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Peveril Securities

Lakeview Drive, Bicester Arc Office

190468

Energy & Sustainability Statement

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Sustainability at our core.

Document Revision History			Ref	190468 Bicester Arc	
Rev	**Author**	**Verification By**	**Date**	**Suitability**	**Comments / Status**
C	J. RODE	C. WALDRON	27/05/2022	S4	EXECUTIVE SUMMARY UPDATED
D	J. RODE	C. WALDRON	24/11/2022	S4	COMMENTS INCORPORATED
E	J. RODE	C. WALDRON	27/09/2023	S4	REVISED FOR NEW PART L

Executive Summary

Couch Perry and Wilkes have been appointed by Peveril Securities Ltd to help steer and inform the energy credentials of the Bicester Arc development at Lakeview drive and to provide an Energy Statements to demonstrate how the development will comply with planning policy relating to energy efficient design and generation of energy from renewable sources. Phase one of the development consists of an office building and a residential building. This report deals with the office building only.

The overall predicted carbon reduction achieved for the building, once all steps of the Energy Hierarchy (Be Lean – Be Clean – Be Green) have been accessed and incorporating the proposed energy efficiency measures, Air Source Heat Pumps and Solar PV, results in a betterment in comparison to the 'baseline' development, incorporating a gas-fired solution, when calculated with Part L 2021 emission factors which came into effect June 2022.

Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions (Part L 2021)	Estimated total Cumulative % Reduction CO_2 Emissions (Part L 2013)
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Proposed 'Lean' Development	6,600	25,896	34%	34%	62%
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Proposed 'Green' Development	**6,600**	**24,498**	**5%**	**37%**	64%

The design of the Bicester Arc Office proposal is underpinned by the desire to deliver a wide range of positive responses to climate change and the ambitions of Cherwell District Council's planning policies and the UK wide target of zero carbon. The proposal improves biodiversity, increases green space, reduces the impact on the local surface water drainage, significantly reduces energy use, and maximises the potential to benefit from continued decarbonisation of the electricity grid where possible.

Contents

1.0 Introduction

CPW have been appointed by Peveril Securities Ltd to help steer and inform the energy credentials of the project and to produce a sustainable building energy strategy to compliment and inform design principles for the proposed office development at Lakeview Drive, Bicester. In undertaking this body of work CPW have also worked closely with the project architects to ensure a well thought out and developed energy strategy can be taken forward and employed within the development.

The proposed energy strategy is summarized within this Energy Statement to support the detailed planning application for phase 1 of the Bicester Arc development. This Energy Statement demonstrates how the development intends to comply with planning policy relating to energy efficient design and generation of energy from renewable sources. Planning Policy ESD3 requires the submission of further information concerning energy use within the building relating to BREEAM, and a further submission in relation to that condition will be made in due course.

The proposed development comprises Ground Floor (reception, office space) and 3No Upper Floor levels of office accommodation.

This statement considers that the development is required to maximise energy efficiency as far as possible by reducing the energy demand, reducing heat losses, ensuring good building fabric efficiency / passive design, encouraging useful solar gain, encouraging useful day lighting, and maximising efficiency of all fixed regulated building services systems (lighting, heating, cooling, hot water and mechanical ventilation systems).

The possibility of connecting to the Bicester District Heating Network (Elmsbrook) scheme has been considered.

This Energy Statement is intended to provide an indication of the energy efficiency of the development and to reflect the latest building design in order to provide evidence for the planning condition relating to building carbon emissions. The strategy detailed within has been followed as the design has progressed to this stage. The figures quoted are estimates based on assumed plant and specifications.

The preferred solution has been strongly influenced by local Planning Policies relating to sustainability and energy efficiency. The Cherwell District Council's Local Plan highlights the Council's desires to limit energy consumption and reduce carbon dioxide emissions through Planning Policies ESD 1-5 and Peveril Securities Ltd fully support this aspiration. It is their intention to closely follow the specific guidance of this document in order to significantly reduce carbon emissions.

In order to ensure a well-considered sustainable design process the approach to assess the energy strategy will follow the proposed energy hierarchy below:

- **a) 'Be Lean' – Energy Efficient Design**
- **b) 'Be Clean' – Decentralised Energy**
- **c) 'Be Green' – Renewable Energy Technology**

This Energy Statement is therefore structured accordingly.

2.0 Methodology

A key objective of the energy strategy analysis undertaken is to avoid a proposal coming forward whereby poor energy efficiency is employed but renewable technologies included, only to satisfy regulatory requirements. Consideration should be given to potential increased inefficiency at part load conditions and at times when renewable energy generation is not available in this respect. The predicted energy demand for the entire development has been based upon an energy model of this specific development modelled in detail in IES software. 'Benchmark' Energy data has been derived from this model which utilises the pertinent figures from Part L 2021 to provide a basis for carrying out options analysis.

The predicted energy efficiency and emissions ratings have been informed and assessed via BRUKL calculation using VE Compliance Modelling. The energy efficiency and emissions ratings detailed have been assessed and are taken as reasonable estimates at this stage of the design, based on the following strategies and equipment specifications.

2.1 Grid Decarbonisation

It is widely accepted, that the previous edition of Part L of the building regulations (2013) used out of date carbon emissions factors relating to different fuel types. None more impacted by this is electrical fuel which now takes greater contribution to its production from renewable sources, rather than relying so heavily on the burning of fossil fuels. With this in mind, an updated version of Part L (2021), incorporating new emissions factors for gas and electricity in particular, has come into effect (June 2022) and recognises the ongoing decarbonisation of the electrical grid. It will therefore be that providing the option of electrically driven systems are far more attractive, in CO_2 emissions terms, than previously experienced.

3.0 Baseline Building

The baseline building for comparison is represented by the notional building, as defined in building regulations and the NCM modelling guide, for a gas-fired servicing solution for the proposed development. This baseline has been chosen to highlight any potential improvement realised by benefiting from decarbonisation of the electrical grid. 'Benchmark' data has been derived from this model to provide the basis for a suitable baseline building.

The baseline present below in carbon emissions terms shall be developed in the following sections with the carbon emissions reduction, from the level tabulated below, presented. As previously stated, the baseline for comparison considers a gas-fired solution without the benefit of the energy efficiency measures and technologies described further within this statement that are not inherent in the NCM model.

Estimated carbon emissions for the Baseline Building are taken from the IES software model and shown in the table below:

Proposed 'Baseline' Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions (Part L 2021)	Estimated total Cumulative % Reduction CO_2 Emissions (Part L 2013)
Estimated 'Baseline' Development (Part L 2013)	6,600	68,073	N/A	**-42%**	N/A
Proposed 'Baseline' Development (Part L 2021)	6,600	39,276	N/A	N/A	42%

4.0 'Be Lean' – Energy Efficient Design

Reducing energy usage is the priority in the energy hierarchy. It is often the measure with the least cost implications, and any reduction will, in turn, reduce the requirement for on-site generation from renewable energy sources.

Achieving an optimum use of energy throughout a building's life requires the implementation of passive design to reduce the need for energy associated with controlling the environment and efficient controls to assist in occupant's use of energy.

The calculated energy demand is based on the following specification:

- Omission of gas fuel to the building to maximise benefit of decarbonising electrical grid. Highly efficient heat pumps in the form of VRF systems are proposed to meet the heating and cooling demand of the building.
- Maximising daylighting in all areas. The glazing specification will be carefully considered, aiming to provide an optimum balance between passive solar heating, limiting summertime overheating and maximising the potential for natural daylight transmission (Lt = 0.5 min. / g = 0.4 max.).
- HVAC and lighting systems to operate 'on demand' where practical.
- Practical zoning of HVAC systems.
- Weather compensation of all heating systems.
- LED lighting to be adopted throughout with automatic daylight dimming facility to the office areas.
- Mechanical ventilation to be delivered by high efficiency Air Handling Unit with heat recovery and low energy fans.
- An air permeability of $3m^3/hr/m^2$ @ 50Pa will be targeted

The following 'U' values are proposed for the building fabric of the new building:

Element	Criteria U-Value (W/m2K)	Notes
Glazing	U = 1.2	G-Value of 0.39 on North facing and 0.26 on South, East and West elevations
Wall	U = 0.16	Build-up TBC at later stage
Roof	U = 0.1	Build-up TBC at later stage
Ground Floor	U = 0.11	Build-up TBC at later stage
Thermal Bridging		Per the accredited details
Air tightness		3 m³/m²/hr (@ 50Pa)

Carbon emissions for the 'Be Lean' building are taken from the IES software model, converted in line with Part L 2022 emissions factors, and as detailed in the table below:

Proposed 'Be Lean' Approach Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions (Part L 2021)	Estimated total Cumulative % Reduction CO_2 Emissions (Part L 2013)
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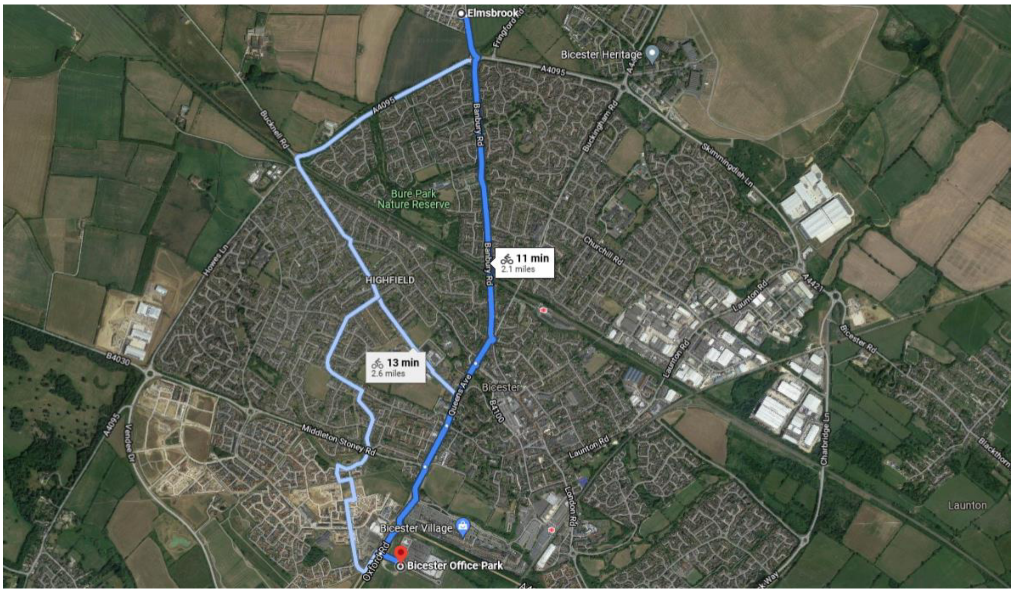
Proposed 'Lean' Development	6,600	25,896	34%	34%	62%

5.0 'Be Clean' – Decentralized Energy

Cherwell District Council's Local Plan encourages connection to existing decentralised energy and heat network through Policy EDS 4. In line with Policy EDS 4, opportunities to connect the planned development to existing or future decentralised heat distribution networks, including those featuring Combined Heat and Power (CHP) plant, have been investigated.



Investigations have been carried out into the viability of connection into a local district heating network. It was found that although the Bicester District Heating Network (Elmsbrook) is located in the general vicinity of the development, with the current provisions of the existing district heating network, connection of the development was not financially feasible.

For the purpose of this assessment, and until such time that a district heat network connection is deemed feasible, carbon emissions for the 'Be Clean' building do not demonstrate any further savings than those detailed for the 'Be Lean' building, and as detailed in the table overleaf:

Proposed 'Be Clean' Approach Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions (Part L 2021)	Estimated total Cumulative % Reduction CO_2 Emissions (Part L 2013)
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6.0 Be Green' – Renewable Energy Technology

The third stage of the energy hierarchy refers to the production of renewable and low/zero carbon energy, relating to the reduction in carbon emissions from on-site or near site renewable.

A range of approved renewable technologies have been appraised, considering the suitability, feasibility, size and capital cost of each system required to meet the target. This is summarised as below:

Technology	Brief Description	Benefits	Issues / Limitations	Feasible for Site?
Solar Photovoltaic	Solar photovoltaic panels convert solar radiation into electrical energy through semi-conductor cells.	• Low maintenance / no moving parts • Easily integrated into building design • No ongoing costs	• Any overshadowing affects panel performance • Panels ideally inclined at 30° to the horizontal facing a southerly direction • Site of conservation area and heritage interest require sensitivity of building aesthetic	Potentially
Solar Thermal	Solar thermal energy can be used to contribute towards space heating and hot water demand. The two most common forms of collector are panel and evacuated tube.	• Low maintenance • Little on going maintenance costs	• Must be sized for building DHW requirements. However, local policy encourages communal heat networks • Doesn't suit occupancy profile of a student residential development as likely to be unoccupied over summer months	No
Ground Source Heat Pump (GSHP)	GSHP systems tap into the earth's considerable energy store to provide heating and cooling to buildings. Installs include horizontal trench and vertical borehole	• Minimal maintenance • Unobtrusive technology (once implemented) • Flexible installation options to meet available site footprint • Decarbonisation of the grid promoting electrically driven heat pumps.	• Large area required for horizontal pipes and no available space on this project • Full ground survey required to determine geology • More beneficial if cooling req • Integration with piled foundations must be done at early stage	No – considering Air Source Heat Pump approach.
Air Source Heat Pump (ASHP)	As an alternative to GSHPs, ASHP systems draw energy from the air to provide heating and cooling to buildings. Installation	• Limited plant space requirements	• External plant area required	Yes – considering grid de-carbonisation for low

	methods include air-to-water and direct refrigerant (VRF)	• Efficient when supporting both heating and cooling (office element of development) • Decarbonisation of the grid promoting electrically driven heat pumps.		carbon heating and cooling. Technology utilized within 'Lean' stage.
Wind Turbine *(Roof Mounted)*	Wind generation equipment operates on the basis of wind turning a propeller, used to drive an alternator to generate electricity. Small scale (1kW – 15kW) turbines can be pole or roof mounted	• Low maintenance / on going costs • Local wind speed is sufficient *(www.bwea.com)* • Excess electrical generation can be exported to grid	• Planning issues • Aesthetic impact and background noise • Structural / vibration impact on building to be assessed • Potential for downstream turbulence due to proximity to other buildings	No
Gas Fired Combined Heat & Power (CHP)	A CHP installation is effectively a mini on-site power plant providing both electric power and thermal heat. CHP is strictly an energy efficient measure rather than a renewable energy technology	• Potential high CO2 saving available • Efficient use of fuel • Excess electrical generation can be exported to grid • Benefits from being part of an energy centre / district heating scheme	• Maintenance intensive • Sufficient base thermal and electrical demand required • Some additional plant space required	No – does not take benefit from grid de-carbonisation.
Bio-Renewable Energy Sources *(Automated feed wood-fuel boiler plant)*	Modern wood-fuel boilers are highly efficient, clean and almost carbon neutral (the tree growing process effectively absorbs the CO2 that is emitted during combustion). Automated systems require mechanical fuel handling and a large storage silo	• Stable long term running costs • Potentially good CO2 savings	• Large area needed for fuel delivery and storage, no available space on this project. • Reliable fuel supply chain required • Regular maintenance required • Significant plant space required	No
Fuel Cells	Fuel cells convert chemical energy directly into electricity by combining hydrogen and oxygen in a controlled reaction	• Virtually no pollution • High electrical efficiency	• Expensive • Early stages of commercialisation • High technology risk	No

The current and forecasted grid decarbonisation, outlined above, promotes electrically driven solutions in lieu of gas-fired considering the realistic and actual carbon emissions compared with those predicted within Part L 2013 modelling software. It is therefore proposed for this stage of the hierarchy that the development utilise Air Source Heat Pumps to meet the heating and cooling demand of the development as discussed within section 5.0 of this statement.

The proposed strategy to incorporate Air Source Heat Pump technology has been discussed and agreed with the project architects to ensure a coordinated solution is taken forward.

In addition to the use of Air Source Heat Pump technology, it is also deemed that the development can take benefit of a roof mounted Solar Photovoltaic (PV) array to further bolster the sustainable credentials of the development and maximise the potential for incorporation of renewable technologies.

Given that the development is at the early stages of design, plant space allocation at roof level will require further development at the next stages. However, an initial prediction dictates that an array in the order of 175m² could be incorporated without putting undue strain on the available space.

Carbon emissions for the 'Be Green' building are taken from the IES software model, converted in line with Part L 2022 emissions factors, and as detailed in the table below:

Proposed 'Be Green' Approach Building Carbon Emissions

	Area (m^2)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions (Part L 2021)	Estimated total Cumulative % Reduction CO_2 Emissions (Part L 2013)
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7.0 Key Objectives of Cherwell District Council

Cherwell District Council have set out the following key objectives for reducing carbon emissions and energy demand. Peveril Securities Ltd fully support the Council in this and are specifically targeting reducing emissions by adopting the Council's strategies.

At the proposed development, the space heating and cooling requirements will be minimised through good thermal envelope design (Be Lean) before being delivered via highly efficient Air Source Heat Pumps in the form of

VRF systems as a low carbon heat supply. The hot water demand for the development is anticipated to be low and will be met by electric point of use systems. Core areas which will require heating only shall be provided with high efficiency direct electric panel heaters. This philosophy acknowledges the improvements in carbon emission factors of grid supplied electricity going forward and avoids a requirement for gas (or fossil fuels) being used in the building. Further, this also provides an ongoing pathway toward zero carbon in that the building carbon emissions will continue to naturally decrease as the carbon emissions of the national electricity grid continue to decrease toward zero in line with government predictions.

Additionally, various building fabric improvements are incorporated into the building design for the proposed development as listed in Section 5.0 of this report demonstrating the intention to reduce energy demand being the first priority for the scheme.

It should also be noted that the utilisation of air source heat pump technology offers superiority in terms of coefficient of performance when compared against, for instance, gas-fired only alternatives.

8.0 Water Efficiency

Cherwell District Council have set out key objectives for reducing water usage as detailed within Policy ESD 3 the Local Plan. Peveril Securities Ltd fully support the Council in this and are specifically targeting reducing water usage by ensuring the design of the domestic water services installations and selection of associated sanitaryware will be undertaken with the primary aim of reducing the overall water consumption of the development, considering the following strategies:

- Wash Hand Basin outlets to be fitted with flow restrictors to limit the peak flow rate to 6 litres / minute or less
- Sink outlets to be fitted with flow restrictors to limit the peak flow rate to 7 litres / minute or less
- Showers to be fitted with flow restrictors to limit the peak flow rate to 8 litres / minute or less
- WC cisterns to be specified as 5 / 3 litre, or less, dual flush type
- Where white goods are specified – washing machines and dishwashers – water efficient appliances will be considered
- Metering of the external and internal points incoming water supply will enable major leak detection of the buried water services.
- Sanitary supply shut off devices to be considered on the water connections to WCs.

9.0 Conclusions

Following a well-structured energy hierarchy has enabled significant carbon reductions to be made to the development. The total carbon reduction is approximately 37% over current building regulations, when compared against the notional benchmark building.

The total predicted carbon reduction, considering the proposal above for the energy efficiency measures, Air Source Heat Pumps and Solar PV is 64% over Part L 2013 requirements (when calculated with more current Part L 2022 emissions factors) and 37% over current Part L 2021 requirements when compared against the Benchmark 'Baseline' Building incorporating the gas-fired solution.

In the first stage of the energy hierarchy (Be Lean) a number of passive and high efficiency measures have been applied to reduce the energy consumption of the building through improving U-values, system efficiencies, etc. The inclusion of Air Source Heat Pump technology in the form of VRF systems also offered a good contribution leading to the bulk of carbon emission reduction coming at the first stage of the hierarchy.

In the second stage of the energy hierarchy (Be Clean) it is currently deemed not feasible for connection to the Local District Heat Network and therefore has not been considered within this Statement.

In the final stage of the energy hierarchy (Be Green) it was concluded that a Solar PV array in the order of 100m² can be incorporated into the scheme to maximize the inclusion of renewable technologies. It was noted that this addition provided an additional 5% reduction in CO_2 emissions above that of the 'Be Lean' building to total the 60% overall reduction.

The total predicted carbon savings at each stage of the energy hierarchy are summarized as follows:

Building Carbon Emissions

	Area (m²)	Regulated Annual Emissions ($kgCO_2$/annum)	% Reduction CO_2 Emissions (Hierarchy stage)	Total Cumulative % Reduction CO_2 Emissions (Part L 2021)	Estimated total Cumulative % Reduction CO_2 Emissions (Part L 2013)
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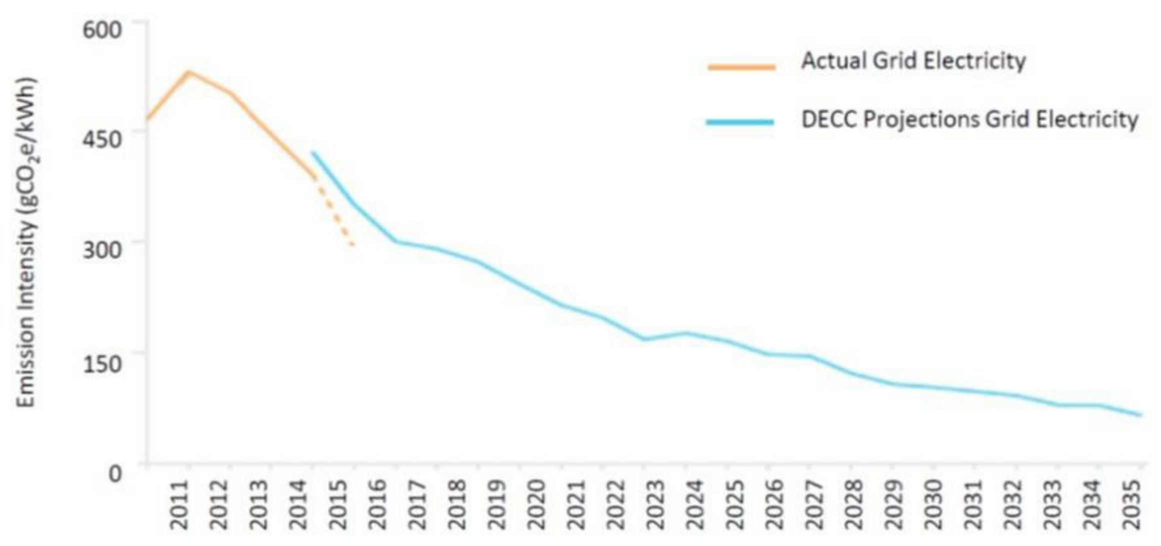
It has also been demonstrated that the strategy proposed for the development addresses the key aspects of Council's planning policies.

The proposed strategy for the office development, via the inclusion of electrically driven equipment, will enable the development to be zero carbon ready in line with the council's aspirations. By omitting the need for a natural gas connection to the site the strategy provides a pathway for the reduction in carbon emissions further through the residual reductions forecasted within the grid as per the figure below:



Period	Carbon Intensity ($gCO_2e/kWhr$)
Part L 2013	519
Actual Year 2017	275
Predicted Year 2023	175
Predicted Year 2030	110
Predicted Year 2035	65

10.0 Appendix A – Part L 2021 Proposed Building BRUKL

BRUKL Output Document

Compliance with England Building Regulations Part L 2021

Project name

Bicester Arc Office 1

As designed

Date: Wed Sep 27 10:33:20 2023

Administrative information

Building Details

Address: Bicester Arc Office 1, Bicester,

Certifier details

Name: CPW

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.22

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.22

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

Foundation area [m²]: 1322.33

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.89	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	3.68	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	42.28	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	40.03	
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	0.16	0.39	SP000040:Surf[5]
Floors	0.18	0.11	0.12	SP000018:Surf[8]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	SP000031:Surf[0]
Windows** and roof windows	1.6	1.19	1.22	SP00001B:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

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

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

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

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

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

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	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.88	6.88	0	-	0.8
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					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.

"No HWS in project, or hot water is provided by HVAC system"

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**
00-Changing Rooms	-	-	-	1.4	-	-	-	-	-	-	N/A
11-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
13-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
21-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
23-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
31-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
33-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
12-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
22-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
32-Office	-	-	-	1.4	-	-	-	-	-	-	N/A
E-00 - N	-	-	-	1.4	-	-	-	-	-	-	N/A
E-00 - W	-	-	-	1.4	-	-	-	-	-	-	N/A
E-00	-	-	-	1.4	-	-	-	-	-	-	N/A
E-00 - S	-	-	-	1.4	-	-	-	-	-	-	N/A
N-00 - S	-	-	-	1.4	-	-	-	-	-	-	N/A
N-00 - E	-	-	-	1.4	-	-	-	-	-	-	N/A
N-00	-	-	-	1.4	-	-	-	-	-	-	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
- N	-	-	-	1.4	-	-	-	-	-	-	N/A

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
01-Stairwell	178	-	-
02-Stairwell	178	-	-
00-Left Pump Room	127	-	-
00-Changing Rooms	158	-	-
00-Washroom	267	-	-
00-Disabled WC	349	-	-
11-Stairwell	178	-	-
12-Stairwell	178	-	-
10-Storage	227	-	-
10-Tiolet	164	-	-
10-Corridor	333	-	-
11-Office	106	-	-
13-Office	106	-	-
21-Stairwell	178	-	-
22-Stairwell	178	-	-
20-Storage	227	-	-
20-Toilet	164	-	-
20-Corridor	333	-	-
21-Office	106	-	-
23-Office	106	-	-
31-Stairwell	178	-	-
32-Stairwell	178	-	-
30-Storage	227	-	-
30-Toilet	164	-	-
30-Corridor	333	-	-
31-Office	106	-	-
33-Office	106	-	-
42-Stairwell	177	-	-
41-Stairwell	297	-	-
41-Upper Floor	209	-	-
00-Comms Room	146	-	-
00-Switch Room	155	-	-
12-Office	114	-	-
22-Office	106	-	-
32-Office	106	-	-
00-Toilet	179	-	-
00-Corridor	301	-	-
E-00 - N	107	-	-

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
E-00 - W	107	-	-
E-00	104	-	-
E-00 - S	108	-	-
N-00 - S	109	-	-
N-00 - E	107	-	-
N-00	104	-	-
- N	107	-	-
00-Entrance - N	231	15	9
00-Entrance	236	15	9

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?
01-Stairwell	N/A	N/A
02-Stairwell	N/A	N/A
00-Changing Rooms	N/A	N/A
00-Washroom	N/A	N/A
00-Disabled WC	N/A	N/A
11-Stairwell	N/A	N/A
12-Stairwell	N/A	N/A
10-Tiolet	N/A	N/A
10-Corridor	N/A	N/A
11-Office	NO (-6.6%)	NO
13-Office	NO (-1.4%)	NO
21-Stairwell	N/A	N/A
22-Stairwell	N/A	N/A
20-Toilet	N/A	N/A
20-Corridor	N/A	N/A
21-Office	NO (-6.6%)	NO
23-Office	NO (-1.4%)	NO
31-Stairwell	N/A	N/A
32-Stairwell	N/A	N/A
30-Toilet	N/A	N/A
30-Corridor	N/A	N/A
31-Office	NO (-6.6%)	NO
33-Office	NO (-1.4%)	NO
42-Stairwell	N/A	N/A
41-Stairwell	N/A	N/A
41-Upper Floor	N/A	N/A
12-Office	NO (-13.3%)	NO
22-Office	YES (+21.5%)	NO
32-Office	YES (+21.5%)	NO
00-Toilet	N/A	N/A
00-Corridor	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
E-00 - N	YES (+5.4%)	NO
E-00 - W	NO (-0.2%)	NO
E-00	NO (-63.7%)	NO
E-00 - S	YES (+32.7%)	NO
N-00 - S	YES (+33.9%)	NO
N-00 - E	YES (+20.9%)	NO
N-00	NO (-63.3%)	NO
- N	YES (+4.9%)	NO
00-Entrance - N	YES (+19.7%)	NO
00-Entrance	NO (-84.6%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	6657.1	6657.1
External area [m^2]	6951	8213.4
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	2419.37	2771.51
Average U-value [W/m^{2}K]	0.35	0.34
Alpha value* [%]	25.29	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
100	**Offices and Workshop Businesses**
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	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/m^2]

	Actual	Notional
Heating	1.72	2.73
Cooling	4.02	3.81
Auxiliary	1.87	1.15
Lighting	11.78	13.83
Hot water	10.44	7.1
Equipment*	39.02	39.02
TOTAL**	**29.82**	**28.62**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	2.63	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*2.63*	*0*

Energy & CO_2 Emissions Summary

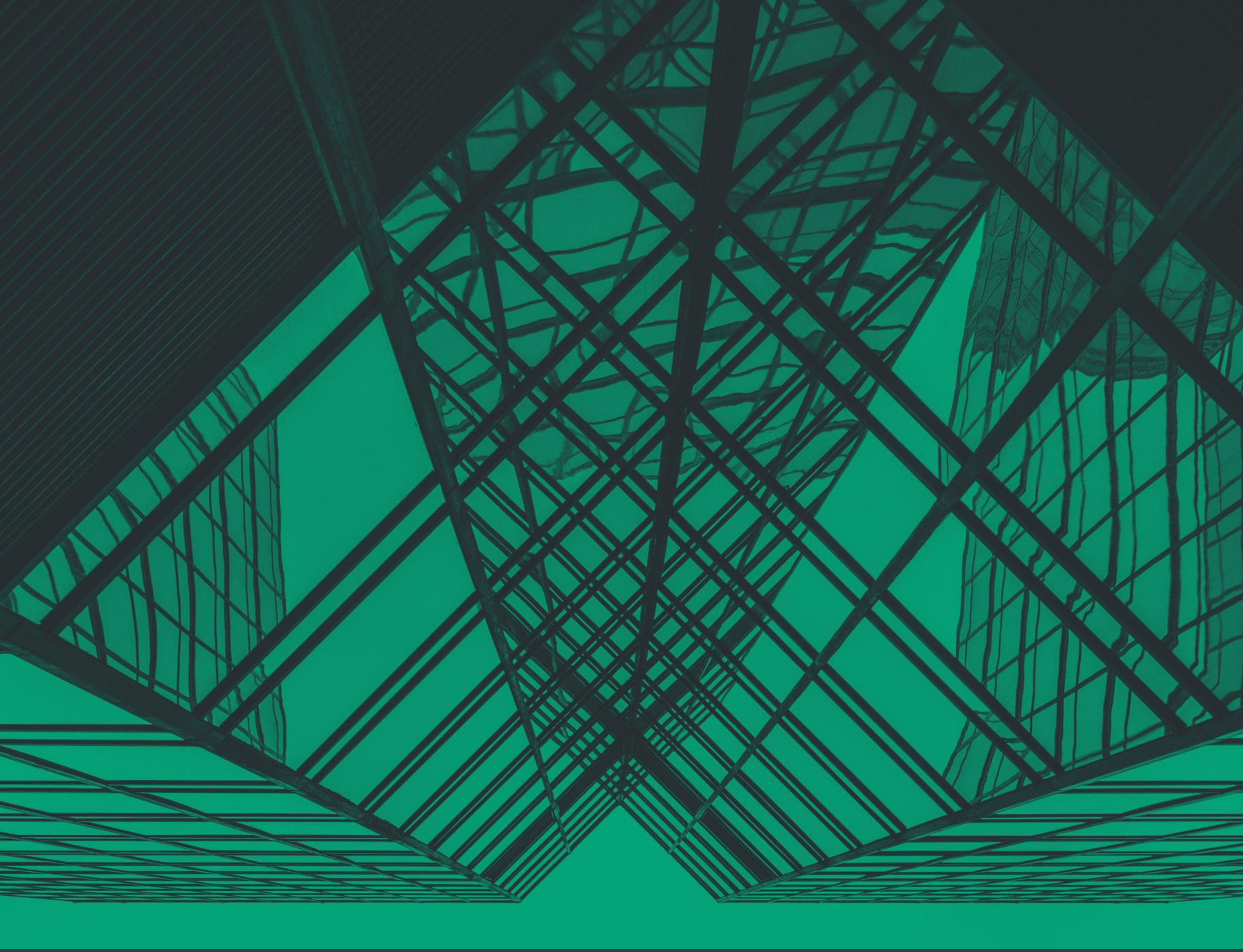
	Actual	Notional
Heating + cooling demand [MJ/m^2]	98.78	90.84
Primary energy [kWh$_{PE}$/m^2]	40.03	42.28
Total emissions [kg/m^2]	3.68	3.89

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	28.3	71.2	1.7	4	1.9	4.55	4.88	4.88	6.88
	Notional	27.5	63.9	2.8	3.8	1.2	2.78	4.63	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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



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