

Jones Lang LaSalle Incorporated

Knowsley Local Plan: Energy Statement

Linden Hill, 35 Wilson Road

JLL | Sustainable Asset Services
December 2025



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Revision No.	Date	Revision Description	Prepared By	Approved By
1.0	01/12/2025	Planning Supporting Document	Hamad Yoonus	Mike Dagnall
2.0	12/12/2025	Planning Supporting Document	Hamad Yoonus	Mike Dagnall

Record of Revisions

Executive Summary

Aim

This document has been prepared by JLL’s Sustainable Asset Services team to present the key design principles of the proposed new warehouse development of located in 35 Wilson Road, Huyton, Liverpool within the Huyton business park in compliance with Knowsley Local Plan Policy CS22 – Sustainable and Low Carbon Development..

Policy Context

This policy promotes energy-efficient design, on-site low and zero carbon (LZC) or renewable technologies, measurable carbon reductions, and sustainable construction practices. The policy ensures all new development contributes to a low carbon, resource-efficient, and climate-resilient future for the borough. Under the principles of the Carbon Compliance Pyramid, the reduction of carbon emissions is addressed through a structured, sequential approach. The first priority is to minimise energy demand by adopting an energy-efficient approach to building design, ensuring that energy use is reduced at the source. The next step involves the integration of low- or zero-carbon technologies to enable on-site energy generation and the utilisation of connected heat networks. Collectively, these measures form the basis of Carbon Compliance. For any residual carbon emissions that cannot be feasibly mitigated on-site, the Government’s proposed Allowable Solutions mechanism provides a pathway for compensation. Under this mechanism, developers can contribute financially to the delivery of verified off-site carbon reduction projects, thereby supporting broader decarbonisation objectives beyond the site boundary.

Proposed development

The proposed development comprises of a storage and distribution warehouse with a 3-storey office ancillary space located in the southern part of the site. The remainder of the site comprises of parking spaces, servicing, landscaping, access and infrastructure. The surrounding area consists primarily of industrial buildings and employment land within Huyton Business Park, with residential areas and green public spaces located nearby but separate from the application site. Huyton Town Centre lies around 1 mile (1.6 km) to the north via Wilson Road, while Liverpool City Centre is approximately 9 miles (14.5 km) away via the M62.

LZC Technology Appraisal

Based on a thorough evaluation of various Low and Zero Carbon (LZC) technologies—assessing factors like risk, cost, and energy savings—photovoltaic (PV) panels and Air Source Heat Pumps (ASHP) have been selected as the most feasible solutions for the site.

The warehouse's large roof area is perfectly suited for a PV array which is anticipated to support the building's energy needs, including on-site electric vehicle (EV) charging. In parallel, the ASHP system, chosen as the most energy-efficient technology, will be installed in the fourth-floor plant room and connected to external louvres on the façade.

Carbon Savings

The assessment is divided into two parts: the baseline assessment, which evaluates the scheme’s energy-efficient design, and the LZC assessment, which examines the use of on-site low and zero carbon (LZC) and renewable technologies. The energy modelling undertaken identifies the total regulated CO₂ emissions only.

The LZC scenario is seen to have a 37.5% improvement in carbon savings from the baseline through the installation of PV panels and ASHP. IESVE UK compliance software has been used to assess the Building CO₂ Emissions Rate (BER).

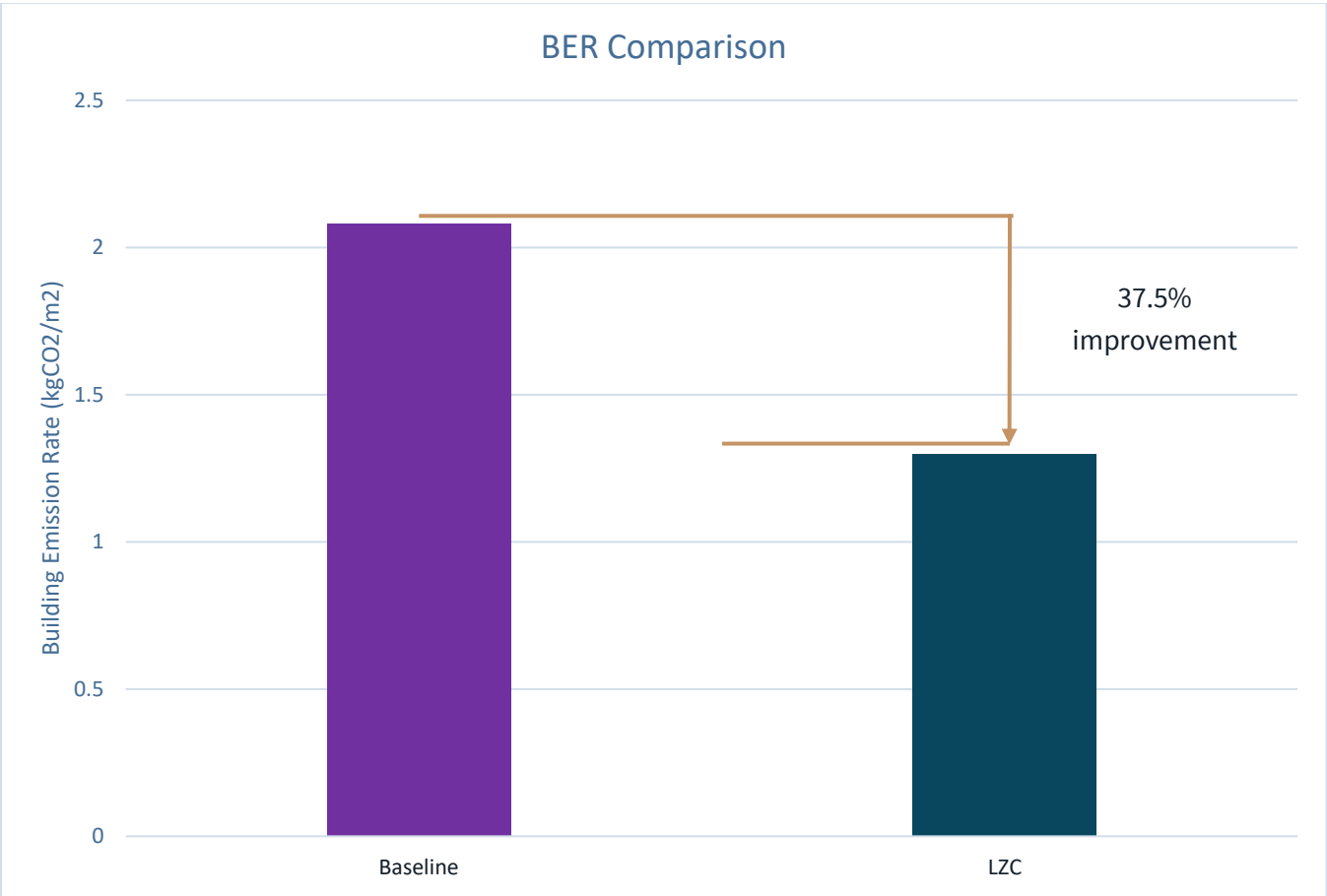


Figure 1 : Carbon Emissions Summary

Introduction

Planning Context

The Knowsley Local Plan: Core Strategy (2016) provides the framework for development in Knowsley up to 2028, focusing on sustainable growth, regeneration, housing, and environmental protection. Central to this is Policy CS22 – Sustainable and Low Carbon Development, which promotes energy-efficient design, on-site low and zero carbon (LZC) or renewable technologies, measurable carbon reductions, and sustainable construction practices. The policy ensures all new development contributes to a low carbon, resource-efficient, and climate-resilient future for the borough.

The scheme was submitted for Outline Planning Application in May 2022 (ref: 22/00284/OUT).

The aim of the Carbon Compliance Pyramid is reducing carbon emissions to minimise energy demand through energy-efficient building design. The next step involves integrating low or zero carbon (LZC) technologies for on-site energy generation and heat networks. Together, these two stages form the basis of Carbon Compliance. Any residual emissions that cannot be mitigated on-site may be addressed through the Government’s proposed Allowable Solutions mechanism, which allows developers to contribute to off-site carbon reduction initiatives. This it to promote sustainable practices and push schemes to move beyond the minimum Building Regulation requirements.

For the purposes of this study, typical assumptions have been made on a typical building services strategy for the use by a typical industrial warehouse tenant, in line with the minimum standards set by Building Regulations Part L 2021 Notional Standards.

Site and Surroundings

The site currently comprises of a warehouse located in Huyton, Liverpool. The site has an irregular shape, bounded by Wilson Road to the southwest, Logwood Mill Brook to the northeast, and neighbouring industrial plots within the business park to the southeast and northwest. The surrounding area consists primarily of industrial buildings and employment land within Huyton Business Park, with residential areas and green public spaces located nearby but separate from the application site. Huyton Town Centre lies around 1 mile (1.6 km) to the north via Wilson Road, while Liverpool City Centre is approximately 9 miles (14.5 km) away via the M62. The existing warehouse on site will be demolished.



Figure 2 : Site Plan

Proposed development

The proposed development is a storage and distribution unit with 3 storey ancillary office spaces and associated infrastructure. A total of 21,110m² is estimated for the overall development. This includes:-

- 1. 1 Amenity space
- 2. 190 car parking spaces, including 11 accessible spaces and 8 motorcycle, scooter parking spaces
- 3. 20 Electric vehicle charging points
- 4. 20 Dock levellers
- 5. 4 Level access bays
- 6. 38 HGV trailer parking bays

The proposed development relates to the new construction of industrial warehouse at the site. The uses of the proposed development and the associated gross internal areas (GIA) are outlined in Table 1. The proposed development aims for BREEAM excellent as well.

Table 1: Area schedule of the Development

Area Use		GIA (m²)
Proposed	Warehouse	19,300
	First (offices and transport)	658
	Second (offices)	576
	Third (offices)	576
	Total	21,110

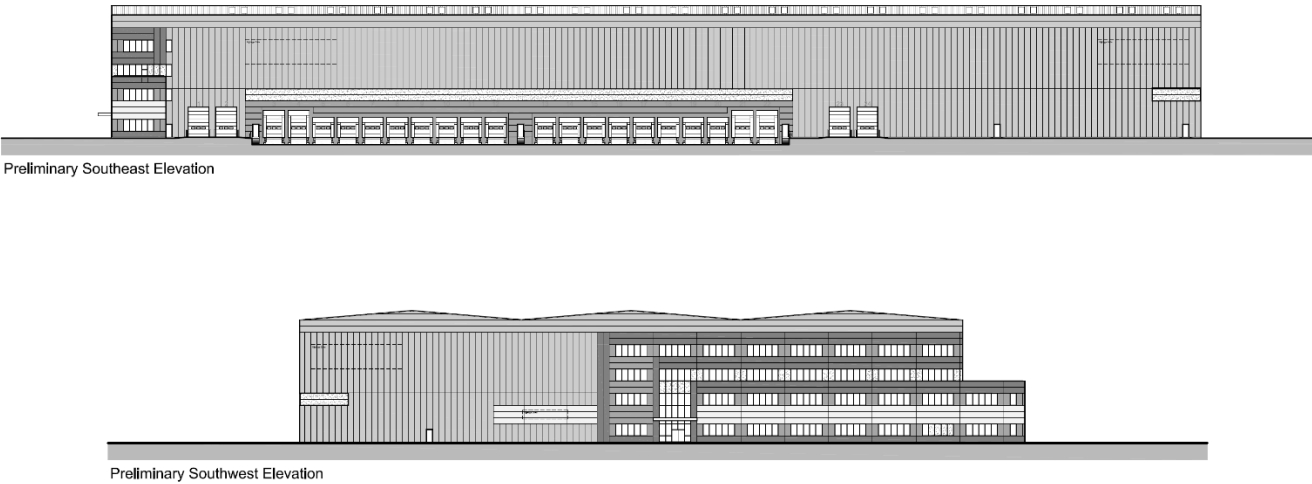


Figure 3 : Proposed Development-Elevation Plan

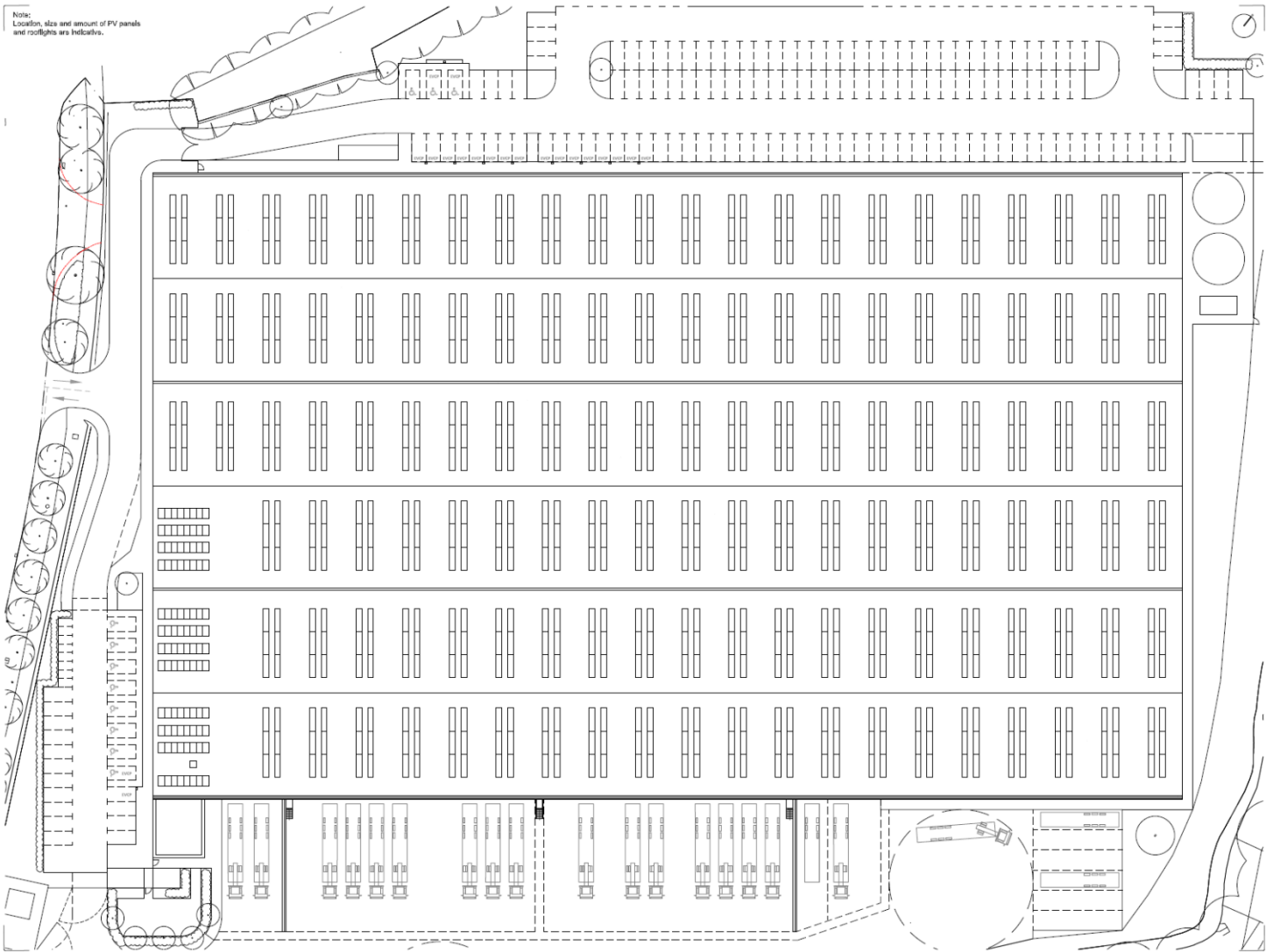


Figure 4 : Proposed Development-Indicative Roof Plan

Planning Policy

Knowsley local Plan, 2016

The Knowsley Local Plan: Core Strategy (adopted January 2016) provides the long-term framework for managing growth and development in the borough up to 2028. It sets out the vision, strategic objectives, and planning policies needed to guide housing, employment, transport, environmental protection, and community infrastructure investment.

Key priorities include:

- Promoting economic growth and investment while tackling social and spatial deprivation.
- Delivering 8,100 new dwellings, including affordable and specialist housing, distributed across local townships.
- Regenerating key centres such as Kirkby, Prescott, and Huyton, alongside major employment areas including Knowsley Industrial and Business Parks.
- Protecting natural assets, maintaining Green Belt boundaries, and allocating sustainable urban extensions to meet future housing and business needs.
- Improving transport connectivity, the quality of town centres, and Green Infrastructure networks to create sustainable, attractive communities.

Policy CS22 – Sustainable and Low Carbon Development

Policy CS22: Sustainable and Low Carbon Development forms a key part of the Knowsley Local Plan's environmental strategy. It translates the borough's commitment to addressing climate change, improving resource efficiency, and reducing carbon emissions into local planning policy. This policy supports both the UK's national carbon reduction targets and the wider environmental objectives of the National Planning Policy Framework (NPPF).

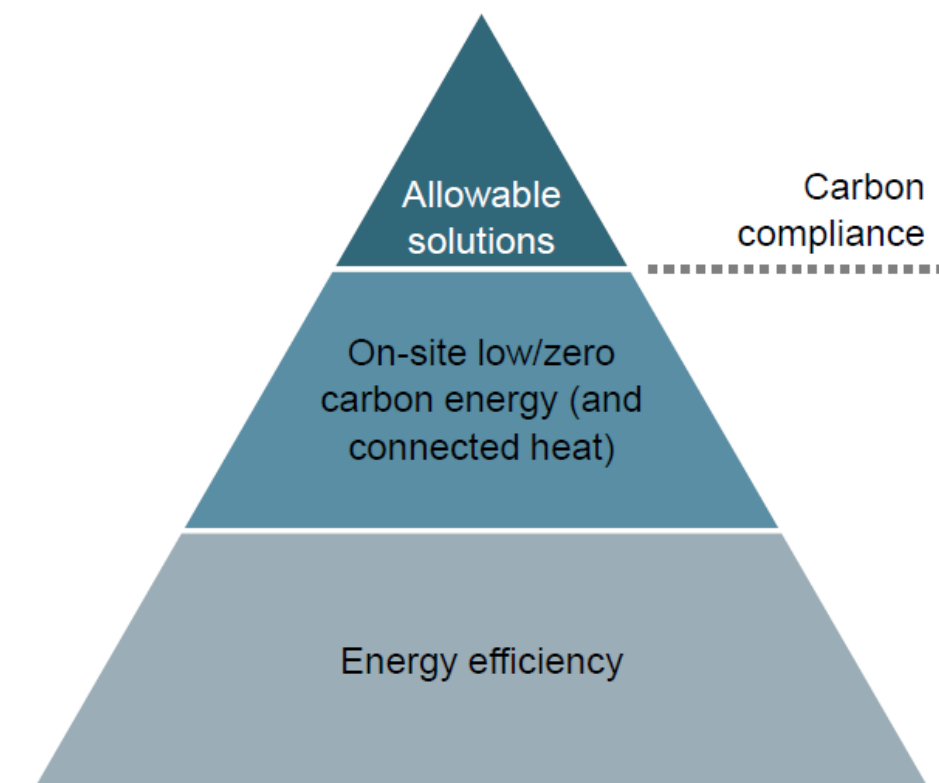
The policy ensures that all new developments in Knowsley contribute to a low carbon future by minimising energy use, incorporating renewable or low carbon technologies, and adopting sustainable construction methods. It aligns with Strategic Objective 7: Manage Environmental Resources, which aims to use energy, waste, water, and land resources prudently while helping communities adapt to the effects of climate change.

Key Policy Principles

Policy CS22 sets out the following expectations for development:

- **Energy Efficiency:** All new buildings should be designed to high energy performance standards, minimising heat loss, optimising natural light, and maximising energy efficiency through layout, building orientation, and innovative design.
- **Low Carbon and Renewable Energy:** Developments are encouraged to incorporate on-site renewable or low carbon technologies—such as solar panels, combined heat and power (CHP) systems, or ground-source heating—to reduce reliance on fossil fuels.
- **Carbon Reduction:** All major developments must demonstrate measurable reductions in carbon dioxide emissions compared to baseline standards. Developers are expected to apply the “carbon compliance hierarchy,” which prioritises energy efficiency and renewable energy use before offsetting any residual emissions.

- **Sustainable Materials and Construction:** The policy promotes sustainable design principles, encouraging the use of recycled or locally sourced materials, water conservation measures, and waste reduction during and after construction.



5Figure 6 : The Knowsley Plan's Carbon Compliance Pyramid

Proposed Low and Zero Carbon Technologies

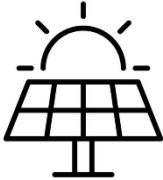
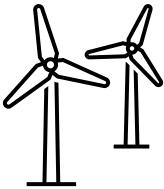
Introduction

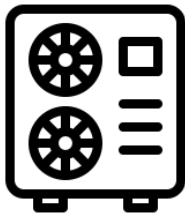
This section of the report assesses the feasibility of implementing LZC technologies in alignment with the sustainability objectives of Policy CS22. The policy requires that all developments minimise energy use, maximise resource efficiency, and incorporate renewable or low-carbon technologies where practical.

Feasibility Matrix

The below Table 2 discusses the various low and zero carbon technologies assessed whether they have been included into the scheme and the justification for the same.

Table 2 : LZC Technology Feasibility Matrix

LZC Technologies	Description	Selected or Not	Reason
Solar Photo-Voltaic Systems 	Solar PV systems convert sunlight directly into electricity using semiconductor materials. They can be installed on building roofs, façades, or as ground-mounted arrays. Electricity generated can be consumed on-site or exported to the grid.	✓	The roof of the warehouse has ample space to install PVs and generate electricity to support the building or EV charging points on-site. The roof of the warehouse is expected to be unshaded from any neighbouring buildings, making it both effective and efficient.
Wind Energy 	Small and medium wind turbines convert wind energy into electricity for local or grid supply. They can be sited in rural or semi-industrial areas with suitable wind speeds.	X	Inconsistent wind speeds limit the efficiency of turbines. Visual and noise impacts can be unpleasant for the tenants.
Ground Source Heat Pump 	GSHP systems collect ambient heat stored in the ground through buried pipe loops and transfer it to a building for heating and hot water.	X	GSHPs require significant land area or deep boreholes, which are cost-prohibitive and logistically unsuitable on constrained urban or brownfield sites typical in Knowsley's regeneration areas. Installation costs are 30–50% higher than ASHP systems, with long payback periods.
Air Source Heat Pump	An ASHP extracts heat from the outside air and upgrades it via an electric compressor to provide space heating and hot water. It	✓	Air Source Heat Pumps are planned to be installed on the lid of the office floor spaces to serve the offices. ASHPs has high energy and carbon savings

	performs efficiently even in cooler climates.		potential making it a good contributor to decarbonising the site..
District Heating 	District heating networks distribute heat from a central source (e.g., CHP, biomass, or waste heat recovery) to multiple buildings via insulated pipes.	X	No existing heat networks found in the vicinity of the site. Decentralised heat pumps and PV offer more flexibility.
CHP 	CHP units generate electricity and utilise the waste heat from that process for on-site space or water heating. They are powered by gas, biogas, or other low-carbon fuels.	X	CHP mostly relies on natural gas and hence has been phased out.
Solar Thermal System 	Solar thermal collectors capture solar energy to heat water for domestic or commercial use. They can complement existing hot water systems and reduce gas demand.	X	The hot water demand in the building is not expected to be high. Also, the PV systems would be more effective on the roof.

Energy Efficiency and Carbon Reduction

Assessment Methodology

Energy efficiency and carbon reduction

The proposed energy strategy outlined in this section has been developed in line with the following requirements set by the Knowsley Plan 2016.

“Under the Carbon Compliance Pyramid, carbon emissions will be reduced as a first priority by minimising energy demand through an energy efficient approach to building design. This is followed by the use of low or zero carbon technologies for on-site energy generation and connected heat systems. These first two steps together are referred to as Carbon Compliance. Any remaining carbon emissions which cannot be managed on-site are likely to be capable of being mitigated through the Government's proposed Allowable Solutions mechanism, under which developers would contribute towards off site delivery of carbon reduction measures.” – Knowsley Plan Policy CS22 excerpt.

The assessment is divided into two parts: the baseline assessment, which evaluates the scheme’s energy-efficient design, and the LZC assessment, which examines the use of on-site low and zero carbon (LZC) and renewable technologies.

The energy modelling undertaken will identify the total regulated CO₂ emissions only. Regulated emissions are associated with the fixed components of the building, such as fixed lighting, ventilation, space heating and cooling and DHW heating. Unregulated emissions are associated with plug-in appliances, such as computing equipment and catering appliances.

Baseline

The baseline scenario represents the building’s performance based on efficient design principles without the integration of low or zero carbon (LZC) technologies. It incorporates conventional building services and passive design measures to reduce energy demand where possible, while ensuring compliance with regulatory standards such as Building Regulations Part L and maintaining a balance between practicality and cost efficiency. The baseline model excludes renewable technologies such as photovoltaic (PV) panels and uses gas boilers for heating and domestic hot water production instead of air source heat pumps (ASHPs). VRF systems are used for cooling as they aren’t considered as low carbon technology in cooling mode.

Fabric Parameters

Table 3 : Fabric Performance

Fabric Breakdown	Proposed Building U-value (W/m²K)	Minimum Part L Building Regulations U-value (W/m²K)
External Wall	0.18	0.26
Ground Floor	0.12	0.18
Roof	0.15	0.16
External Door (Personnel)	1.6	1.6
Vehicle Access/Loading Bay Door	1.3	1.3
External Door (High Usage Entrance)	1.9	3.0
External Window	1.4	1.6

Rooflight	2.1	2.2
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Fabric Element	
Airtightness (m³/h.m²@50Pa)	3.0
Thermal Bridging (y-value)	IES Default
Windows g-value	29.0%
Rooflights g-value	40.0%

Design Criteria

Table 4 : Heating, DHW and Cooling System Types and Efficiencies

System Type	Heating efficiency, SCOP	Cooling efficiency, SEER
VRF	-	5
Gas Boilers	0.93	-
Electric Panel Heaters	1.0	-
DHW, Electric Point of Use	1.0	-

Table 5 : Ventilation System Types and Efficiencies

System Type	SFP, W/l/s	Heat Recovery Type and Efficiency %
AHU	1.2	PHE, 76%
Toilet Extracts	0.4	-

Natural Lighting

The warehouse design incorporates rooflights covering approximately 11% of the roof area, providing generous natural daylight throughout the internal spaces. The office areas feature an estimated 40% window-to-wall ratio to enhance visual comfort and light levels. Daylight sensors are installed to automatically adjust artificial lighting, reducing overall energy consumption and supporting efficient building operation.

Dynamic Simulation Model

Integrated Environment Solution (IES) has been employed to assess the carbon savings through low carbon technologies. The model was built based on the drawings from the Studio KMA architects on 14th of November 2025. The VE compliance module is used to capture the carbon savings in line with the dynamic grid electricity carbon factors. Manchester weather file has been used as it closely replicates the weather scenario in Liverpool.

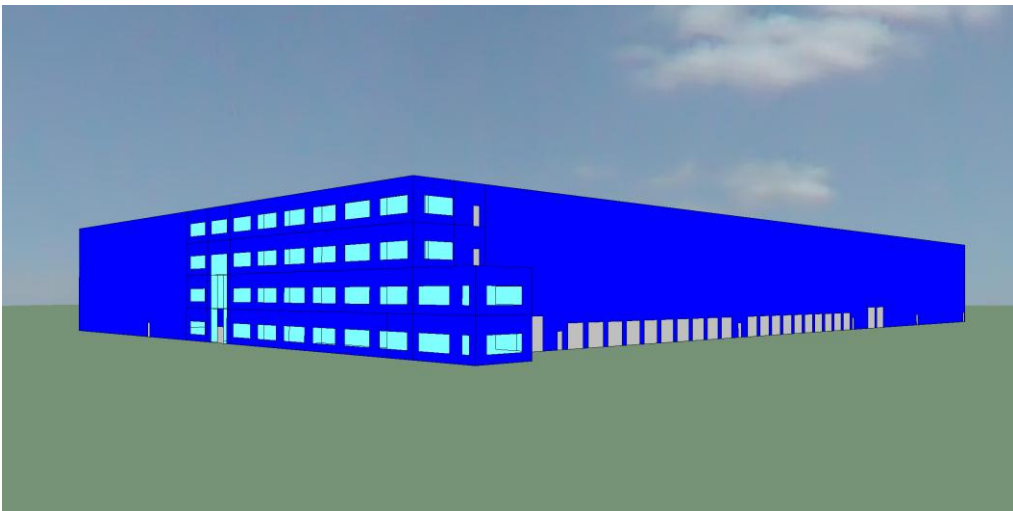


Figure 7 : Linden Hill IES Geometry Model

Results

An analysis of end-use energy demand highlights that domestic hot water and lighting are the largest contributors to overall consumption. Lighting accounts for 4.55 kWh/m², reflecting both occupant usage and the building’s illumination requirements, while domestic hot water demand is slightly higher at 5.40 kWh/m² due to system efficiency and anticipated usage patterns. In comparison, heating is relatively low at 2.25 kWh/m², aided by the building’s thermal performance and passive design measures, with cooling requirements even lower at 0.41 kWh/m². Auxiliary energy use, covering fans, pumps, and control systems, totals 1.48 kWh/m². In total, these end uses result in a building energy consumption of 14.11 kWh/m² for the baseline, forming a clear benchmark against which the impact of adding LZC technologies can be assessed. The breakdown indicates a relatively high DHW consumption, based on conservative estimates from NCM occupancy profiles and usage levels. This needs to be reviewed at future design stages, and if high demand persists in the design, an air source heat pump (ASHP) may be recommended to improve efficiency and reduce energy use.

Table 6 : Baseline End use Regulated Energy Breakdown

End-use Breakdown	Heating	Cooling	Auxiliary	Lighting	Hot water	PV	Total
Consumption (kWh/m²)	2.25	0.41	1.48	4.55	5.4	0	14.11

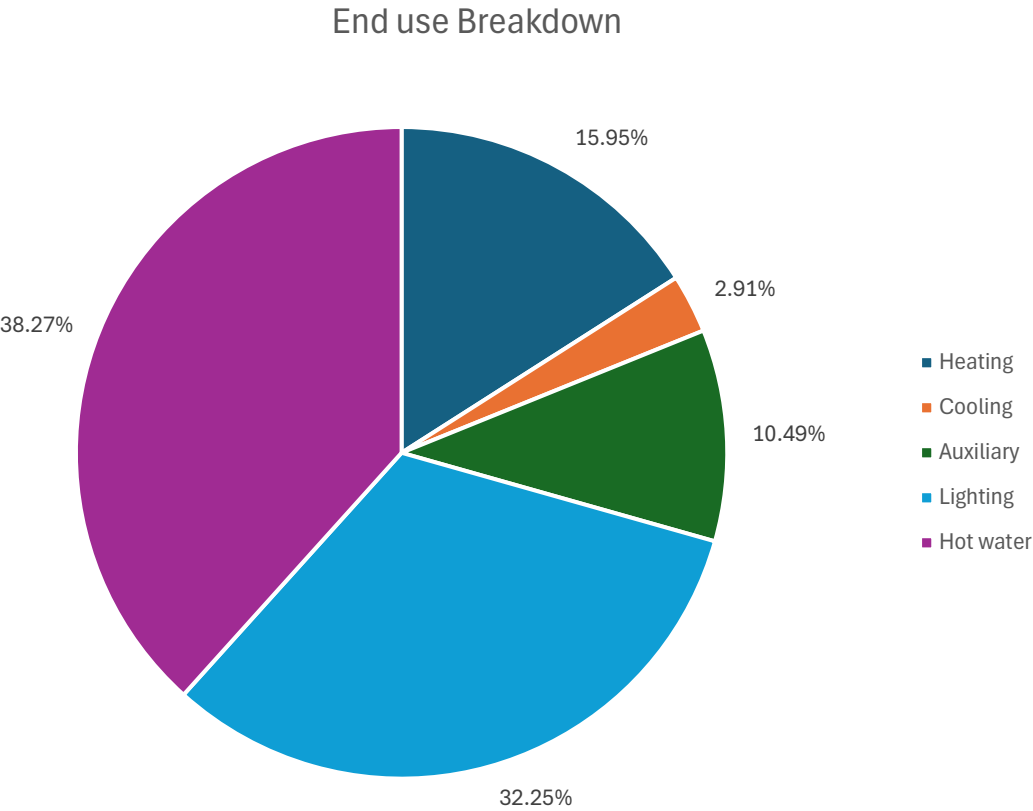


Figure 8 : Baseline End-use Regulated Energy Percentage Breakdown

Low and Zero Carbon Technologies

On-site Low and Zero Carbon Technologies

The low and zero carbon (LZC) scenario builds upon the baseline design by incorporating renewable and low-carbon technologies to reduce the building’s overall energy demand and carbon emissions. This model integrates air source heat pumps (ASHPs) in place of gas boilers for heating with a SCOP of 2.7. ASHPs in heating mode is considered a low carbon technology as it enables to derive heat from the atmosphere reducing the electrical load on the system.

Table 7 : Low Carbon Technology

System Type	Heating efficiency, SCOP	Cooling efficiency, SEER
VRF	2.7	5

As part of the LZC technology, the roof could be used to achieve a PV array comprising of mono-crystalline panels of roughly 510 m² roof cover along the 5°-pitch angle of the roof. Battery storage may be added to capture surplus solar energy for use during peak demand periods.

The roof is capable of installing PV to achieve an overall generation of 79.3 MWh/annum. The detailed space allocations for PV and ASHP is discussed below.

These technologies work alongside the same efficient and passive design strategies established in the baseline to enhance the building’s operational performance and sustainability credentials.

Results

The heating and auxiliary end use consumptions have dropped from the baseline by 37% and 75% respectively. This is because of the highly efficient VRF systems installed and the AHU and pumps having lower auxiliary loads. The cooling has slightly increased which is a result of reduced reliance on fresh air to remove heat from the space in summer.

Table 8 : End use Regulated Energy Breakdown

End-use Breakdown	Heating	Cooling	Auxiliary	Lighting	Hot water	PV	Total
Consumption (kWh/m²)	1.41	0.65	0.36	4.55	5.4	-27.42	12.37 (excluding PV)

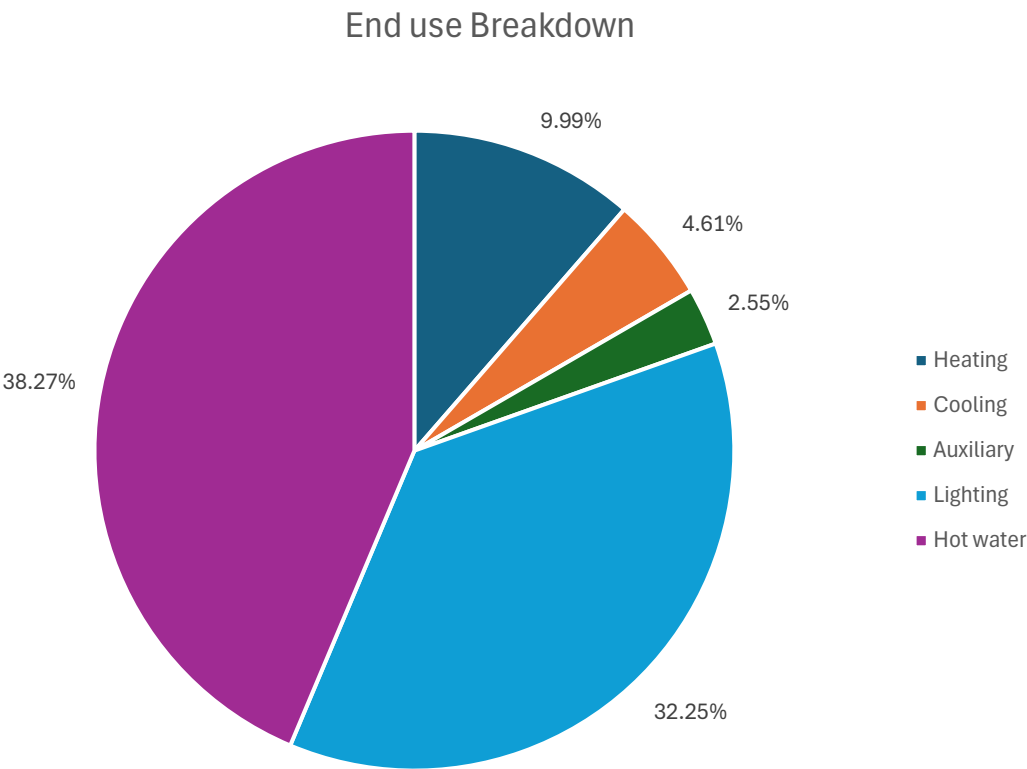


Figure 9 : End use Regulated Energy Percentage Breakdown with LZC technologies

Carbon Savings from LZC technologies

Comparing the building carbon emission rates from the two scenarios, incorporating LZC technologies (PV and ASHP) has reduced the building emission rates by 37.5% as seen in Figure 10. The major contribution comes from the PVs which are installed on the roof of the warehouse.

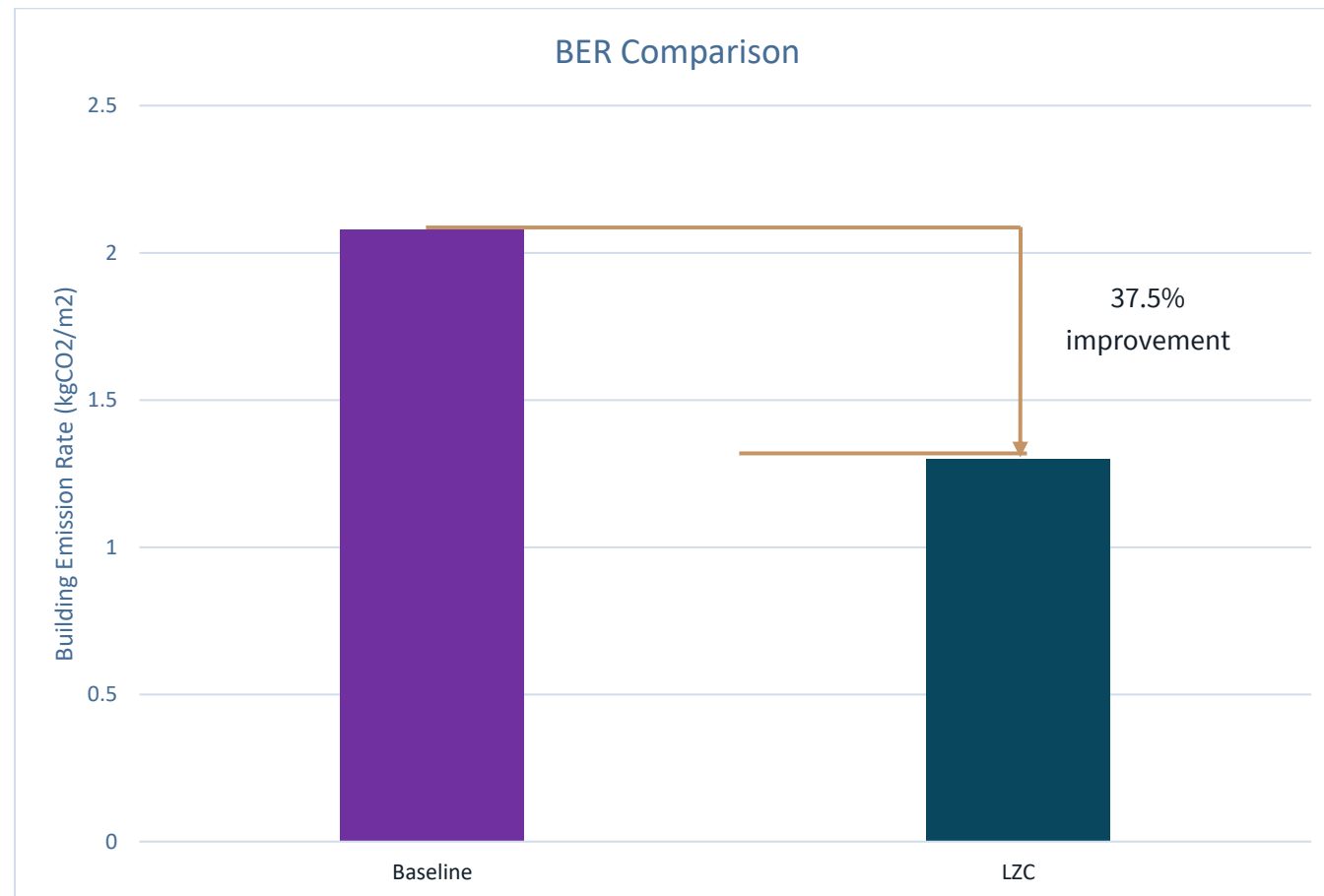


Figure 10 : Building Emission Rate Comparison

Implementation

Spatial Allowance

PV Panels

The primary location for the photovoltaic (PV) panel installation is the main roof area of the warehouse. This area has been identified as the optimal location due to its large, unobstructed surface, which allows for maximum solar exposure. An array could be positioned to maximise energy generation to support partly the building's base load and the on-site EV charging infrastructure. It is assumed the PVs will be placed along the 5° pitch of the roof covering an estimated 510 m².

ASHP

The primary outdoor equipment for the building's Variable Refrigerant Flow (VRF) heating and air conditioning system will be housed in a purpose-built plant space located on the roof level above the fourth-floor offices. Placing the plant here centralizes the equipment, keeps it out of sight, and isolates noise and vibration away from the main office areas below.

This location will also house associated plant items, such as control panels, pumps, and pipework manifolds. The entire area will be enclosed and integrated with large, external louvres on the façade. These louvres are critical for two reasons:

- 1. **Airflow:** They provide an unobstructed path for the massive amount of air the VRF units need to draw in and expel to effectively heat or cool the refrigerant.
- 2. **Protection and Aesthetics:** They screen the equipment from view, providing a clean architectural finish, and offer protection from direct weather while still allowing for ventilation.

This design ensures the HVAC system operates efficiently while being neatly integrated into the building's overall structure.

Acoustic Review

Given the proposed warehouse's proximity to the M57 motorway, the acoustic design must be carefully considered in line with the principles of the Knowsley Local Plan: Core Strategy. The assessment should first address the potential impact of existing road traffic noise on the internal environment of the development to ensure a good standard of amenity for future occupants. Furthermore, the review must evaluate the potential operational noise from the development itself, including plant equipment and vehicle movements, to ensure there is no adverse impact on nearby noise-sensitive receptors, such as any adjacent residential properties or community facilities. Future works can comprise internal noise modelling, and external façade performance reviews to confirm that internal noise levels achieve a good standard of amenity for occupants. All plant and mechanical equipment associated with the warehouse should be fitted with appropriate acoustic treatments — such as enclosures, screens, or silencers — to reduce noise emissions. Since the scheme is within the located within the Huyton Business Park which is predominantly occupied by industrial sites this is not identified as a major concern. These approaches align with the Core Strategy's principles of mitigating negative impacts from both traffic and new development, while protecting the amenity of the local community and enhancing the quality of place.

Payback Period

This analysis shows that while both technologies contribute to the site's energy goals, the Photovoltaic (PV) system presents a significantly stronger financial case. With a lower upfront cost and approximately 50% higher annual energy savings, the PV system's payback period of 24 years is far more commercially attractive than the Air Source Heat Pump (ASHP) without any payback. The ASHP should therefore be viewed primarily as a strategic investment for decarbonizing heat, rather than a cost-saving measure alone.

Table 9 : Payback period for the LZC Technologies

System Type	Installation Cost	Annual Energy Savings (MWh/annum)	Annual Utility Cost savings*	Payback Period
ASHP	£200,000	18.3	N/A**	N/A
PV	£178,500	27.42	£7,592	24
*Based on UK 2025 unit electricity price of 27.68 p/kWh ** The cost of unit electricity is higher than gas				

Conclusions

Overview

This document has been prepared by JLL’s Sustainable Asset Services team to present the key principles of the Knowsley Local Plan Policy CS22 – Sustainable and Low Carbon Development, in compliance for the new warehouse development of located in 35 Wilson Rd, Huyton, Liverpool within the Huyton business park.

This policy promotes energy-efficient design, on-site low and zero carbon (LZC) or renewable technologies, measurable carbon reductions, and sustainable construction practices. The policy ensures all new development contributes to a low carbon, resource-efficient, and climate-resilient future for the borough. Under the principles of the Carbon Compliance Pyramid, the reduction of carbon emissions is addressed through a structured, sequential approach. The first priority is to minimise energy demand by adopting an energy-efficient approach to building design, ensuring that energy use is reduced at the source. The next step involves the integration of low- or zero-carbon technologies to enable on-site energy generation and the utilisation of connected heat networks. Collectively, these measures form the basis of Carbon Compliance. For any residual carbon emissions that cannot be feasibly mitigated on-site, the Government’s proposed Allowable Solutions mechanism provides a pathway for compensation. Under this mechanism, developers can contribute financially to the delivery of verified off-site carbon reduction projects, thereby supporting broader decarbonisation objectives beyond the site boundary.

LZC Technology Appraisal

Based on a thorough evaluation of various Low and Zero Carbon (LZC) technologies—assessing factors like risk, cost, and energy savings—the LZC feasibility study concluded that the feasible LZC technologies for the development are:

- 510 m² of roof-mounted solar photovoltaic (PV) panels.
- 110 kW Air-Source Heat Pumps (ASHPs) for space heating provision.

The warehouse's large roof area is perfectly suited for a PV array, which can contribute to the building's energy needs, including on-site electric vehicle (EV) charging. In parallel, the ASHP system, chosen as the most energy-efficient technology, will be installed in the fourth-floor plant room and connected to external louvres on the façade.

Carbon Savings

The assessment is divided into two parts: the baseline assessment, which evaluates the scheme’s energy-efficient design, and the LZC assessment, which examines the use of on-site low and zero carbon (LZC) and renewable technologies. The energy modelling undertaken will identify the total regulated CO₂ emissions only.

The LZC scenario is seen to have a 37.5% improvement in carbon savings from the baseline through the installation of PV panels and ASHP. IESVE UK compliance software has been used to assess the Building CO₂ Emissions Rate (BER).

Recommendations

- PV installation is highly encouraged due to its non-obstructive location, high yield, and relatively short payback period.
- ASHP is recommended primarily from a decarbonisation perspective, as well as for the energy savings it offers.
- MEP engineers should be consulted in the future regarding the sizing and implementation of these LZC technologies.
- Sustainability consultants can help with evaluating the overall environmental benefits, advising on optimal design integration, and supporting compliance with building regulations.

Glossary

Acronym	Unit (if applicable)	Full Form	Definition
■ NZC	-	Net Zero Carbon (Building)	A highly energy efficient and powered from renewable energy sources building, with carbon balance offset.
■ ASHP	-	Air Source Heat Pump	Low carbon heating and cooling technology
■ PV	-	Photo-voltaic	A silicon-based solution that converts solar energy into electricity
■ GIA	m ²	Gross Internal Area	Total area of a building (including areas occupied by internal walls and partitions).
■ EUI	kWh/m ² /year	Energy Use Intensity	Measurement of a building’s annual energy consumption relative to its GIA.
■ NCM	-	National Calculation Methodology	A procedure (for buildings other than dwellings) for demonstrating compliance with the carbon emission requirements (based on Building Regulations) and for calculating ‘operational ratings’ and ‘asset ratings’.
■ BER	kgCO ₂ /m ² /year	Building Emissions Rate	The predicted actual CO ₂ emission rate from a building. The BER must be less than the TER.
■ TER	kgCO ₂ /m ² /year	Target CO ₂ Emissions Rate	The minimum allowable energy performance of a building. It is determined from a notional building that is the same type, size and shape as the proposed building.

Appendices

Appendix A – Baseline and LZC BRUKLs

Baseline

BRUKL Output Document

Compliance with England Building Regulations Part L 2021

 HM Government

Project name

Linden Hill BRUKL 1

As built

Date: Tue Nov 25 16:12:44 2025

Administrative information

Building Details

Address: 35 Wilson Rd, Liverpool, L36 6AE

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.29

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.29

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

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Foundation area [m²]: 533.64

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	1.61
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	2.08
Target primary energy rate (TPER), kWh _{eq} /m ² annum	15.13
Building primary energy rate (BPER), kWh _{eq} /m ² annum	20.97
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	0.26	0_000003:Surf[0]
Floors	0.18	0.12	0.12	0_000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.15	0.15	0F000000:Surf[0]
Windows** and roof windows	1.6	1.34	1.34	0_000001:Surf[2]
Rooflights***	2.2	2.09	2.09	0_000003:Surf[2]
Personnel doors^	1.6	1.6	1.6	0_000001:Surf[1]
Vehicle access & similar large doors	1.3	1.3	1.3	0_000003:Surf[103]
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]

U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]

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

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	21786.4	21786.4
External area [m²]	50493.7	50493.7
Weather	MAN	MAN
Infiltration [m³/hm²@ 50Pa]	3	5
Average conductance [W/K]	14085.7	13435.5
Average U-value [W/m²K]	0.28	0.27
Alpha value* [%]	25	10

* 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	2.25	2.8
Cooling	0.41	0.31
Auxiliary	1.48	1.26
Lighting	4.55	3.77
Hot water	5.4	3.95
Equipment*	30.87	30.87
TOTAL **	14.11	12.07

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

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	1.46
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	0	1.46

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	13.3	15.94
Primary energy [kWh _{eq} /m²]	20.97	15.13
Total emissions [kg/m²]	2.08	1.61

Fabric element	U _{Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.18	0.26	0_000003:Surf[0]
Floors	0.18	0.12	0.12	0_000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.15	0.15	0F000000:Surf[0]
Windows** and roof windows	1.6	1.34	1.34	0_000001:Surf[2]
Rooflights***	2.2	2.09	2.09	0_000003:Surf[2]
Personnel doors^	1.6	1.6	1.6	0_000001:Surf[1]
Vehicle access & similar large doors	1.3	1.3	1.3	0_000003:Surf[103]
High usage entrance doors	3	-	-	No high usage entrance doors in building
U _{a-Limit} = Limiting area-weighted average U-values [W/(m²K)] U _{a-Calc} = Calculated area-weighted average U-values [W/(m²K)]				U _{i-Calc} = Calculated maximum individual element U-values [W/(m²K)]
* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows. ** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position. ^ For fire doors, limiting U-value is 1.8 W/m²K				
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.				

Air permeability	Limiting standard	This building
m³/(h.m²) at 50 Pa	8	3

	Actual	Notional
Heating + cooling demand [MJ/m ²]	13.3	15.94
Primary energy [kWh _{te} /m ²]	13.53	14.86
Total emissions [kg/m ²]	1.3	1.39

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