

ENERGY AND SUSTAINABILITY STRATEGY

FOR:
Indurent Park, Knowsley

A PROJECT FOR:
Indurent Management Limited

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EXECUTIVE SUMMARY

1. MBA Consulting Engineers Ltd. has been commissioned by Indurent Management Limited to produce an Energy and Sustainability Strategy report in support of the application for Full Planning Permission for the proposed development on Land to the East of Moorgate Point, Alchemy Way, Knowsley Business Park Kirby.
2. The planning application proposes:

“Demolition of Existing Buildings/Structures and Erection of Industrial & Logistics Warehouse Units (Use Class B2 and/ or B8 and/ or E(g)(iii)), with Ancillary Offices, Including Provision of Revised Access Arrangements from Alchemy Way and All Associated Works of Landscaping, Car Parking and Servicing Arrangements.”
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 compliance with national building regulation Part L requirements.
 - Installation of renewable energy technologies.
 - Achieve EPC A+
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.

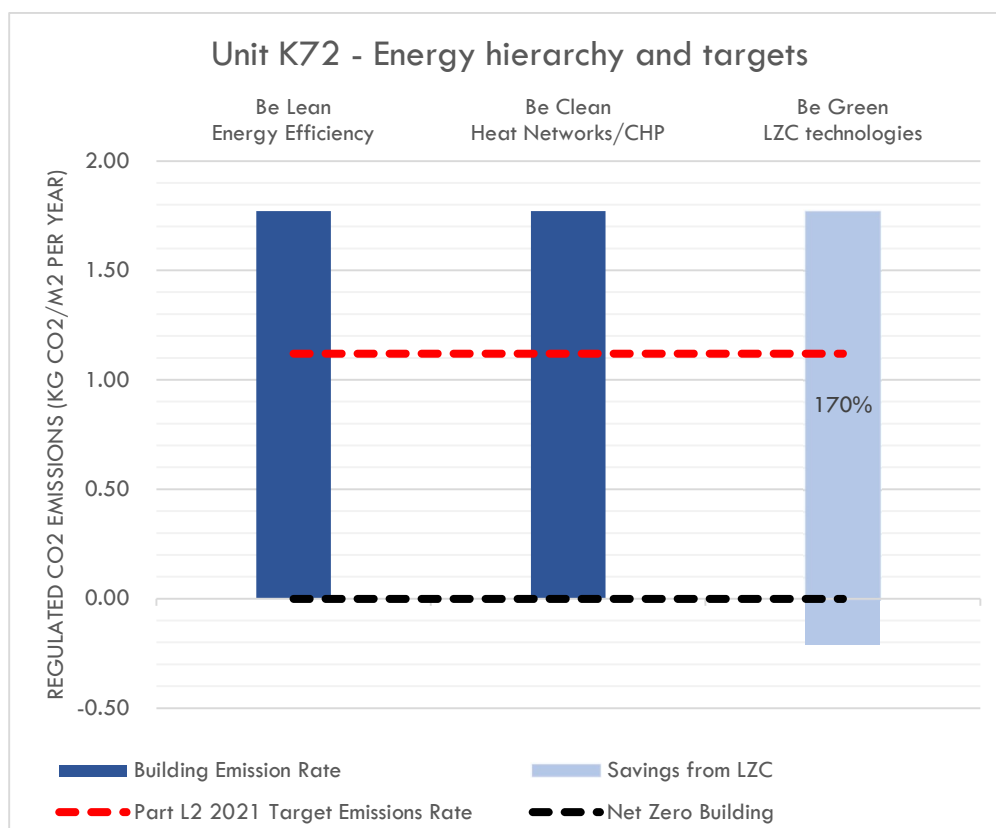


Figure 1 – Energy Hierarchy and targets – Unit K72

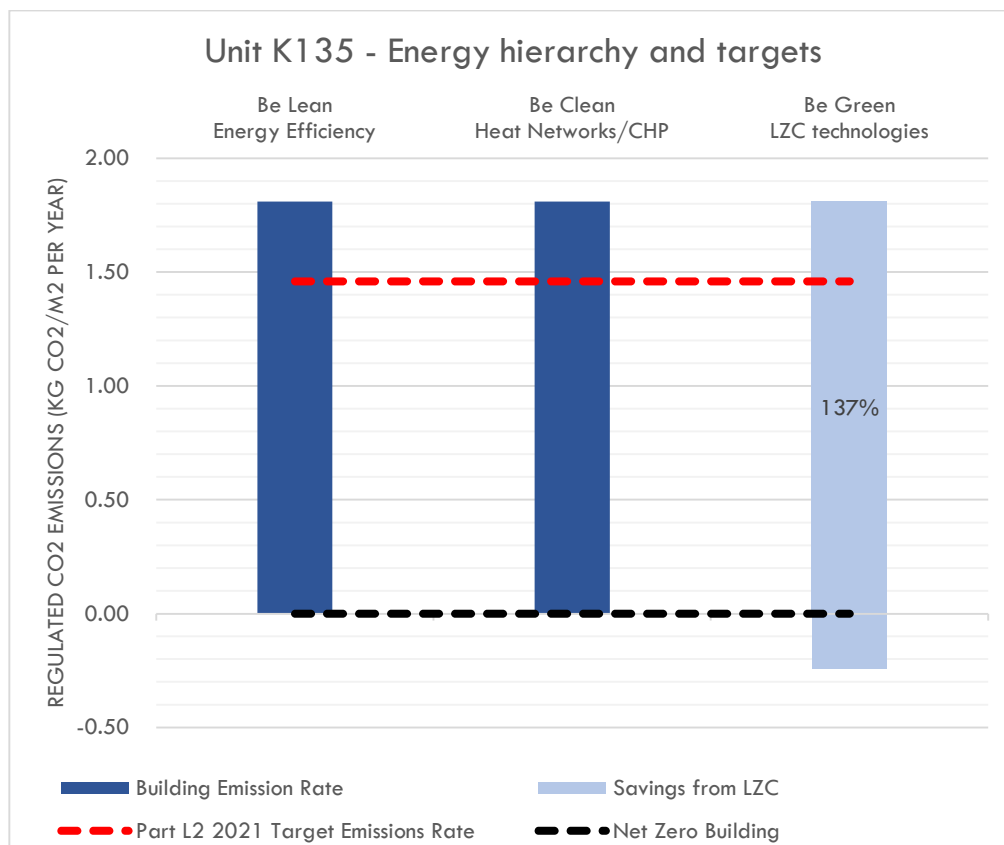


Figure 2 – Energy Hierarchy and targets – Unit K135

7. The results in [Figure 1-2](#) 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. 137-170% reduction in CO₂ emissions.
8. [Table 1](#) below shows the improvement in CO₂ savings for the proposed development compared to Part L2 target rates. The development achieves a total of 116-119% reduction in regulated CO₂ 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
K72	Be Lean	1.12	1.77	-58%
	Be Clean	1.12	1.77	-58%
	Be Green	1.12	-0.21	119%
K135	Be Lean	1.46	1.81	-24%
	Be Clean	1.46	1.81	-24%
	Be Green	1.46	-0.24	116%

Table 1 – CO₂ 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.

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1.0 INTRODUCTION

1. MBA Consulting Engineers Ltd. has been commissioned by Indurent Management Limited to produce an energy and sustainability strategy report in support of the application for Full Planning Permission for the proposed development on Land to the East of Moorgate Point, Alchemy Way, Knowsley Business Park Kirby.
2. The proposal development is described as:

“Demolition of Existing Buildings/Structures and Erection of Industrial & Logistics Warehouse Units (Use Class B2 and/ or B8 and/ or E(g)(iii)), with Ancillary Offices, Including Provision of Revised Access Arrangements from Alchemy Way and All Associated Works of Landscaping, Car Parking and Servicing Arrangements.”



Figure 3 – Site Layout Plan – 22520-UMC-ZZZZ-SI-DR-A-0601[P.01] – Masterplan

3. The proposed development Energy Strategy has been developed in accordance with the following complimentary local Borough planning policies:
 - Knowsley Local Plan Core Strategy (adopted January 2016)
 - Policy SD1: Sustainable Development
 - Policy CS2: Development Principles
 - Policy CS19: Design Quality and Accessibility in New Development
 - Policy CS22: Sustainable and Low Carbon Development
 - Policy CS23: Renewable and Low Carbon Infrastructure
 - Knowsley Design Quality in New Development SPD Adopted January 2016

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), 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. $BPER \leq TPER$.
 - The Building Emission Rate (BER) must not exceed the Target Emission Rate (TER), i.e. $BER \leq TER$.
 - 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 KNOWSLEY LOCAL PLAN CORE STRATEGY JANUARY 2016

1. The Knowsley Local Plan Core Strategy, adopted in January 2016, 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 SD1: Sustainable Development
 - When considering development proposals, a positive approach will be taken, which reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework
3. Policy CS2: Development Principles
 - Principle 2 expects new development to reduce carbon emissions and adapt to the effects of climate change by:

- Contributing to reductions in carbon dioxide emissions from all sources, in line with national targets;
- Ensuring an ability to adapt to future changes to national targets for carbon dioxide and other greenhouse gas emissions, including recognising the role of new technology;
- Identifying and applying measures offering effective mitigation and adaptation to likely environmental, social and economic impacts of climate change; and
- Meeting appropriate minimum standards for sustainability.
- Principle 4 expects new developments to recognise environmental limits, protect and enhance environmental assets, enhance local character and promote quality of place by:
 - Minimising negative impact upon flood risk, air quality, water quality, land quality, soil quality, and noise or vibration levels and ensuring any negative impacts are appropriately mitigated.
- Principle 5 expects new developments to make the most efficient use of available resources and infrastructure through promotion of sustainable construction and efficiency in resource use

4. Policy CS19: Design Quality and Accessibility in New Development

- To address the challenges of climate change and future changes in social, economic and environmental priorities, new development should integrate:
 - Sustainable design principles,
 - Biodiversity
 - Flood risk mitigation
 - Waste recycling; and
 - Energy and resource efficiency.

5. Policy CS22: Sustainable and Low Carbon Development – Sustainable Construction Principles

- Sustainable Construction Principles are required through high standards of sustainable design and construction including minimising carbon emissions. New development is required to:
 - Use natural systems to avoid internal overheating and excessive heat generation.
 - Limit energy use by incorporating high standards of insulation, heat retention, natural ventilation and passive solar techniques.
 - Supply energy efficiently and incorporating decentralised energy systems, using renewable and low carbon energy where feasible.

6. Policy CS22: Sustainable and Low Carbon Development – Priority Zone and Decentralised Energy Networks

- Knowsley Industrial Park is identified as a ‘Priority Zone’ to promote the production of renewable, low carbon and decentralised energy. New development must:
 - Make provision for connection to an existing or planned decentralised energy network; and
 - Be designed to enable future connectivity in terms of proposed site layout, infrastructure and heating provision, including consideration of connections at a later date or phase.

7. Policy CS23: Renewable and Low Carbon Infrastructure

- The Council will support proposals that will produce and distribute decentralised, low carbon and renewable energy.

2.5 KNOWSLEY DESIGN QUALITY IN NEW DEVELOPMENT SPD JANUARY 2016

1. The Knowsley Design Quality in New Development Supplementary Planning Document (SPD) assists in the interpretation of 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. A.7: The design of all new development should:
 - Meet any requirements regarding renewable energy, carbon reduction or sustainable development set out in the Building Regulations and any local adopted planning policy or guidance.

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 compliance with national building regulation Part L requirements.
 - Installation of renewable energy technologies.
 - Achieve EPC A+
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 9.5.6 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 42kWh/m² 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 UMC Architects plans and elevation drawings. A list of drawings used to build the energy model are listed in [Appendix D](#).
5. **Figure 5** below shows images of the proposed development from the dynamic simulation model:

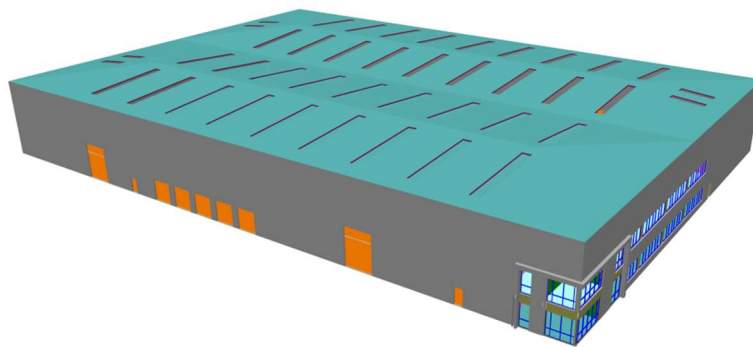


Figure 4 – TAS model of site – Unit K72

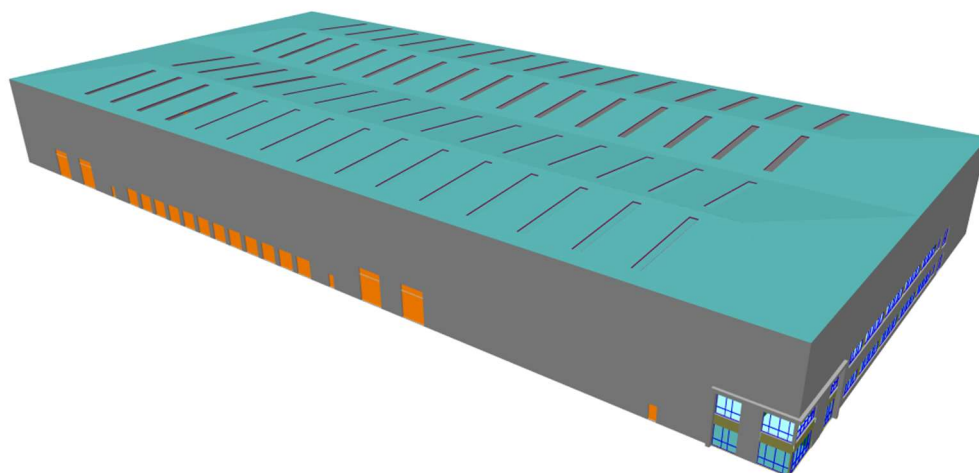


Figure 5 – TAS model of site – Unit K135

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 B2 and/ or B8 and/ or E(g)(iii) 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 CO₂ 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 CO₂ 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.
2. The current Building Regulations Part L2 (2021 edition 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 2 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	0.18	With metal cladding, to improve upon part L limiting values
Ground floors	0.18	0.15	To improve upon part L limiting values
Roof (flat)	0.18	0.15	With metal cladding, to improve upon part L limiting values
Roofs (pitched)	0.16	N/A	N/A
Windows	1.6	1.4 g-value 0.36 LTV 0.65	To improve upon part L limiting values
Roof-lights	2.2	1.3 g-value 0.55 LTV 0.58	To improve upon part L limiting values
Personnel Doors	1.6	1.4	To improve upon part L limiting values
Vehicle access & similar large doors	1.3	1.1	To improve upon part L limiting values
High usage entrance doors	3.0	N/A	N/A

Table 2 – 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 0.36, LTV 0.65)
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 Indurent Management Limited is committed to reduce.

4.2 AIR PERMEABILITY

1. The proposed development will have an improved air permeability to a maximum of $1.75 \text{ m}^3/(\text{h.m}^2)$ @50Pa, which is an improvement upon the standard Part L2 (2021, England edition incorporating 2023 amendments) value of $8 \text{ m}^3/(\text{h.m}^2)$ @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 3 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 areas	Electric panel heaters. Efficiency 1
	Warehouse	Modelled as unconditioned area.
Ventilation	Office/reception areas	MVHR with plate heat exchanger. SFP 1.4W/l/s; Heat recovery Efficiency: 75% (Plate heat exchanger)
	Toilets	Zonal Extract system SFP 0.5W/l/s
	Warehouse /Circulation areas	Natural Ventilation

FIXED BUILDING SERVICES	ZONE	DESCRIPTION/PERFORMANCE
Domestic Hot Water	Office areas	Instantaneous electric water heaters. Efficiency 1.00
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;
	Circulation areas	Lighting will comprise of LED with average illuminance of 95lm/W; Design Lighting Level as NCM; Presence detection Auto On/Auto Off; Daylight control Photocell on/off;
	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 3 – Summary of active design measures

- It is highlighted that the warehouse areas will be offered to the market as a shell. There are reasonable expectations for the warehouse areas 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.
- The CO₂ emissions and primary energy rates improvements at Be Lean stage are reflected in Table 4 below:

UNIT	TER KGC ₂ /M ²	BER KGC ₂ /M ²	%CO ₂	TPER KWH/M ²	BPER KWH/M ²	%PER
K72	1.12	1.77	-58%	11.86	18.93	-60%
K135	1.46	1.81	-24%	15.58	19.29	-24%

Table 4 – 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 m², 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.
 - 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.
 4. The hybrid mechanical ventilation system will automatically control the natural ventilation input, according to internal and external conditions, where possible reducing the use of mechanical HVAC and reducing energy consumption.

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 CO₂ emissions.
2. The site falls within Knowsley Industrial Park which is identified as a 'Priority Zone' within the Knowsley Local Plan Core Strategy.
3. 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.
4. 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.

5. 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 CO₂ emissions and primary energy rates improvements at Be Clean stage are reflected in Table 5 below. Since there is no proposed connection to district heating for this site, the results have not changed from Be Lean Stage.

UNIT	TER KGC ₂ /M ²	BER KGC ₂ /M ²	%CO ₂	TPER KWH/M ²	BPER KWH/M ²	%PER
K72	1.12	1.77	-58%	11.86	18.93	-60%
K135	1.46	1.81	-24%	15.58	19.29	-24%

Table 5 – 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 6 – 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 6 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 6 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)
K72	395	116	105,370	15	95,590	927	30,136	3.3
K135	790	232	203,715	28	191,180	1854	58,262	3.4

Table 6 – PV energy generation and life cycle cost

7. Estimated area of PV's is based on an assumed PV panel of 440W peak output and panel size of 1.5m². Exact area may vary depending on panel specifications.
8. In terms of Grants, there are 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.
9. 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.

$$\frac{\text{CO}_2 \text{ Emissions from Electricity} \times \text{Boiler Efficiency}}{\text{CO}_2 \text{ Emissions from Gas per unit}} = \text{Break Even COP}$$

$$\frac{0.1388\text{kgCO}_2 \times 0.9\%}{0.21\text{kgCO}_2} = 0.595$$

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.

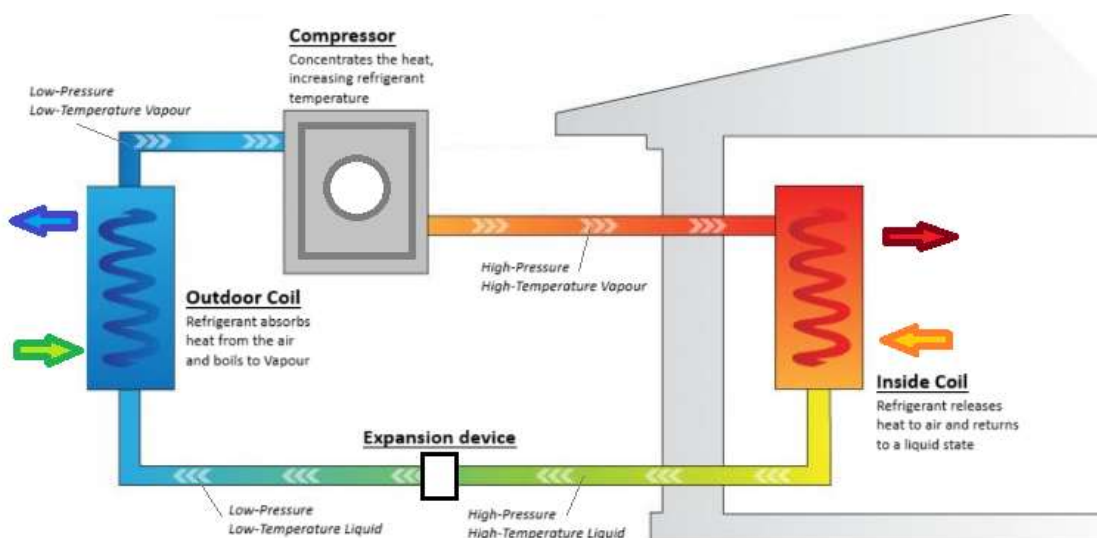


Figure 7 – Air Source Heat Pump – Typical Diagram

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.
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 7 below shows the predicted annual energy generation for heating from the proposed ASHP and the anticipated CO₂ savings when compared to a gas 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)
K72	2,772	1,980	274.83	24,238	566	>25
K135	3,927	2,805	389.31	43,313	802	>25

Table 7 – Predicted ASHP Energy Generation, Carbon savings and costs

- 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.
- 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.
- Annual and peak heating loads from the Part L assessment may not be accurate for the actual running of the building.
- The CO₂ emissions and primary energy rates improvements at Be Green stage are reflected in Table 8 below:

UNIT	TER KGCO ₂ /M ²	BER KGCO ₂ /M ²	%CO ₂	TPER KWH/M ²	BPER KWH/M ²	%PER
K72	1.12	-0.21	119%	11.86	-4.07	134%
K135	1.46	-0.24	116%	15.58	-4.45	129%

Table 8 – CO₂ emission and primary energy rates – Be Green Stage

8.0 CONCLUSION

- 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.
- To comply with policy requirements, the following targets have been established for the development:
 - Achieve compliance with national building regulation Part L requirements.
 - Installation of renewable energy technologies.
 - Achieve EPC A+
- 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.

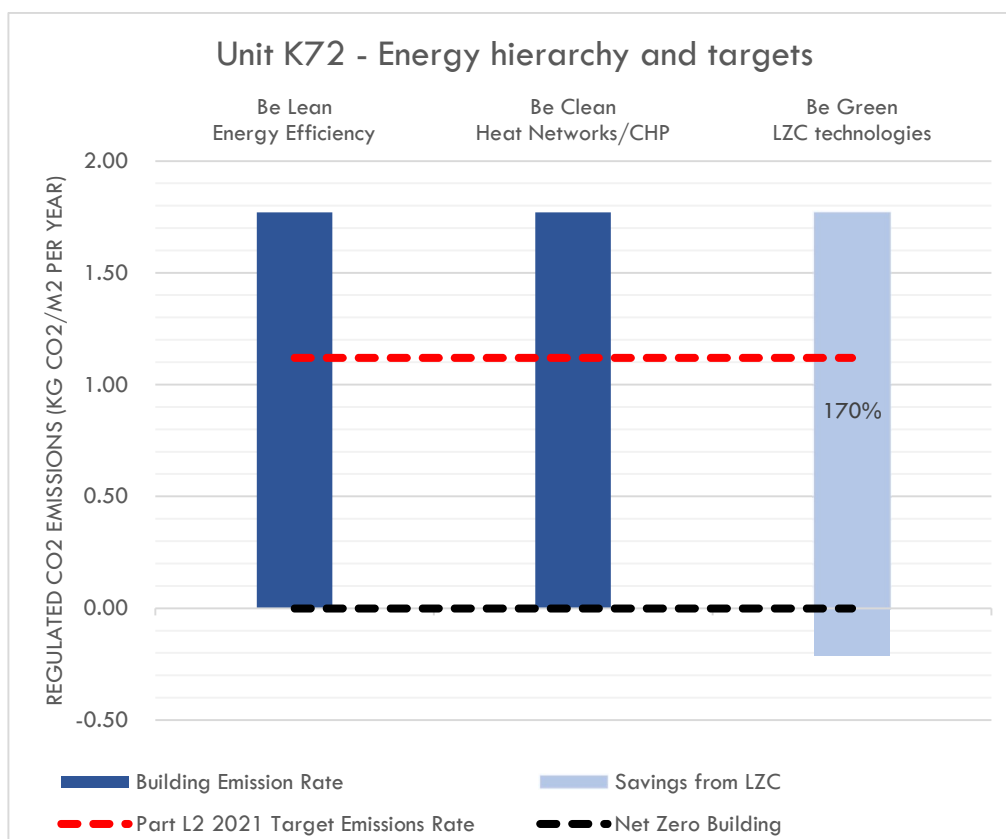


Figure 8 – Unit K72 Energy Hierarchy and targets

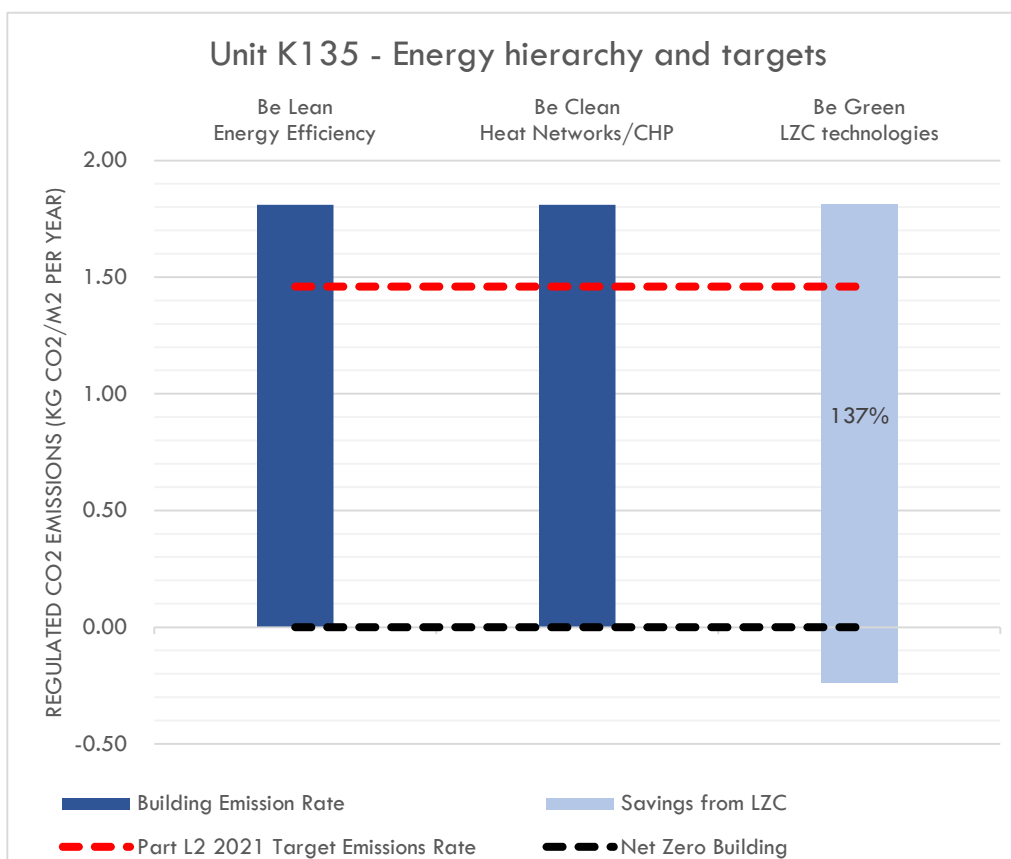


Figure 9 – Unit K135 Energy Hierarchy and targets

4. The results in the figures above are reflecting the savings for each stage of the energy hierarchy. It can be seen that the Low Zero Carbon Technologies (ASHP, PVs) contribute to approx. 137-170% reduction in CO₂ emissions.
5. [Table 9](#) below shows the improvement in CO₂ savings for the proposed building compared to Part L2 target rates. The development achieves a total of 116-119% reduction in regulated CO₂ 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
K72	Be Lean	1.12	1.77	-58%
	Be Clean	1.12	1.77	-58%
	Be Green	1.12	-0.21	119%
K135	Be Lean	1.46	1.81	-24%
	Be Clean	1.46	1.81	-24%
	Be Green	1.46	-0.24	116%

Table 9 – CO₂ emission rates - Building Regulations Part L2 (England incorporating 2023 amendments)

6. 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.

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 5.1 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 5.1 m/s
- At 25m above ground level 5.8 m/s.
- At 45m above ground level 6.3 m/s.

Figure 10 – Average Wind Speeds (source: NOABL)

2. As demonstrated in [Figure 10](#) above, taking a turbine with a rotor at 45m above ground level may increase wind speeds to 6.3 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 11 – 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

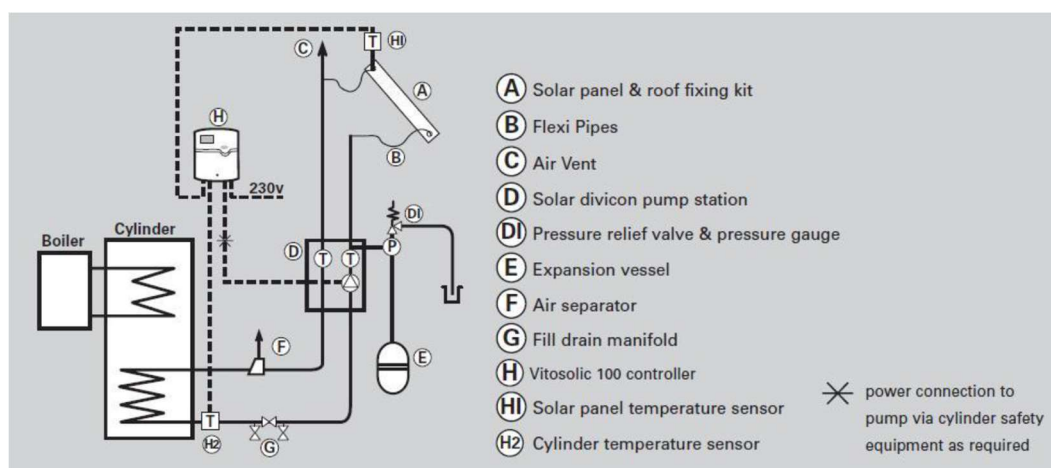


Figure 12 – Evacuated Tube Solar Collector Typical Schematic Diagram

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.

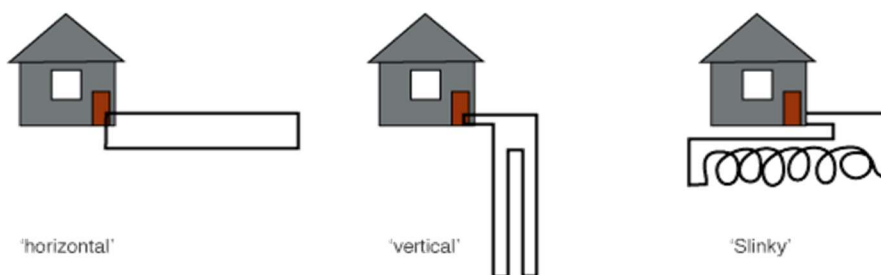


Figure 13 – Ground Source Heat Pump Loop Arrangements

3. As Figure 13 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 [Table 10](#) 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.

LZC ENERGY GENERATION BREAKDOWN	VALUE K72	VALUE K135
Total Area (m ²)	6,720	12,575
Total Regulated Energy Consumption (kWh/m ²)	12.33	12.59
Total Regulated Energy Consumption (kWh/annum)	82,858	158,319
ASHP Heating Energy output (kWh/annum)	2,772.05	3,926.79
ASHP Renewable proportion (kWh/annum)	1,980.04	2,804.85
Proportion of regulated energy generated by LZC	2.39%	1.77%
PV energy output (kWh/annum)	105,370	203,715
Proportion of regulated energy generated by Renewables	127%	129%
Total Energy generated by LZC & Renewables(kWh/annum)	107,350	206,520
Proportion of regulated energy generated by LZC & Renewables	130%	130%
Carbon emissions savings from ASHP (tCO ₂ /annum)	0.27	0.39
Carbon emissions savings from PV (tCO ₂ /annum)	14.63	28.28
Total carbon emissions saving from LZC & renewables (tCO₂/annum)	14.90	28.66

Table 10 – Percentage regulated energy & carbon savings from LZC & renewable technologies

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

BE LEAN STAGE

Project name

Shell and Core

K72, Indurent Park Knowsley

As designed

Date: Fri Jul 11 14:16:43 2025

Administrative information**Building Details**

Address: K72, Indurent Park, Alchemy Way, Knowsley
Industrial Park, KIRKBY, L33 7XN

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park,
Breckland, Linford Wood, Milton Keynes, MK14
6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

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

Foundation area [m²]: 198.14**The CO₂ emission and primary energy rates of the building must not exceed the targets**

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

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	1.12
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.77
Target primary energy rate (TPER), kWh _{pe} /m ² annum	11.86
Building primary energy rate (BPER), kWh _{pe} /m ² annum	18.93
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	Internal Wall (Insulated)
Floors	0.18	0.15	0.15	Internal Floor/Internal Ceiling Undercroft FTC3.625
Pitched roofs	0.16	0.15	0.15	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.4	1.4	Spandrel Panel
Rooflights***	2.2	1.3	1.3	Rooflight 2
Personnel doors^	1.6	1.4	1.4	Fire Door
Vehicle access & similar large doors	1.3	1.1	1.1	Level Vehicle Door 1F
High usage entrance doors	3	-	-	No high usage entrance doors in project
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	1.75

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- AHU + 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.					

2- EO + EPH (5 Zones)

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

3- NV + EPH

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

1- Direct Electric HWS

	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	Zone	Standard
	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
0F WC D		-	-	0.5	-	-	-	-	-	-	-	N/A
1F WC D		-	-	0.5	-	-	-	-	-	-	-	N/A
1F WC 1		-	-	0.5	-	-	-	-	-	-	-	N/A

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	
1F WC 2	-	-	0.5	-	-	-	-	-	-	-	N/A	
0F Store Clean	-	-	0.5	-	-	-	-	-	-	-	N/A	
1F Store Clean	-	-	0.5	-	-	-	-	-	-	-	N/A	
0F Reception	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Meet	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Tea	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Office Front	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F WC 3	-	-	0.5	-	-	-	-	-	-	-	N/A	

Shell and core configuration

Zone	Assumed shell?
0F WC D	NO
1F WC D	NO
1F WC 1	NO
1F WC 2	NO
0F Reception	NO
1F Meet	NO
1F Tea	NO
1F Office Front	NO
0F Circ 1	NO
0F Circ 2	NO
0F Circ 3	NO
1F WC 3	NO
1F Circ 1	NO
1F Circ 2	NO
1F Circ 3	NO
2F Circ 1	NO
2F Circ 2	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 1		120	-	-
Warehouse Undercroft Front		120	-	-
0F WC D		95	-	-
1F WC D		95	-	-
1F WC 1		95	-	-
1F WC 2		95	-	-
0F Store Clean		95	-	-
1F Store Clean		95	-	-
0F Reception		100	95	-
Ware_Plant 1		95	-	-
Ware_Plant 2		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
1F Meet		100	-	-
1F Tea		100	-	-
1F Office Front		100	-	-
0F Circ 1		95	-	-
0F Circ 2		95	-	-
0F Circ 3		95	-	-
1F WC 3		95	-	-
1F Circ 1		95	-	-
1F Circ 2		95	-	-
1F Circ 3		95	-	-
2F Circ 1		95	-	-
2F Circ 2		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 1	YES (+47%)	NO
Warehouse Undercroft Front	YES (+33%)	NO
0F Reception	YES (+44%)	NO
1F Meet	YES (+57%)	NO
1F Tea	YES (+39%)	NO
1F Office Front	YES (+28%)	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]	6720	6720
External area [m ²]	16037	16037
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	2	5
Average conductance [W/K]	3620	5454
Average U-value [W/m ² K]	0.23	0.34
Alpha value* [%]	18.5	3.5

* 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

100 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
Others: Miscellaneous 24hr Activities
Others: Car Parks 24 hrs
Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.52	0.46
Cooling	0.27	0.2
Auxiliary	0.27	0.35
Lighting	7.43	6.46
Hot water	3.88	1.33
Equipment*	40.44	40.44
TOTAL **	12.37	8.79

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0.86
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0.86</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	8.06	6.34
Primary energy [kWh _{PE} /m ²]	18.93	11.86
Total emissions [kg/m ²]	1.77	1.12

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	35.8	125.6	3.8	7	5.9	2.64	5	2.64	5
Notional	36	78.9	3.8	5	7.6	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	90.1	0	25	0	14.3	1	0	1	0
Notional	119.1	0	24.7	0	17.2	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	76.9	0	21.4	0	0	1	0	1	0
Notional	84	0	17.4	0	0	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

Project name

Shell and Core

Unit K135

As designed

Date: Mon Jul 14 09:39:09 2025

Administrative information

Building Details

Address: Unit K135, Indurent Park, Alchemy Way,
Knowsley Industrial Park, KIRKBY, L33

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park,
Breckland, Linford Wood, Milton Keynes, MK14
6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

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

Foundation area [m²]: 343.97The CO₂ emission and primary energy rates of the building must not exceed the targets

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

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	1.46
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	1.81
Target primary energy rate (TPER), kWh _{pe} /m ² annum	15.58
Building primary energy rate (BPER), kWh _{pe} /m ² annum	19.29
Do the building's emission and primary energy rates exceed the targets?	BER > TER BPER > TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	Internal Wall (Insulated)
Floors	0.18	0.15	0.15	Internal Floor/Internal Ceiling Undercroft FTC3.875
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.15	0.15	Roof
Windows** and roof windows	1.6	1.4	1.4	Spandrel Panel
Rooflights***	2.2	1.3	1.3	Rooflight
Personnel doors^	1.6	1.4	1.4	Fire Door
Vehicle access & similar large doors	1.3	1.1	1.1	Level Vehicle Door GF
High usage entrance doors	3	-	-	No high usage entrance doors in project
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	1.75

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- MVHR + VRF (5 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	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- NV + EPH

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

3- EO + EPH (5 Zones)

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

4- NV + Split (Comms 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	5	-	-	-
Standard value	N/A	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Direct Electric HWS

	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	
0F WC D	-	-	0.5	-	-	-	-	-	-	-	N/A	
1F WC D	-	-	0.5	-	-	-	-	-	-	-	N/A	
1F WC 1	-	-	0.5	-	-	-	-	-	-	-	N/A	
1F WC 2	-	-	0.5	-	-	-	-	-	-	-	N/A	
0F Store Clean	-	-	0.5	-	-	-	-	-	-	-	N/A	
1F Store Clean	-	-	0.5	-	-	-	-	-	-	-	N/A	
0F Reception	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Meet	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Tea	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Office Front	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F Office Rear	-	-	-	1.4	-	-	-	-	-	-	N/A	
1F WC 3	-	-	0.5	-	-	-	-	-	-	-	N/A	

Shell and core configuration

Zone	Assumed shell?
0F WC D	NO
1F WC D	NO
1F WC 1	NO
1F WC 2	NO
0F Reception	NO
1F Meet	NO
1F Tea	NO
1F Office Front	NO
1F Office Rear	NO
0F Circ 1	NO
0F Circ 2	NO
0F Circ 3	NO
0F Circ 4	NO
1F WC 3	NO
0F Circ 5	NO
1F Circ 1	NO
1F Circ 2	NO
1F Circ 3	NO
1F Circ 4	NO
1F Circ 5	NO
1F Circ 6	NO
Comms 1	NO
2F Circ 1	NO
2F Circ 2	NO
2F Circ 3	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 1		120	-	-

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 Undercroft Front		120	-	-
Warehouse Undercroft Rear		120	-	-
0F WC D		95	-	-
1F WC D		95	-	-
1F WC 1		95	-	-
1F WC 2		95	-	-
0F Store Clean		95	-	-
1F Store Clean		95	-	-
0F Reception		100	95	-
Ware_Plant 1		95	-	-
Ware_Plant 2		95	-	-
1F Meet		100	-	-
1F Tea		100	-	-
1F Office Front		100	-	-
1F Office Rear		100	-	-
0F Circ 1		95	-	-
0F Circ 2		95	-	-
0F Circ 3		95	-	-
0F Circ 4		95	-	-
1F WC 3		95	-	-
0F Circ 5		95	-	-
1F Circ 1		95	-	-
1F Circ 2		95	-	-
1F Circ 3		95	-	-
1F Circ 4		95	-	-
1F Circ 5		95	-	-
1F Circ 6		95	-	-
Comms 1		95	-	-
2F Circ 1		95	-	-
2F Circ 2		95	-	-
2F Circ 3		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 1	YES (+45%)	NO
Warehouse Undercroft Front	YES (+37%)	NO
Warehouse Undercroft Rear	NO (-43%)	NO
0F Reception	YES (+32%)	NO
1F Meet	YES (+54%)	NO
1F Tea	YES (+18%)	NO
1F Office Front	YES (+3%)	NO
1F Office Rear	NO (-68%)	NO
Comms 1	N/A	N/A

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]	12575	12575
External area [m ²]	30529	30529
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	2	5
Average conductance [W/K]	6717	10291
Average U-value [W/m ² K]	0.22	0.34
Alpha value* [%]	17.7	2.7

* 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

100 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
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.52	0.51
Cooling	0.31	0.23
Auxiliary	0.24	0.31
Lighting	7.76	6.57
Hot water	3.78	3.78
Equipment*	42.44	42.44
TOTAL**	12.62	11.4

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0.96
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0.96</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	8.5	7.09
Primary energy [kWh _{PE} /m ²]	19.29	15.58
Total emissions [kg/m ²]	1.81	1.46

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	28.4	123.5	3	6.9	5.9	2.64	5	2.64	5
Notional	34.6	73.8	3.6	4.7	7.6	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	106	0	29.5	0	0	1	0	1	0
Notional	126.6	0	26.2	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	104.1	0	28.9	0	14.3	1	0	1	0
Notional	150.8	0	31.3	0	17.2	1.34	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity									
Actual	0	1450.7	0	80.6	0	0	5	0	5
Notional	0	1317.8	0	83.2	0	0	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

BE GREEN STAGE

Project name

Shell and Core

K72, Indurent Park Knowsley

As designed

Date: Fri Jul 11 14:54:51 2025

Administrative information

Building Details

Address: K72, Indurent Park, Alchemy Way, Knowsley
Industrial Park, KIRKBY, L33

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park,
Breckland, Linford Wood, Milton Keynes, MK14
6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

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

Foundation area [m²]: 198.14The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	1.12
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	-0.21
Target primary energy rate (TPER), kWh _{PE} /m ² .annum	11.86
Building primary energy rate (BPER), kWh _{PE} /m ² .annum	-4.07
Do the building's emission and primary energy rates exceed the targets?	BER =< TER BPER =< TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	Internal Wall (Insulated)
Floors	0.18	0.15	0.15	Internal Floor/Internal Ceiling Undercroft FTC3.625
Pitched roofs	0.16	0.15	0.15	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.4	1.4	Spandrel Panel
Rooflights***	2.2	1.3	1.3	Rooflight 2
Personnel doors^	1.6	1.4	1.4	Fire Door
Vehicle access & similar large doors	1.3	1.1	1.1	Level Vehicle Door 1F
High usage entrance doors	3	-	-	No high usage entrance doors in project
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	1.75

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- AHU + 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.					

2- EO + EPH (5 Zones)

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

3- NV + EPH

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

1- Direct Electric HWS

	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	Zone	Standard
0F WC D	Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	-	N/A
1F WC D		-	-	0.5	-	-	-	-	-	-	-	N/A
1F WC 1		-	-	0.5	-	-	-	-	-	-	-	N/A

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
1F WC 2	-	-	0.5	-	-	-	-	-	-	-	N/A
0F Reception	-	-	-	1.4	-	-	-	-	-	-	N/A
1F Meet	-	-	-	1.4	-	-	-	-	-	-	N/A
1F Tea	-	-	-	1.4	-	-	-	-	-	-	N/A
1F Office Front	-	-	-	1.4	-	-	-	-	-	-	N/A
1F WC 3	-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
0F WC D	NO
1F WC D	NO
1F WC 1	NO
1F WC 2	NO
0F Reception	NO
1F Meet	NO
1F Tea	NO
1F Office Front	NO
0F Circ 1	NO
0F Circ 2	NO
0F Circ 3	NO
1F WC 3	NO
1F Circ 1	NO
1F Circ 2	NO
1F Circ 3	NO
2F Circ 1	NO
2F Circ 2	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 1		120	-	-
Warehouse Undercroft Front		120	-	-
0F WC D		95	-	-
1F WC D		95	-	-
1F WC 1		95	-	-
1F WC 2		95	-	-
0F Store Clean		95	-	-
1F Store Clean		95	-	-
0F Reception		100	95	-
Ware_Plant 1		95	-	-
Ware_Plant 2		95	-	-
1F Meet		100	-	-
1F Tea		100	-	-

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
1F Office Front		100	-	-
0F Circ 1		95	-	-
0F Circ 2		95	-	-
0F Circ 3		95	-	-
1F WC 3		95	-	-
1F Circ 1		95	-	-
1F Circ 2		95	-	-
1F Circ 3		95	-	-
2F Circ 1		95	-	-
2F Circ 2		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 1	YES (+47%)	NO
Warehouse Undercroft Front	YES (+33%)	NO
0F Reception	YES (+44%)	NO
1F Meet	YES (+57%)	NO
1F Tea	YES (+39%)	NO
1F Office Front	YES (+28%)	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]	6720	6720
External area [m ²]	16037	16037
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	2	5
Average conductance [W/K]	3620	5454
Average U-value [W/m ² K]	0.23	0.34
Alpha value* [%]	18.5	3.5

* 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

100 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
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.48	0.46
Cooling	0.27	0.2
Auxiliary	0.27	0.35
Lighting	7.43	6.46
Hot water	3.88	1.33
Equipment*	40.44	40.44
TOTAL **	12.33	8.79

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	15.68	0.86
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>15.68</i>	<i>0.86</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	8.06	6.34
Primary energy [kWh _{PE} /m ²]	-4.07	11.86
Total emissions [kg/m ²]	-0.21	1.12

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	35.8	125.6	2.8	7	5.9	3.5	5	3.5	5
Notional	36	78.9	3.8	5	7.6	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	90.1	0	25	0	14.3	1	0	1	0
Notional	119.1	0	24.7	0	17.2	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	76.9	0	21.4	0	0	1	0	1	0
Notional	84	0	17.4	0	0	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

Project name

Shell and Core

Unit K135

As designed

Date: Mon Jul 14 09:21:58 2025

Administrative information

Building Details

Address: Unit K135, Indurent Park, Alchemy Way,
Knowsley Industrial Park, KIRKBY, L33

Certifier details

Name: MBA Consulting Engineers

Telephone number: 01908 320099

Address: Maple House, Woodlands Business Park,
Breckland, Linford Wood, Milton Keynes, MK14
6FG

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

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

Foundation area [m²]: 343.97The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² .annum	1.46
Building CO ₂ emission rate (BER), kgCO ₂ /m ² .annum	-0.24
Target primary energy rate (TPER), kWh _{PE} /m ² .annum	15.58
Building primary energy rate (BPER), kWh _{PE} /m ² .annum	-4.45
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.18	Internal Wall (Insulated)
Floors	0.18	0.15	0.15	Internal Floor/Internal Ceiling Undercroft FTC3.875
Pitched roofs	0.16	-	-	No pitched roofs in project
Flat roofs	0.18	0.15	0.15	Roof
Windows** and roof windows	1.6	1.4	1.4	Spandrel Panel
Rooflights***	2.2	1.3	1.3	Rooflight
Personnel doors^	1.6	1.4	1.4	Fire Door
Vehicle access & similar large doors	1.3	1.1	1.1	Level Vehicle Door GF
High usage entrance doors	3	-	-	No high usage entrance doors in project
U _{a-Limit} = Limiting area-weighted average U-values [W/(m ² K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m ² K)] U _{i-Calc} = Calculated maximum individual element U-values [W/(m ² K)] * Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m ² K NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	1.75

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- 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.					

2- NV + EPH

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

3- EO + EPH (5 Zones)

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

4- NV + Split (Comms 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	5	-	-	-
Standard value	N/A	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- Direct Electric HWS

	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
0F WC D		-	-	0.5	-	-	-	-	-	-	-	N/A
1F WC D		-	-	0.5	-	-	-	-	-	-	-	N/A
1F WC 1		-	-	0.5	-	-	-	-	-	-	-	N/A
1F WC 2		-	-	0.5	-	-	-	-	-	-	-	N/A
0F Reception		-	-	-	1.4	-	-	-	-	-	-	N/A
1F Meet		-	-	-	1.4	-	-	-	-	-	-	N/A
1F Tea		-	-	-	1.4	-	-	-	-	-	-	N/A
1F Office Front		-	-	-	1.4	-	-	-	-	-	-	N/A
1F Office Rear		-	-	-	1.4	-	-	-	-	-	-	N/A
1F WC 3		-	-	0.5	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
0F WC D	NO
1F WC D	NO
1F WC 1	NO
1F WC 2	NO
0F Reception	NO
1F Meet	NO
1F Tea	NO
1F Office Front	NO
1F Office Rear	NO
0F Circ 1	NO
0F Circ 2	NO
0F Circ 3	NO
0F Circ 4	NO
1F WC 3	NO
0F Circ 5	NO
1F Circ 1	NO
1F Circ 2	NO
1F Circ 3	NO
1F Circ 4	NO
1F Circ 5	NO
1F Circ 6	NO
Comms 1	NO
2F Circ 1	NO
2F Circ 2	NO
2F Circ 3	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 1		120	-	-

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 Undercroft Front		120	-	-
Warehouse Undercroft Rear		120	-	-
0F WC D		95	-	-
1F WC D		95	-	-
1F WC 1		95	-	-
1F WC 2		95	-	-
0F Store Clean		95	-	-
1F Store Clean		95	-	-
0F Reception		100	95	-
Ware_Plant 1		95	-	-
Ware_Plant 2		95	-	-
1F Meet		100	-	-
1F Tea		100	-	-
1F Office Front		100	-	-
1F Office Rear		100	-	-
0F Circ 1		95	-	-
0F Circ 2		95	-	-
0F Circ 3		95	-	-
0F Circ 4		95	-	-
1F WC 3		95	-	-
0F Circ 5		95	-	-
1F Circ 1		95	-	-
1F Circ 2		95	-	-
1F Circ 3		95	-	-
1F Circ 4		95	-	-
1F Circ 5		95	-	-
1F Circ 6		95	-	-
Comms 1		95	-	-
2F Circ 1		95	-	-
2F Circ 2		95	-	-
2F Circ 3		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 1	YES (+45%)	NO
Warehouse Undercroft Front	YES (+37%)	NO
Warehouse Undercroft Rear	NO (-43%)	NO
0F Reception	YES (+32%)	NO
1F Meet	YES (+54%)	NO
1F Tea	YES (+18%)	NO
1F Office Front	YES (+3%)	NO
1F Office Rear	NO (-68%)	NO
Comms 1	N/A	N/A

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]	12575	12575
External area [m ²]	30529	30529
Weather	MAN	MAN
Infiltration [m ³ /hm ² @ 50Pa]	2	5
Average conductance [W/K]	6717	10291
Average U-value [W/m ² K]	0.22	0.34
Alpha value* [%]	17.7	2.7

* 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

100 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
 Others: Miscellaneous 24hr Activities
 Others: Car Parks 24 hrs
 Others: Stand Alone Utility Block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.5	0.51
Cooling	0.31	0.23
Auxiliary	0.24	0.31
Lighting	7.76	6.57
Hot water	3.78	3.78
Equipment*	42.44	42.44
TOTAL **	12.59	11.4

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	16.2	0.96
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>16.2</i>	<i>0.96</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	8.5	7.09
Primary energy [kWh _{PE} /m ²]	-4.45	15.58
Total emissions [kg/m ²]	-0.24	1.46

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	28.4	123.5	2.3	6.9	5.9	3.5	5	3.5	5
Notional	34.6	73.8	3.6	4.7	7.6	2.64	4.4	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	106	0	29.5	0	0	1	0	1	0
Notional	126.6	0	26.2	0	0	1.34	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity									
Actual	104.1	0	28.9	0	14.3	1	0	1	0
Notional	150.8	0	31.3	0	17.2	1.34	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity									
Actual	0	1450.7	0	80.6	0	0	5	0	5
Notional	0	1317.8	0	83.2	0	0	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

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

Energy Performance Certificate

Non-Domestic Building



K72

Indurent Park, Alchemy Way

Knowsley Industrial Park

KIRKBY

L33

Certificate Reference Number:

3483-4198-7307-2237-9609

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+

< -1

This is how energy efficient the building is.

Net zero CO₂ emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

Less energy efficient

Technical information

Main heating fuel:	Other
Building environment:	Unconditioned
Total useful floor area (m ²):	6720
Building complexity:	Level 5
Building emission rate (kgCO ₂ /m ² per year):	-0.05
Primary energy use (kWh _{PE} /m ² per year):	-1.93

Benchmarks

Buildings similar to this one could have ratings as follows:

8 If newly built

30 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 v9.5.6 using calculation engine TAS v9.5.6
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, Breckland, Linford Wood, Milton Keynes MK14 6FG
Issue Date:	11 Jul 2025
Valid Until:	10 Jul 2035 (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: 5104-3537-5203-4146-6487

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.

This certificate and other data about the building may be shared with other bodies (including government departments and enforcement agencies) for research, statistical and enforcement purposes. For further information about how data about the property are used, please visit www.ndepcregister.com. To opt out of having information about your building made publicly available, please visit www.ndepcregister.com/optout.

There is more information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government website at: www.gov.uk/government/collections/energy-performance-certificates. It explains the content and use of this document and advises on how to identify the authenticity of a certificate and how to make a complaint.

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.

To find out how you could use Green Deal finance to improve your property please call 0300 123 1234.

Energy Performance Certificate

Non-Domestic Building



Unit K135

Indurent Park, Alchemy Way

Knowsley Industrial Park

KIRKBY

L33

Certificate Reference Number:

2433-4081-1696-9232-7140

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+

< -1

This is how energy efficient the building is.

Net zero CO₂ emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

Less energy efficient

Technical information

Main heating fuel:	Other
Building environment:	Unconditioned
Total useful floor area (m ²):	12575
Building complexity:	Level 5
Building emission rate (kgCO ₂ /m ² per year):	-0.1
Primary energy use (kWh _{pe} /m ² per year):	-2.52

Benchmarks

Buildings similar to this one could have ratings as follows:

11

If newly built

44

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 v9.5.6 using calculation engine TAS v9.5.6
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, Breckland, Linford Wood, Milton Keynes MK14 6FG
Issue Date:	14 Jul 2025
Valid Until:	13 Jul 2035 (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: 8382-9143-7077-6975-9381

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.

This certificate and other data about the building may be shared with other bodies (including government departments and enforcement agencies) for research, statistical and enforcement purposes. For further information about how data about the property are used, please visit www.ndepcregister.com. To opt out of having information about your building made publicly available, please visit www.ndepcregister.com/optout.

There is more information in the guidance document *Energy Performance Certificates for the construction, sale and let of non-dwellings* available on the Government website at: www.gov.uk/government/collections/energy-performance-certificates. It explains the content and use of this document and advises on how to identify the authenticity of a certificate and how to make a complaint.

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.

To find out how you could use Green Deal finance to improve your property please call 0300 123 1234.

APPENDIX D – ARCHITECTURAL DRAWINGS USED FOR DYNAMIC MODELLING

DRAWING	DATE RECEIVED
22520-UMC-K072-00-DR-A-1001[P.01] - K72 - Building Layout	03.07.2025
22520-UMC-K072-ZZ-DR-A-1002[P.01] - K72 - Office Layout	03.07.2025
22520-UMC-K072-ZZ-M2-A-1101[P01] - K72 - Building Section	03.07.2025
22520-UMC-K072-ZZ-M2-A-1301[P01] - K72 - Building Elevations	03.07.2025
22520-UMC-K135-00-DR-A-1001[P.02] - K135 - Building Layout	03.07.2025
22520-UMC-K135-ZZ-DR-A-1002[P02] - K135 - Office Layout	03.07.2025
22520-UMC-K135-ZZ-M2-A-1101[P01] - K135 - Building Section	03.07.2025
22520-UMC-K135-ZZ-M2-A-1301[P01] - K135 - Building Elevations	03.07.2025
22520-UMC-K072-RF-M2-A-1003[P.01] - K72 - Roof Layout	07.07.2025
22520-UMC-K135-RF-DR-A-1003[P.01] - K135 - Roof Layout	07.07.2025

Table 11 – Architectural Drawings used to produce the draft thermal model

APPENDIX E – BREEAM DRAFT ENE 01 CALCULATIONS OUTPUTS

File 1

Upload building '_brukl.inp' file Choose File No file chosen 25078-mba-k72-zz-m3-en-1700_actual_bruk1.inp

Is space heating provided by a district (network) heating? No

Energy performance - Building score

Heating and cooling demand energy performance ratio (EPRdem)	0.259
Primary energy consumption performance ratio (EPRpe)	0.326
CO ₂ -eq energy performance ratio (EPRco2-eq)	0.326
Overall building energy performance ratio (EPRnc)	0.912
Total BREEAM credits achieved	9.0

Is the primary energy consumption the same or lower than that of the notional building? Yes

Is the primary energy consumption at least 10% lower than that of or higher than that of the notional building? Yes

Calculate score Clear

Figure 14 – BREEAM Calculation Outputs for Unit K72

File 1

Upload building '_brukl.inp' file Choose File No file chosen 25078-mba-k135-zz-m3-en-1700_actual_bruk1.inp

Is space heating provided by a district (network) heating? No

Energy performance - Building score

Heating and cooling demand energy performance ratio (EPRdem)	0.259
Primary energy consumption performance ratio (EPRpe)	0.326
CO ₂ -eq energy performance ratio (EPRco2-eq)	0.326
Overall building energy performance ratio (EPRnc)	0.912
Total BREEAM credits achieved	9.0

Is the primary energy consumption the same or lower than that of the notional building? Yes

Is the primary energy consumption at least 10% lower than that of or higher than that of the notional building? Yes

Calculate score Clear

Figure 15 – BREEAM Calculation Outputs for Unit K135