11.55*	*5.07*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	34.6	54.04
Primary energy [kWh_{PE}/m^2]	42.72	48.84
Total emissions [kg/m^2]	4.04	4.53

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	30.3	103.1	2.4	5.7	0	3.5	5	3.5	5
	Notional	393.3	169.6	41.4	10.7	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0.5	206.9	0	11.5	11.7	3.5	5	3.5	5
	Notional	0	293.3	0	18.5	5.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	66	0	18.3	0	0	1	0	1	0
	Notional	66.1	0	13.7	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	79.6	0	22.1	0	28.8	1	0	1	0
	Notional	79.5	0	16.5	0	34.6	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	72.2	0	20	0	11.7	1	0	1	0
	Notional	75.3	0	15.6	0	9.7	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

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

Shinfield Park - Unit 5 - For Planning

As designed

Date: Tue Jan 13 12:14:11 2026

Administrative information

Building Details

Address: Shinfield Park - Unit 5 - For Planning, Reading,

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park , MILTON KEYNES, MK14 6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.7"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.7

BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 271.14

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	4	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	3.29	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	43.26	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	34.62	
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	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.26	0.26	External Wall
Floors	0.18	0.18	0.18	Internal Floor/Insulated Soffit (between warehouse and
Pitched roofs	0.16	0.16	0.16	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.6	1.6	Spandrel Panel
Rooflights***	2.2	2.2	2.2	Rooflight (vertical)
Personnel doors^	1.6	1.6	1.6	Fire Door
Vehicle access & similar large doors	1.3	1.3	1.3	Vehicle Door large upper
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]

* 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^2K

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	2.5

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- NV + VRF (Reception lobby)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- MVHR + VRF (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	5	-	-	0.75
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- NV + EPH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- EOL + EPH (5 Zones)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- MVHR + EPH (GF Lockers (no shower))

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	1	-	-	-	0.75
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- New HWS Circuit

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	1	0
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		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
GF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Male	-	-	0.5	-	-	-	-	-	-	-	N/A
FF WC Female	-	-	0.5	-	-	-	-	-	-	-	N/A
FF Cleaners Store	-	-	0.5	-	-	-	-	-	-	-	N/A
GF Lockers (no shower)	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL1	-	-	-	-	1.4	-	-	-	-	-	N/A
Office NDL	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Changing (shower)	-	-	0.5	-	-	-	-	-	-	-	N/A
Office DL2	-	-	-	-	1.4	-	-	-	-	-	N/A
Office DL3	-	-	-	-	1.4	-	-	-	-	-	N/A
FF WC disabled	-	-	0.5	-	-	-	-	-	-	-	N/A
Office NDL2	-	-	-	-	1.4	-	-	-	-	-	N/A
GF Cleaners Store	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
GF WC disabled	NO
FF WC Male	NO
FF WC Female	NO
GF Lockers (no shower)	NO
Office DL1	NO
Office NDL	NO
Reception lobby	NO
GF Staircase	NO
GF Lobby	NO
GF Changing (shower)	NO
FF Lobby WC male	NO
FF Lobby WC female	NO
FF Corridor	NO
FF Roof access	NO
Office DL2	NO
Office DL3	NO

Shell and core configuration

Zone	Assumed shell?
FF Corridor 2	NO
FF WC disabled	NO
FF Staircase	NO
Office NDL2	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
Warehouse	120	-	-
Warehouse Undercroft DL1	120	-	-
Warehouse Undercroft NDL	120	-	-
GF WC disabled	95	-	-
FF WC Male	95	-	-
FF WC Female	95	-	-
FF Cleaners Store	95	-	-
GF Lockers (no shower)	95	-	-
Office DL1	100	-	-
Office NDL	100	-	-
Reception lobby	100	95	-
GF Staircase	95	-	-
GF Lobby	95	-	-
GF Changing (shower)	95	-	-
FF Lobby WC male	95	-	-
FF Lobby WC female	95	-	-
FF Corridor	95	-	-
FF Roof access	95	-	-
Office DL2	100	-	-
Office DL3	100	-	-
FF Corridor 2	95	-	-
FF WC disabled	95	-	-
Warehouse Undercroft DL2	120	-	-
FF Staircase	95	-	-
Office NDL2	100	-	-
GF Cleaners Store	95	-	-

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?
Warehouse	YES (+79%)	NO
Warehouse Undercroft DL1	YES (+93%)	NO
Warehouse Undercroft NDL	NO (-45%)	NO
GF Lockers (no shower)	N/A	N/A
Office DL1	NO (-12%)	NO
Office NDL	NO (-70%)	NO
Reception lobby	YES (+57%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Office DL2	YES (+25%)	NO
Office DL3	YES (+12%)	NO
Warehouse Undercroft DL2	YES (+265%)	NO
Office NDL2	NO (-57%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3552	3552
External area [m^2]	9161	9161
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	3491	2938
Average U-value [W/m^2K]	0.38	0.32
Alpha value* [%]	19.07	4.07

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
95	**Storage or Distribution**
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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
5	**Others: Miscellaneous 24hr Activities**
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.48	1.67
Cooling	0.74	1.07
Auxiliary	1.54	1.04
Lighting	19.36	18.58
Hot water	8.89	8.71
Equipment*	47.97	47.97
TOTAL**	**33.02**	**31.07**

* 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/m^2]

	Actual	Notional
Photovoltaic systems	10.6	1.85
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*10.6*	*1.85*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	30.53	29.7
Primary energy [kWh_{PE}/m^2]	34.62	43.26
Total emissions [kg/m^2]	3.29	4

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 SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	156.3	75.5	12.4	4.2	0	3.5	5	3.5	5
	Notional	393.3	75.5	41.4	4.8	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	73.8	127.2	5.9	7.1	11.7	3.5	5	3.5	5
	Notional	10.5	164.3	1.1	10.4	5.7	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	71.3	0	19.8	0	0	1	0	1	0
	Notional	71.5	0	14.8	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	77.8	0	21.6	0	28.6	1	0	1	0
	Notional	77.7	0	16.1	0	34.3	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	81.5	0	22.6	0	11.7	1	0	1	0
	Notional	84.5	0	17.5	0	9.9	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

APPENDIX C – DRAFT INDICATIVE EPC CERTIFICATE (BASED ON WORST CASE SHELL AREAS)

Energy Performance Certificate

Non-Domestic Building

HM Government

Shinfield Park - Unit 1 - For Planning
Reading

Certificate Reference Number:
0369-9069-1523-0454-8673

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

14 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	8224
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	3.03
Primary energy use (kWh_{PE}/m^2 per year):	32.31

Benchmarks

Buildings similar to this one could have ratings as follows:

14 If newly built

55 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	TAS v9.5.7 using calculation engine TAS v9.5.7
Property Reference:	UPRN-123456789012
Assessor Name:	MBA Consulting Engineers
Assessor Number:	LCEA000000
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	MBA Consulting Engineers Ltd
Employer/Trading Address:	Maple House, Woodlands Business Park, Milton Keynes Mk14 6FG
Issue Date:	09 Jan 2026
Valid Until:	08 Jan 2036 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 4041-9566-3885-9375-5284

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by CIBSE Certification Limited. You can obtain contact details of the Accreditation Scheme at www.cibsecertification.com.

A copy of this certificate has been lodged on a national register as a requirement under the Energy Performance of Buildings Regulations 2012 as amended. It will be made available via the online search function at www.ndepcregister.com. The certificate (including the building address) and other data about the building collected during the energy assessment but not shown on the certificate, for instance heating system data, will be made publicly available at www.opendatacommunities.org.

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Opportunity to benefit from a Green Deal on this property

The Green Deal can help you cut your energy bills by making energy efficiency improvements at no upfront costs. Use the Green Deal to find trusted advisors who will come to your property, recommend measures that are right for you and help you access a range of accredited installers. Responsibility for repayments stays with the property - whoever pays the energy bills benefits so they are responsible for the payments.

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Energy Performance Certificate

Non-Domestic Building

HM Government

Shinfield Park - Unit 2 - For Planning
Reading

Certificate Reference Number:
4787-5254-5995-2429-7961

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

14 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	3769
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	3.61
Primary energy use (kWh_{PE}/m^2 per year):	38.47

Benchmarks

Buildings similar to this one could have ratings as follows:

14 If newly built

56 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	TAS v9.5.7 using calculation engine TAS v9.5.7
Property Reference:	UPRN-123456789012
Assessor Name:	MBA Consulting Engineers
Assessor Number:	LCEA000000
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	MBA Consulting Engineers Ltd
Employer/Trading Address:	Maple House, Woodlands Business Park, Milton Keynes Mk14 6FG
Issue Date:	09 Jan 2026
Valid Until:	08 Jan 2036 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 4010-5372-2577-0688-0591

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by CIBSE Certification Limited. You can obtain contact details of the Accreditation Scheme at www.cibsecertification.com.

A copy of this certificate has been lodged on a national register as a requirement under the Energy Performance of Buildings Regulations 2012 as amended. It will be made available via the online search function at www.ndepcregister.com. The certificate (including the building address) and other data about the building collected during the energy assessment but not shown on the certificate, for instance heating system data, will be made publicly available at www.opendatacommunities.org.

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Opportunity to benefit from a Green Deal on this property

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Energy Performance Certificate

Non-Domestic Building

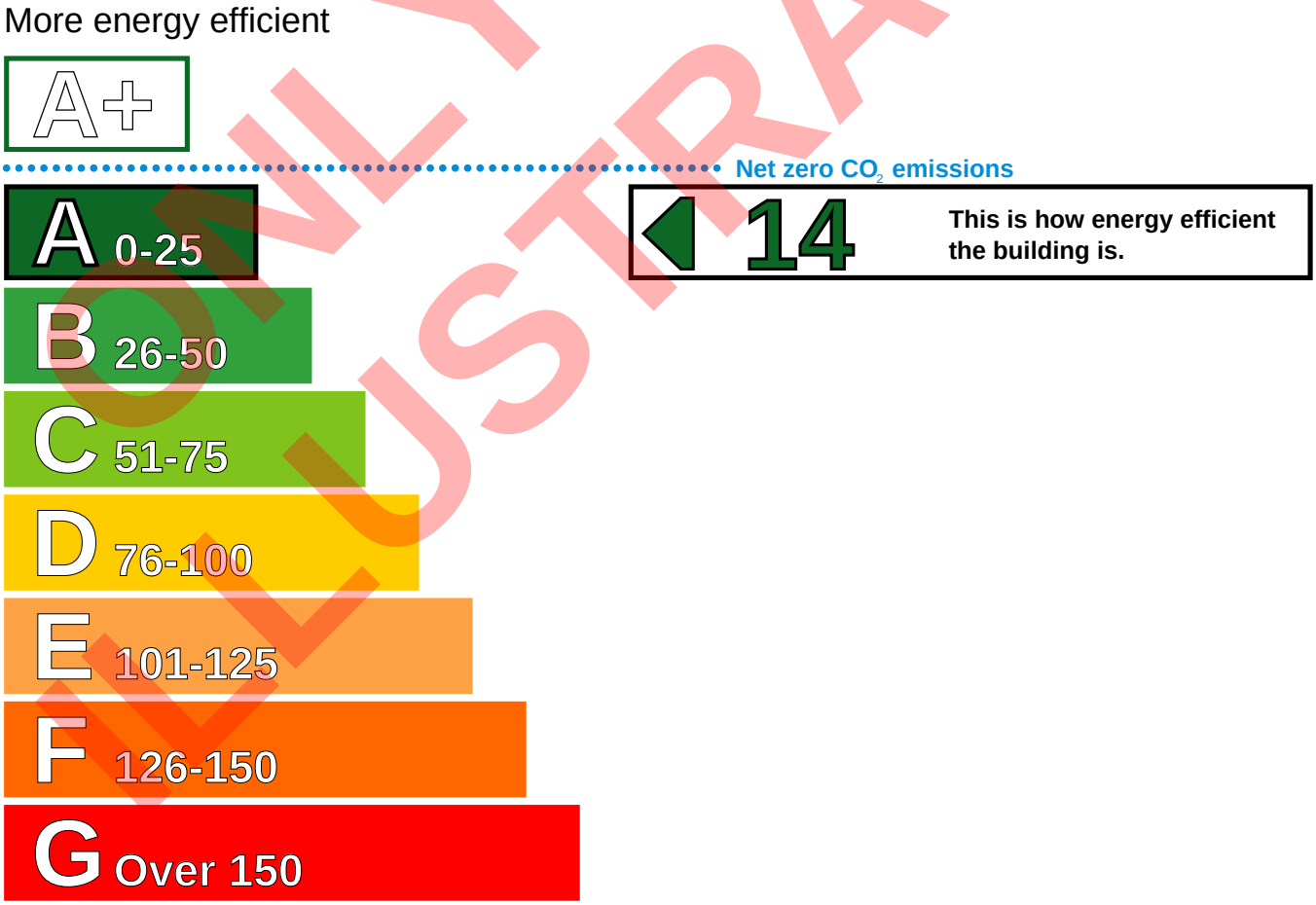
HM Government

Shinfield Park Unit 3A - For Planning
Reading
RG2 9FW

Certificate Reference Number:
6083-7317-2223-6663-5878

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating



Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	1187
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	4.75
Primary energy use (kWh_{PE}/m^2 per year):	50.5

Benchmarks

Buildings similar to this one could have ratings as follows:

15 If newly built

58 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	TAS v9.5.7 using calculation engine TAS v9.5.7
Property Reference:	UPRN-123456789012
Assessor Name:	MBA Consulting Engineers
Assessor Number:	LCEA123456
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	MBA Consulting Engineers Ltd
Employer/Trading Address:	Maple House, Woodlands Business Park, Milton Keynes Mk14 6FG
Issue Date:	12 Jan 2026
Valid Until:	11 Jan 2036 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 2472-8124-6848-9888-5512

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by CIBSE Certification Limited. You can obtain contact details of the Accreditation Scheme at www.cibsecertification.com.

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Opportunity to benefit from a Green Deal on this property

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Energy Performance Certificate

Non-Domestic Building

HM Government

Shinfield ParkUnit 3B - For Planning
Reading
RG2 9FW

Certificate Reference Number:
4178-3994-9941-3606-2424

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

14 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	1188
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	4.78
Primary energy use (kWh_{PE}/m^2 per year):	50.95

Benchmarks

Buildings similar to this one could have ratings as follows:

14 If newly built

58 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	TAS v9.5.7 using calculation engine TAS v9.5.7
Property Reference:	UPRN-123456789012
Assessor Name:	MBA Consulting Engineers
Assessor Number:	LCEA123456
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	MBA Consulting Engineers Ltd
Employer/Trading Address:	Maple House, Woodlands Business Park, Milton Keynes Mk14 6FG
Issue Date:	12 Jan 2026
Valid Until:	11 Jan 2036 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 6305-0687-7483-8927-4243

About this document and the data in it

This document has been produced following an energy assessment undertaken by a qualified Energy Assessor, accredited by CIBSE Certification Limited. You can obtain contact details of the Accreditation Scheme at www.cibsecertification.com.

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Energy Performance Certificate

Non-Domestic Building

HM Government

Shinfield Park - Unit 4 - For Planning
Reading

Certificate Reference Number:
4491-9928-2244-9137-5902

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

13 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	2539
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	3.79
Primary energy use (kWh_{PE}/m^2 per year):	40.22

Benchmarks

Buildings similar to this one could have ratings as follows:

13 If newly built

51 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	TAS v9.5.7 using calculation engine TAS v9.5.7
Property Reference:	UPRN-123456789012
Assessor Name:	MBA Consulting Engineers
Assessor Number:	LCEA000000
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	MBA Consulting Engineers Ltd
Employer/Trading Address:	Maple House, Woodlands Business Park, Milton Keynes Mk14 6FG
Issue Date:	09 Jan 2026
Valid Until:	08 Jan 2036 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 1908-0855-4668-5911-3332

About this document and the data in it

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Energy Performance Certificate

Non-Domestic Building

HM Government

Shinfield Park - Unit 5 - For Planning
Reading

Certificate Reference Number:
5337-8727-2842-6057-4573

This certificate shows the energy rating of this building. It indicates the energy efficiency of the building fabric and the heating, ventilation, cooling and lighting systems. The rating is compared to two benchmarks for this type of building: one appropriate for new buildings and one appropriate for existing buildings. There is more advice on how to interpret this information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government's website at www.gov.uk/government/collections/energy-performance-certificates.

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

14 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	3552
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	4.08
Primary energy use (kWh_{PE}/m^2 per year):	43.45

Benchmarks

Buildings similar to this one could have ratings as follows:

14 If newly built

55 If typical of the existing stock

Administrative information

This is an Energy Performance Certificate as defined in the Energy Performance of Buildings Regulations 2012 as amended.

Assessment Software:	TAS v9.5.7 using calculation engine TAS v9.5.7
Property Reference:	UPRN-123456789012
Assessor Name:	MBA Consulting Engineers
Assessor Number:	LCEA123456
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	MBA Consulting Engineers Ltd
Employer/Trading Address:	Maple House, Woodlands Business Park, Milton Keynes Mk14 6FG
Issue Date:	13 Jan 2026
Valid Until:	12 Jan 2036 (unless superseded by a later certificate)
Related Party Disclosure:	Not related to the owner

Recommendations for improving the energy performance of the building are contained in the associated Recommendation Report: 4434-0951-1577-4149-2114

About this document and the data in it

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APPENDIX D – ARCHITECTURAL DRAWINGS USED FOR DYNAMIC MODELLING

DRAWING	DATE RECEIVED
5704-CA-01-00-DR-A-01110-T04-UNIT 1 - WAREHOUSE GA PLAN	15.08.2025
5704-CA-01-RF-DR-A-01112-T04-UNIT 1 - ROOF GA PLAN	15.08.2025
5704-CA-01-XX-DR-A-01111-T04-UNIT 1 - OFFICE FLOOR GA PLANS	15.08.2025
5704-CA-01-XX-DR-A-02110-T04-UNIT 1 - PROPOSED ELEVATIONS	15.08.2025
5704-CA-01-XX-DR-A-03110-T04-UNIT 1 - PROPOSED WAREHOUSE GA SECTIONS	15.08.2025
5704-CA-01-XX-DR-A-03111-T04-UNIT 1 - PROPOSED OFFICE SECTIONS	15.08.2025
5704-CA-01-XX-DR-A-35010-T03-UNIT 1 - OFFICE REFLECTED CEILING PLANS	15.08.2025
5704-CA-02-00-DR-A-01120-T04-UNIT 2 - WAREHOUSE GA PLAN	15.08.2025
5704-CA-02-RF-DR-A-01122-T03-UNIT 2 - ROOF GA PLAN	15.08.2025
5704-CA-02-XX-DR-A-01121-T04-UNIT 2 - OFFICE FLOOR GA PLANS	15.08.2025
5704-CA-02-XX-DR-A-02120-T03-UNIT 2 - PROPOSED ELEVATIONS	15.08.2025
5704-CA-02-XX-DR-A-03120-T03-UNIT 2 - PROPOSED WAREHOUSE GA SECTIONS	15.08.2025
5704-CA-02-XX-DR-A-03121-T04-UNIT 2 - PROPOSED OFFICE SECTIONS	15.08.2025
5704-CA-02-XX-DR-A-35020-T04-UNIT 2 - OFFICE REFLECTED CEILING PLANS	15.08.2025
5704-CA-03-00-DR-A-01130-T04-UNIT 3A AND 3B - WAREHOUSE GA PLAN	15.08.2025
5704-CA-03-RF-DR-A-01132-T03-UNIT 3A AND 3B - ROOF GA PLAN	15.08.2025
5704-CA-03-XX-DR-A-01131-T04-UNIT 3A AND 3B - OFFICE FLOOR GA PLANS	15.08.2025
5704-CA-03-XX-DR-A-02130-T03-UNIT 3A AND 3B - PROPOSED ELEVATIONS	15.08.2025
5704-CA-03-XX-DR-A-03130-T03-UNIT 3A AND 3B - PROPOSED WAREHOUSE GA SECTIONS	15.08.2025
5704-CA-03-XX-DR-A-03131-T03-UNIT 3A AND 3B - PROPOSED OFFICE SECTIONS	15.08.2025
5704-CA-03-XX-DR-A-35030-T03-UNIT 3A&3B - OFFICE REFLECTED CEILING PLANS	15.08.2025
5704-CA-04-00-DR-A-01140-UNIT 4 - WAREHOUSE GA PLAN-T04	15.08.2025
5704-CA-04-RF-DR-A-01142-UNIT 4 - ROOF GA PLAN-T03	15.08.2025
5704-CA-04-XX-DR-A-01141-UNIT 4 - OFFICE FLOOR GA PLANS-T03	15.08.2025
5704-CA-04-XX-DR-A-02140-UNIT 4 - PROPOSED ELEVATIONS-T03	15.08.2025
5704-CA-04-XX-DR-A-03140-UNIT 4 - PROPOSED WAREHOUSE GA SECTIONS-T03	15.08.2025
5704-CA-04-XX-DR-A-03141-UNIT 4 - PROPOSED OFFICE SECTIONS-T03	15.08.2025
5704-CA-04-XX-DR-A-35040-UNIT 4 - OFFICE REFLECTED CEILING PLANS-T03	15.08.2025
5704-CA-05-00-DR-A-01150-T04-UNIT 5 - WAREHOUSE GA PLAN	15.08.2025

DRAWING	DATE RECEIVED
5704-CA-05-RF-DR-A-01152-T03-UNIT 5 - ROOF GA PLAN	15.08.2025
5704-CA-05-XX-DR-A-01151-T03-UNIT 5 - OFFICE FLOOR GA PLANS	15.08.2025
5704-CA-05-XX-DR-A-02150-T03-UNIT 5 - PROPOSED ELEVATIONS	15.08.2025
5704-CA-05-XX-DR-A-03150-T03-UNIT 5 - PROPOSED WAREHOUSE GA SECTIONS	15.08.2025
5704-CA-05-XX-DR-A-03151-T03-UNIT 5 - PROPOSED OFFICE SECTIONS	15.08.2025
5704-CA-05-XX-DR-A-35050-T03-UNIT 5 - OFFICE REFLECTED CEILING PLANS	15.08.2025
5704-CA-ZZ-00-DR-A-01051 - PROPOSED SITE LAYOUT MASTERPLAN_VE-T13	15.08.2025
5704-CA-01-00-DR-A-00100-UNIT 1 - WAREHOUSE GA PLAN-P3	21.01.2025
5704-CA-01-RF-DR-A-00102-UNIT 1 - ROOF GA PLAN-P3	21.01.2025
5704-CA-01-ZZ-DR-A-00101-UNIT 1 -OFFICE FLOOR GA PLANS-P3	21.01.2025
5704-CA-01-ZZ-DR-A-00150-UNIT 1 - PROPOSED WAREHOUSE GA SECTIONS-P3	21.01.2025
5704-CA-01-ZZ-DR-A-00151-UNIT 1 - PROPOSED OFFICE SECTIONS-P3	21.01.2025
5704-CA-01-ZZ-DR-A-00170-UNIT 1 - PROPOSED ELEVATIONS-P3	21.01.2025
5704-CA-02-00-DR-A-00100-UNIT 2 - WAREHOUSE GA PLAN-P3	21.01.2025
5704-CA-02-RF-DR-A-00102-UNIT 2 - ROOF GA PLAN-P3	21.01.2025
5704-CA-02-ZZ-DR-A-00101-UNIT 2 - OFFICE FLOOR GA PLANS-P3	21.01.2025
5704-CA-02-ZZ-DR-A-00150-UNIT 2 - PROPOSED WAREHOUSE GA SECTIONS-P3	21.01.2025
5704-CA-02-ZZ-DR-A-00151-UNIT 2 - PROPOSED OFFICE SECTIONS-P3	21.01.2025
5704-CA-02-ZZ-DR-A-00170-UNIT 2 - PROPOSED ELEVATIONS-P3	21.01.2025
5704-CA-03-00-DR-A-00100-UNIT 3A AND 3B - WAREHOUSE GA PLAN-P3	21.01.2025
5704-CA-03-RF-DR-A-00102-UNIT 3A AND 3B - ROOF GA PLAN-P3	21.01.2025
5704-CA-03-ZZ-DR-A-00101-UNIT 3A AND 3B - OFFICE FLOOR GA PLANS-P3	21.01.2025
5704-CA-03-ZZ-DR-A-00150-UNIT 3A AND 3B - PROPOSED WAREHOUSE GA SECTIONS-P3	21.01.2025
5704-CA-03-ZZ-DR-A-00151-UNIT 3A AND 3B - PROPOSED OFFICE SECTIONS-P3	21.01.2025
5704-CA-03-ZZ-DR-A-00170-UNIT 3A AND 3B - PROPOSED ELEVATIONS-P3	21.01.2025
5704-CA-04-00-DR-A-00100-UNIT 4 - WAREHOUSE GA PLAN-P3	21.01.2025
5704-CA-04-RF-DR-A-00102-UNIT 4 - ROOF GA PLAN-P3	21.01.2025
5704-CA-04-ZZ-DR-A-00101-UNIT 4 - OFFICE FLOOR GA PLANS-P3	21.01.2025
5704-CA-04-ZZ-DR-A-00150-UNIT 4 - PROPOSED WAREHOUSE GA SECTIONS-P3	21.01.2025
5704-CA-04-ZZ-DR-A-00151-UNIT 4 - PROPOSED OFFICE SECTIONS-P3	21.01.2025
5704-CA-04-ZZ-DR-A-00170-UNIT 4 - PROPOSED ELEVATIONS-P3	21.01.2025

DRAWING	DATE RECEIVED
5704-CA-05-00-DR-A-00100-UNIT 5 - WAREHOUSE GA PLAN-P3	21.01.2025
5704-CA-05-RF-DR-A-00102-UNIT 5 - ROOF GA PLAN-P3	21.01.2025
5704-CA-05-ZZ-DR-A-00101-UNIT 5 - OFFICE FLOOR GA PLANS-P3	21.01.2025
5704-CA-05-ZZ-DR-A-00150-UNIT 5 - PROPOSED WAREHOUSE GA SECTIONS-P3	21.01.2025
5704-CA-05-ZZ-DR-A-00151-UNIT 5 - PROPOSED OFFICE SECTIONS-P3	21.01.2025
5704-CA-05-ZZ-DR-A-00170-UNIT 5 - PROPOSED ELEVATIONS-P3	21.01.2025
5704-CA-ZZ-00-DR-A-00051 - PROPOSED SITE LAYOUT MASTERPLAN-P4	21.01.2025

Table 17 – Architectural Drawings used to produce the draft thermal model

APPENDIX E – BREEAM DRAFT ENE 01 CALCULATIONS OUTPUTS

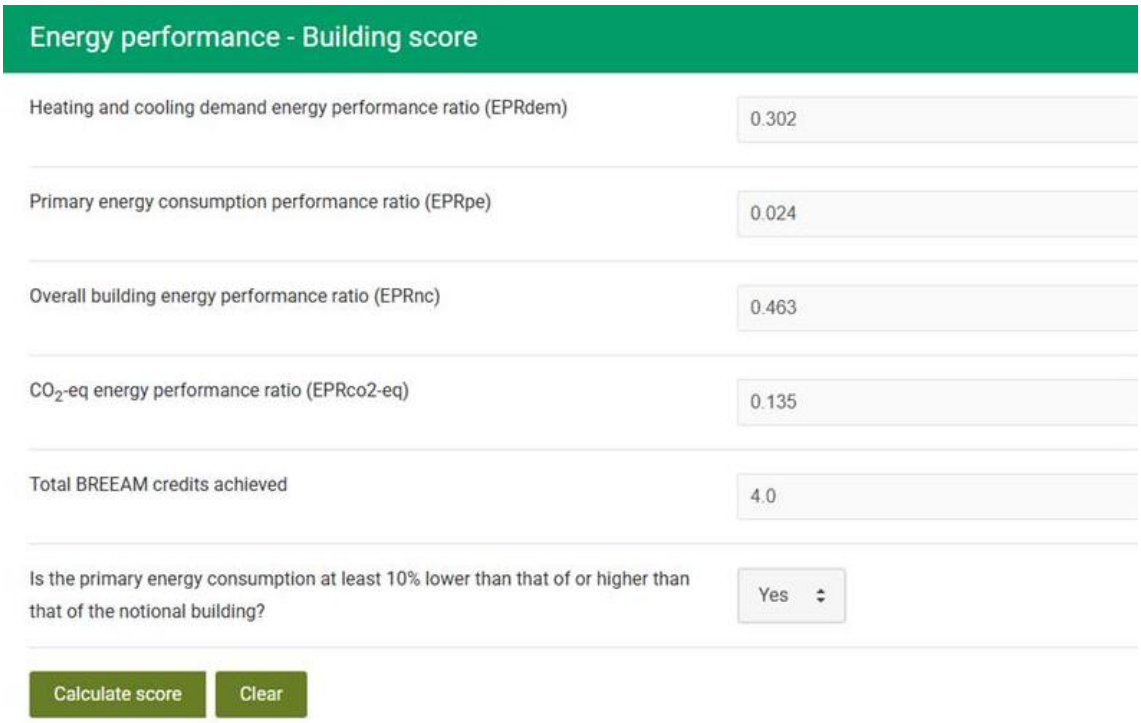

Figure 25 – BREEAM Calculation Outputs for Unit 1

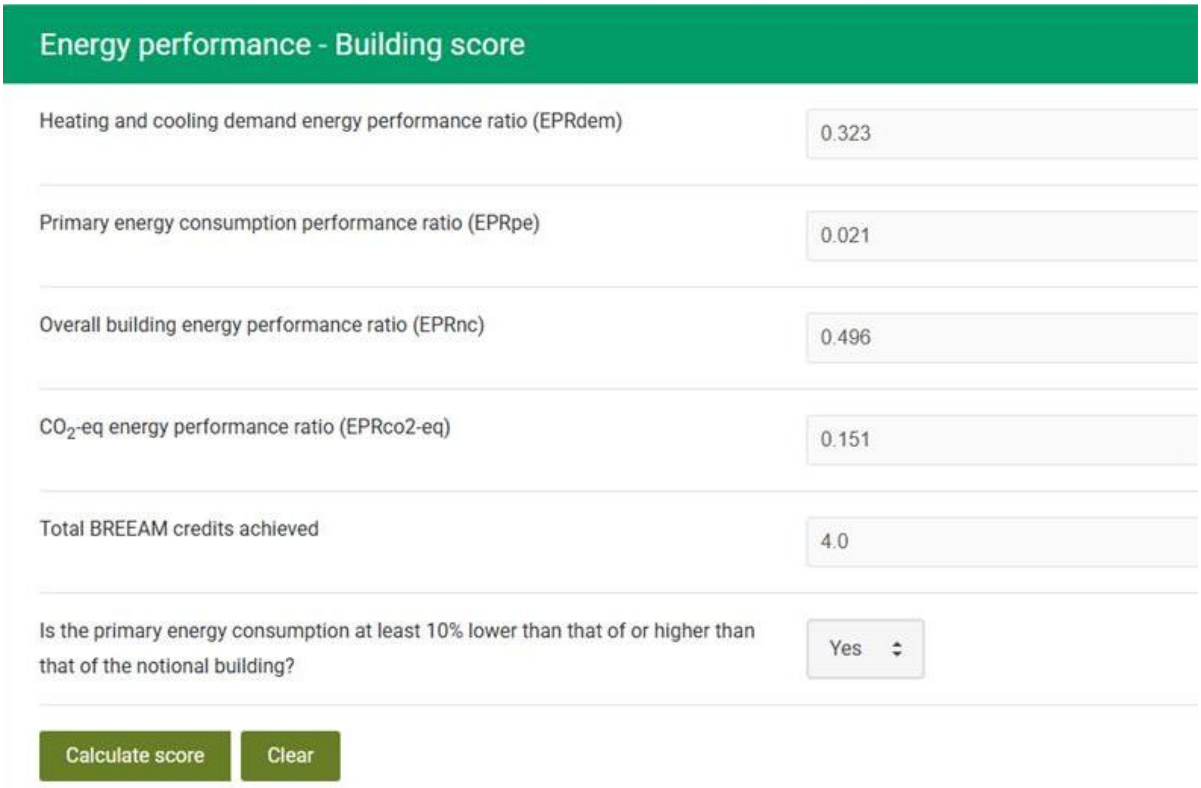

Figure 26 – BREEAM Calculation Outputs for Unit 2

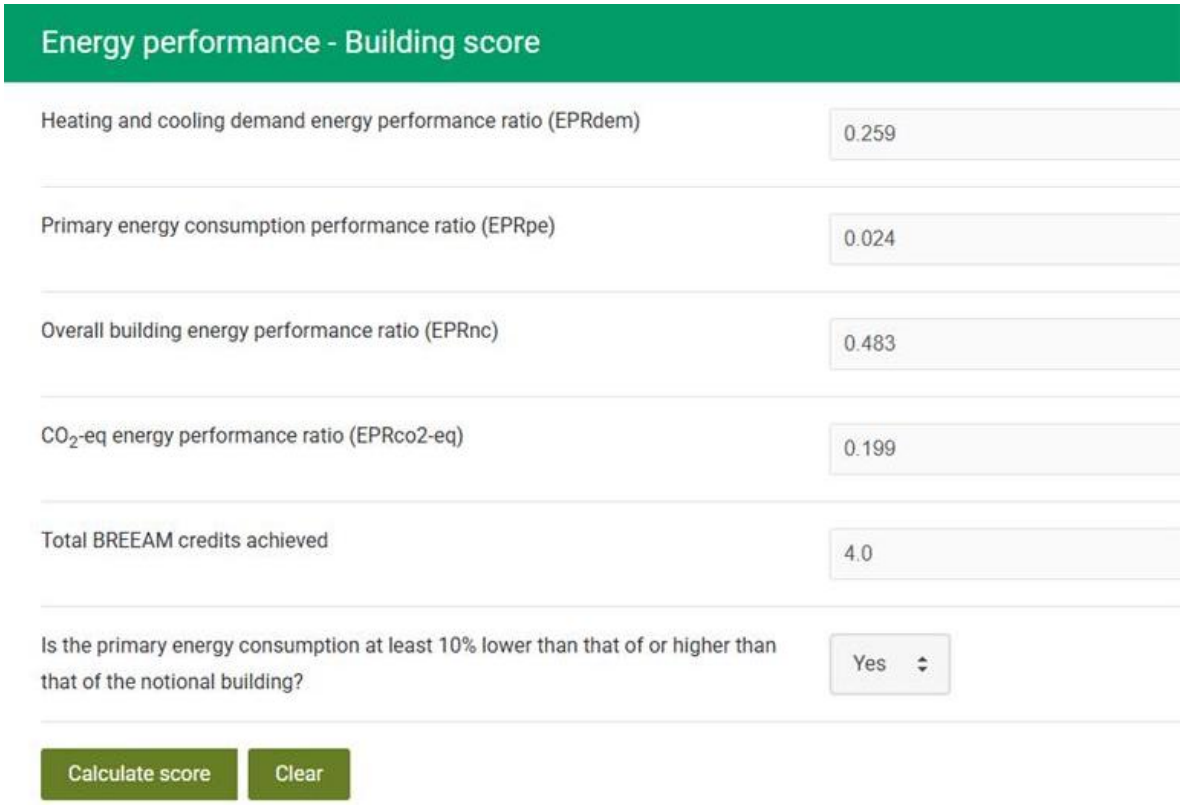

Figure 27 – BREEAM Calculation Outputs for Unit 3A

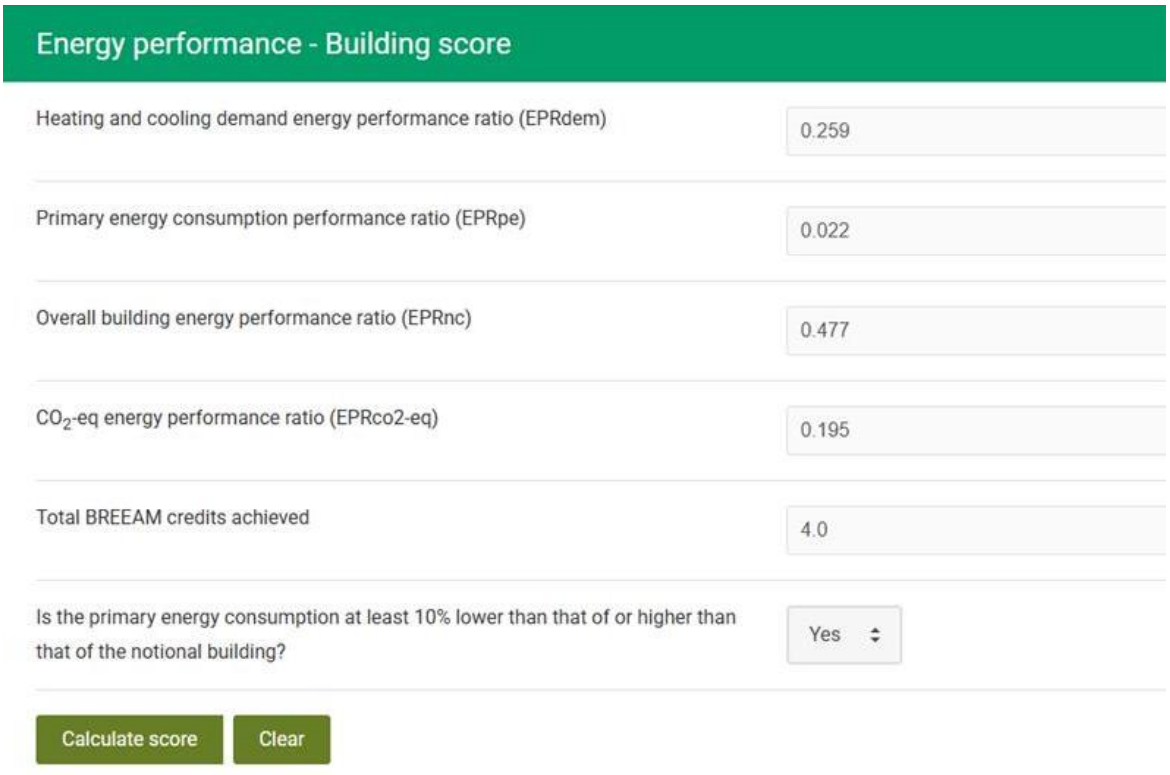

Figure 28 – BREEAM Calculation Outputs for Unit 3B

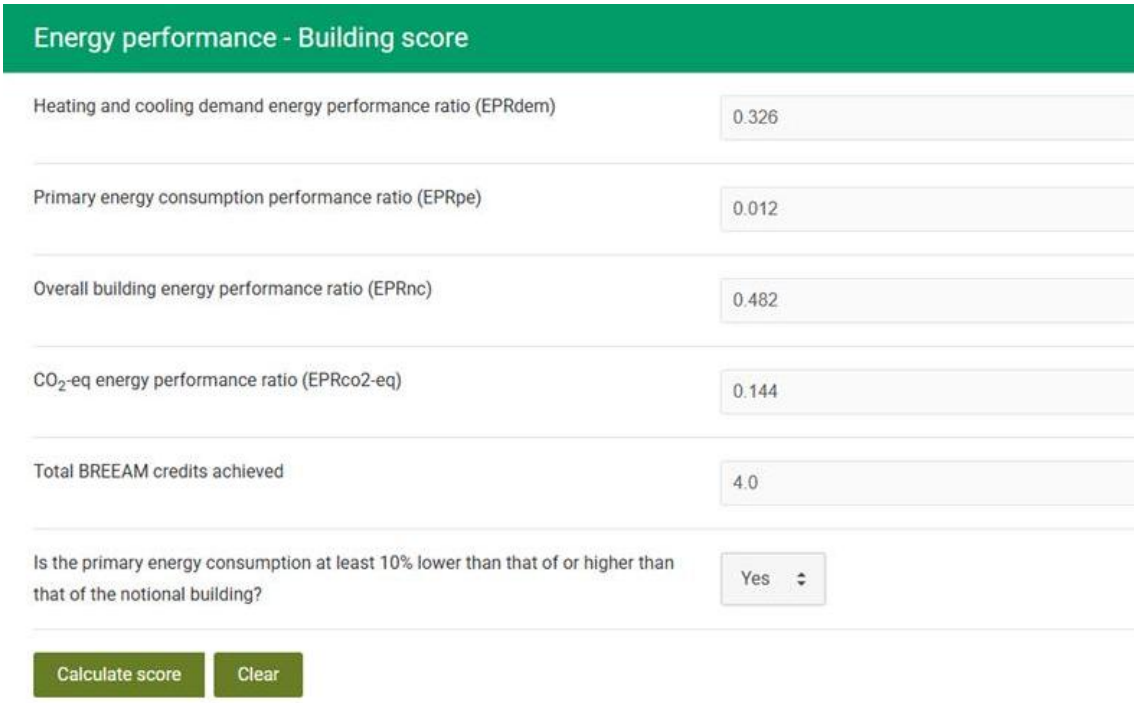

Figure 29 – BREEAM Calculation Outputs for Unit 4

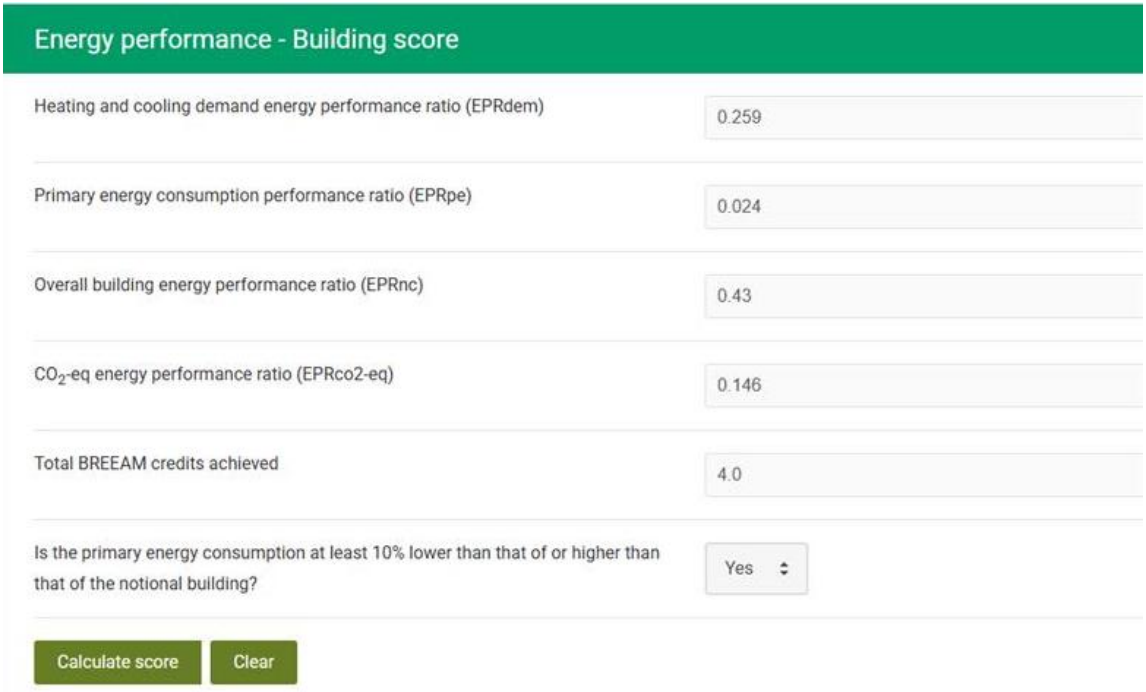

Figure 30 – BREEAM Calculation Outputs for Unit 5