ENERGY STATEMENT

ALBION LAND

CATALYST BICESTER – PHASE 4

ALBION LAND

Issued by:

Engineering Services Consultancy Ltd

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Issue date: 09/05/2022

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OUR PROJECT REF: ESC2102

DOCUMENT REF : 2102/ESC/00/ZZ/RP/Z/0016

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P1	09 May 2022	**Kim Nguyen** LCEA203717	**Chris Pearce**

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1. EXECUTIVE SUMMARY

The Energy Statement supports the full planning application for employment development (Use Classes E(g)i and/or E(g)ii and/or E(g)iii), and associated infrastructure, access (including diverted public right of way), parking, and landscaping. The development will include three new employment units, **Unit 13 - 15**. This development is part of a larger multi-phase development, denoted by the Cherwell District Council as 'Bicester Gateway', which is situated between the A41 dual carriageway and Wendlebury Road, which are to the south of the retail area known as Bicester Avenue (Wyvale) Garden Centre.

The statement addresses to how the three new employment units shall seek to comply with Building Regulation's Approved Document Part L2 (ADL2) 2010 (2021 Edition), with Policies ESD 1 – 5 of the Cherwell District Council's *The Cherwell Local Plan 2011-2031*, *Policy Bicester 10: Bicester Gateway* and an Energy Performance Certificate rating of 'A'.

An energy/carbon assessment in accordance to Building Regulation's Approved Document Part L2 (ADL2) 2010 (2021 Edition) was performed in order to comply with the above requirements.

To comply with Building Regulation's ADL2, Policies ESD 1 – 5 and EPC rating of 'A', the following was proposed…

- A stage-by-stage energy hierarchy which encourages:
    - Stage 1: Employment of passive design solutions, i.e. exploiting natural daylight and providing good building fabric performance to maximise energy saving, and provision of highly efficient mechanical and electrical building services systems.
    - Stage 2: Investigate feasibility of efficient supply of fuel and energy, i.e. District Heat Network or another form of decentralised energy supply.
    - Stage 3: The feasibility of low and zero carbon technologies to attain further carbon reduction, if required to comply with Building Regulation's ADL2 AND achieve EPC Rating of 'A'
- Target associated BREEAM NC credits in regard to sustainable construction and water consumption.

The proposed strategy resulted in the following…

- **Unit 13 – 15** achieved compliance with Building Regulation's ADL2 Section 1 – 2 and 4 – 7 through the use of efficient building fabric and Air Source Heat Pumps and Photovoltaic Panels. High efficacy lighting and lighting controls were also used. The amount of Photovoltaic Panels for each employment unit are the maximum amount, placed outside of rooflights and areas/perimeters required to safely maintain the roof gutters, rooflights and Photovoltaic Panels.
- **Unit 13** achieves an EPC rating of 'A' and Part L2 compliance, using approx. 321 m^2 of Photovoltaic Panels. The annual generation equates to approx. **55,000 kWh/yr**.
- **Unit 14** achieves an EPC rating of 'A' and Part L2 compliance, using 225 m^2 of Photovoltaic Panels. The annual generation equates to approx. **40,000 kWh/yr**.

- **Unit 15** achieves an EPC rating of 'A' and Part L2 compliance, using 297 m^2 of Photovoltaic Panels. The annual generation equates to approx. **51,000 kWh/yr**.
- **Unit 13 – 15** achieves **8 Ene 01 credits** each. Should the development aim to achieve an 'Excellent' rating, each building can feasibly achieve the required Ene 01 credits for it.

2. INTRODUCTION

Engineering Services Consultancy Ltd (ESC) has been commissioned by Albion Land to produce an Energy Statement that will support the full planning application for the employment units, Unit 13 - 15. The statement aims to address the following…

- Building Regulation's Approved Document Part L2 (ADL2) 2021
- Policies ESD 1 – 5 set out within Cherwell District Council's *The Cherwell Local Plan 2011-2031*.
- Energy Performance Certificate Rating of 'A'

The ADL2 is England's legal guideline standard for non-domestic buildings which regards energy efficiency and limiting carbon emissions.

The Energy Performance Certificate is a legal requirement for domestic and non-domestic buildings, that are constructed, sold or rented out, to display their energy efficiency rating as public information.

Policies ESD 1 – 5 aim towards new large domestic and non-domestic developments that are under the Council's jurisdiction and their key objective is to mitigate climate change, reduce energy usage, increase resource efficiency, promote the use of renewable energy and reduce carbon emissions and embodied carbon.

To comply with ADL2 2021 and Policies ESD 1 – 5, we shall propose an energy hierarchy that will be staged as follows…

- Stage 1: Employ passive design solutions, such as good building fabric performance, improve air tightness and exploitation of natural daylight to maximise reduction in energy and carbon emissions.
- Stage 2: Provide highly efficient HVAC and lighting systems so energy can be supplied and used efficiently.
- Stage 3: Assessment of the feasibility of low and zero carbon (LZC) technologies to further reduce carbon emissions, if required to comply with Building Regulations ADL2

However, this energy hierarchy does not address the items in Policy ESD 3 that encompasses the use of sustainable construction methods and reducing water consumption. Therefore, the statement shall reference the associated BREEAM credits required to fully comply with Policy ESD 3, these credits are highlighted in Section 7. The five policies will be further elaborated.

This report has been produced by Kim Nguyen, of Engineering Services Consultancy Ltd. Kim Nguyen is a certified Low Carbon Energy Assessor (Ref: LCEA203717).

2.1 SITE DESCRIPTION

The development under the full planning application is the fourth phase of the wider commercial development scheme known as 'Catalyst Bicester'. The fourth phase comprises of three new employment buildings, known as Unit 13 – 15, with Use Class E(g)i and/or E(g)ii and/or E(g)iii. Each building will comprise of flexible employment units across three storeys, with operators distributing these uses across the space as required. Figure 1 illustrates the location of the site and Figure 2 illustrates the current layout of the development site.

The new development is located on a site denoted by the Cherwell District Council as 'Bicester Gateway', which is situated between the A41 dual carriageway and Wendlebury Road, which are to the south of the existing retail area known as Bicester Avenue (Wyvale) Garden Centre.

In accordance to the Cherwell District Council's *The Cherwell Local Plan 2011-2031, Policy Bicester 10: Bicester Gateway*, the new development is to be part of a 'high-tech' and 'knowledge-based' employment development that shall create approximately 3,500 new science, research and technology jobs.

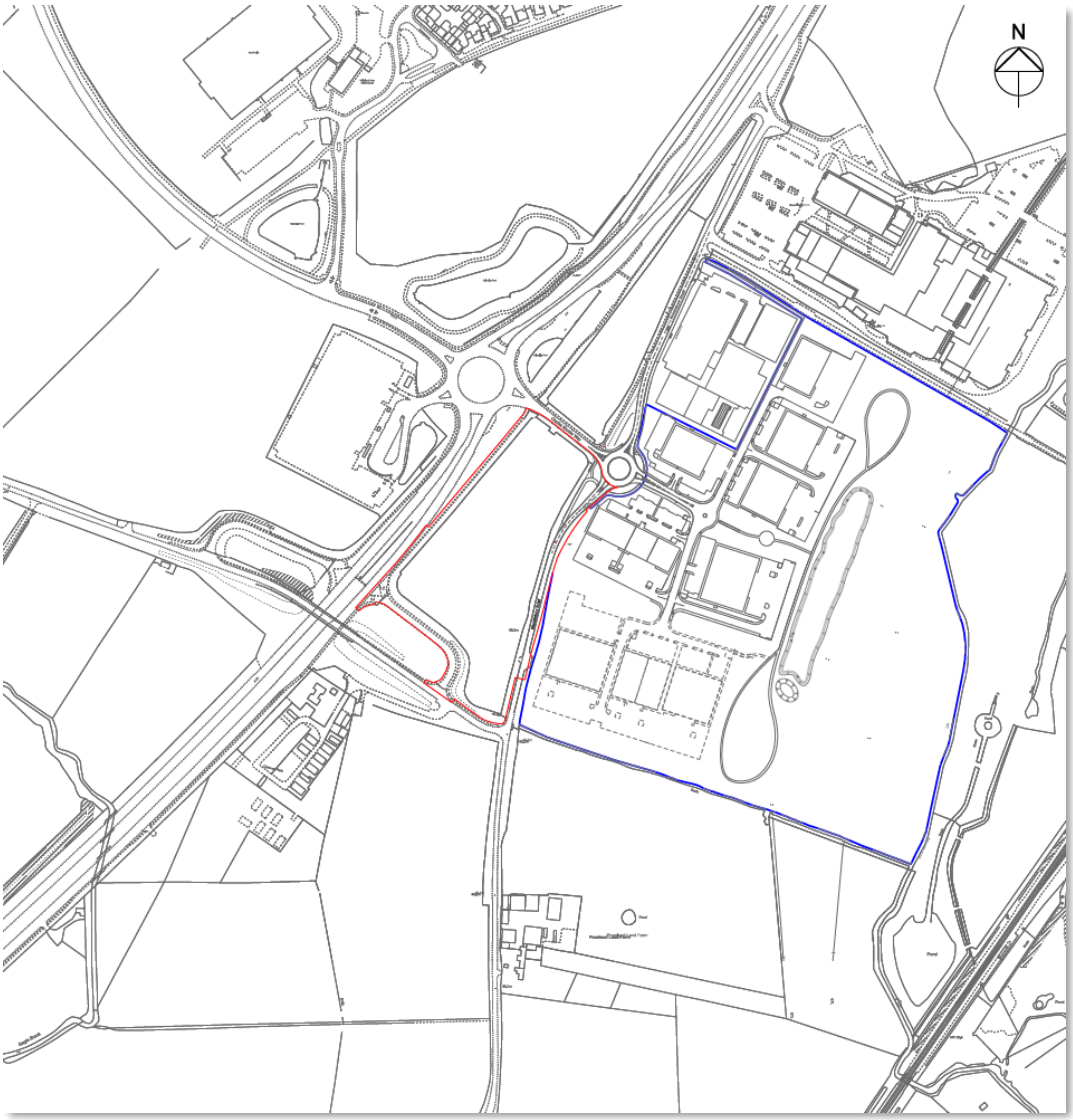


Figure 1: Proposed site location plan. Source: Cornish Architects

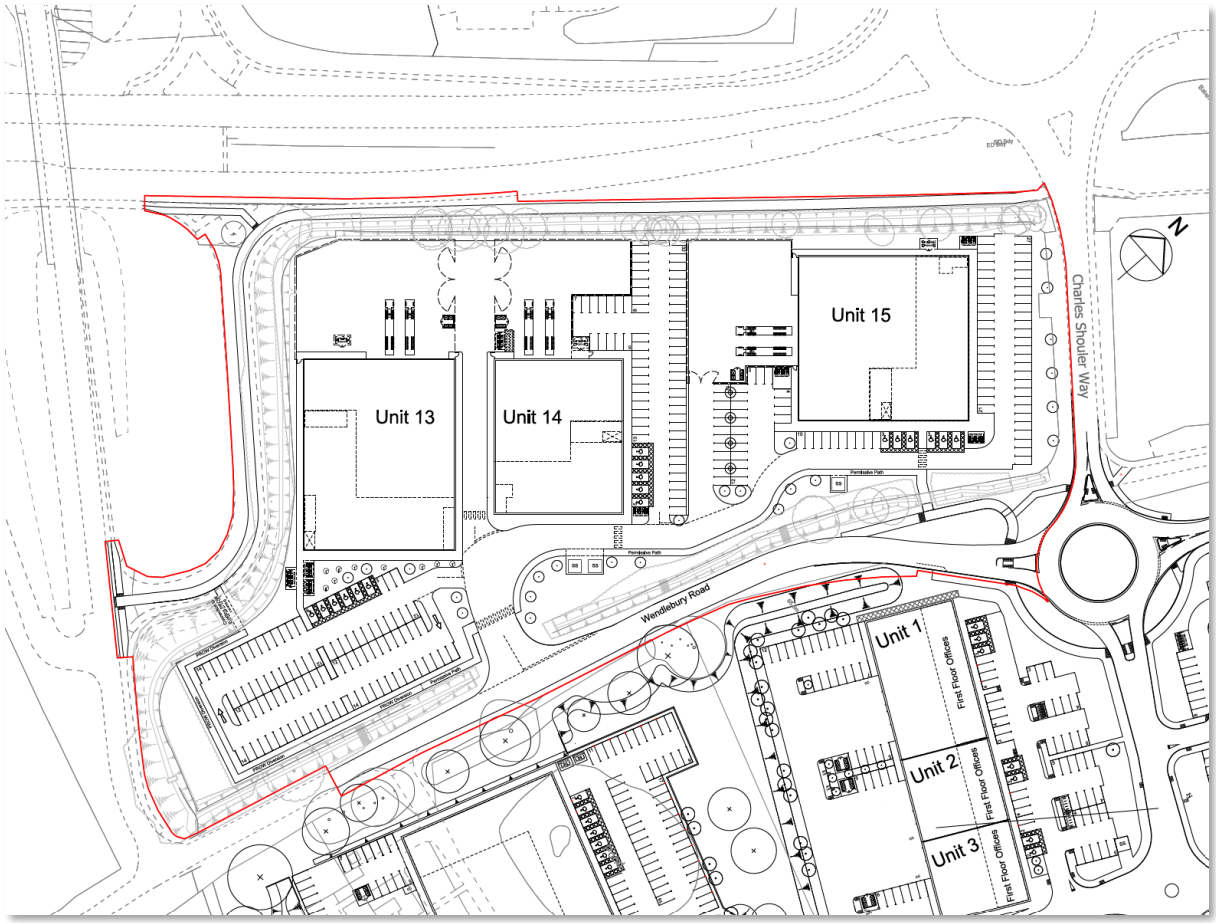


Figure 2: Proposed site plan. Source: Cornish Architects

3. DEVELOPMENT REQUIREMENTS

The proposed development is required to be constructed in a certain manner to meet energy efficiency and sustainability requirements. The minimum benchmark requirements are as follows…

- Building Regulation's Approved Document Part L2 (ADL2) 2021
- Policies ESD 1 – 5 set out within Cherwell District Council's *The Cherwell Local Plan 2011-2031*.
- Energy Performance Certificate Rating of 'A'

3.1 BUILDING REGULATIONS APPROVED DOCUMENT PART L2 2021

The ADL2 is England's legal guideline standard document for new non-domestic buildings with an objective to regulate how much carbon dioxide is emitted, by assessing the building's intrinsic energy performance via its building fabric and internal building services. Within the document, new buildings are required to meet multiple requirements.

As such, the development shall aim to be meet ADL2's standard as a minimum requirement in terms of carbon emissions and energy efficiency.

3.1.1 APPROVED DOCUMENT L2 SECTION 1 AND 2

Section 1 and 2 are concerned with the amount of carbon dioxide emitted from a building per annum as well as the primary energy consumption. Both parameters are calculated by an approved Energy Assessor, using approved software tools. Within the approved software, the Energy Assessor creates a virtual building model which reflects the actual building and incorporates actual design features including building envelope, building orientation, glazing, air permeability, geographical location, and building services. This particular virtual model is referred to as the "Actual Building". The Energy Assessor also applies a standard database of internal environmental conditions and activities which take place within, known as NCM templates.

When concerned with the carbon emission and primary energy rate assessment, the Actual Building is compared against a "Notional Building". The Notional Building is generated automatically within the accredited software and mimics the physical size, shape, orientation, location, and layout of the Actual Building. However, the design features (fabric and building services) of the Notional Building are not related to the Actual Building and may be better in performance. In order to pass the carbon emissions and primary energy assessment for compliance with ADL2 2021, the carbon emission and primary energy rates of the Actual Building must be equal to, or less than, the two parameters of the Notional Building.

The annual carbon dioxide emission and primary energy per square metre of floor area calculated for the Actual Building is known as the Building Emission Rate (BER) and Building Primary Energy Rate (BPER), respectively, whilst the annual carbon dioxide emission and

primary energy per square metre of floor area for the Notional Building is known as the Target Emission Rate (TER) and Target Primary Energy Rate (TPER).

3.1.2 APPROVED DOCUMENT L2 SECTION 4, 5, 6 AND 7

Sections 4 and 7 assesses the performance of the building fabric to ensure that reasonable provision is made to limit heat gains and heat losses. During the calculation, the software assesses building fabric U-values and building air permeability to ensure that minimum standards prescribed by the Building Regulations are met.

Sections 5 and 6 also requires M&E building services to meet minimum energy efficiency standards. Whilst he efficiency of such plant and equipment is entered into the software to calculate building carbon emission; it is not automatically checked during the assessment for compliance with Section 5 and 6. The BRUKL Output Document therefore provides a schedule of plant and equipment efficiency for review by the Building Control Officer (BCO).

3.1.3 SHELL AND CORE DEVELOPMENTS

Building Regulations Part L2 sets out, for shell and core developments, that the building should be demonstrated via the design stage TER/BER and BPER/TPER submission how the building shell as offered could meet the energy efficiency requirements. For those parts of the building where certain systems are not installed at the point the building is to be offered to the market, the model that is used to derive the BER should assume efficiencies for those services that will be installed as part of the first fit-out work.

At practical completion of the base building, the as-built TER/BER and BPER/TPER calculation should be based only on the building and systems as actually constructed; the fit-out areas should be assumed to be conditioned to temperatures appropriate to their designated use, but no associated energy demand included.

The unit is to be left as a shell area in this development, therefore an ‘as-designed’ TER/BER and BPER/TPER calculation has been provided applying assumed systems and efficiencies to this area. In addition, the ‘as-built’ TER/BER and BPER/TPER calculation has been provided to show the office area complies with Building Regulations as a standalone base building.

3.2 CHERWELL DISTRICT COUNCIL

'THE CHERWELL LOCAL PLAN 2011 – 2031'

The Cherwell Local Plan 2011 – 2031 is The Cherwell District Council's local plan with purpose to expand its district to increase job employment, improve local and national economy and improve connections on rail and road. It is their aim to execute this plan in a sustainable and environmentally conscious manner.

To encourage this in the construction and use of any new domestic and non-domestic development, *The Cherwell Local Plan 2011 – 2031* introduced five policies known as Policies ESD 1 – 5. These policies aim to mitigate a development's involvement in climate change as well as reduce its energy usage, carbon emissions and embodied carbon.

3.2.1 THE CHERWELL LOCAL PLAN 2011 – 2031 – POLICY BICESTSER 10: BICESTER GATEWAY

The Catalyst Bicester development is an allocated site within Local Plan, known as 'Bicester Gateway', whereby its associated policies is highlighted in section *Policy Bicester 10: Bicester Gateway* of *The Cherwell Local Plan 2011 – 2031*.

Within *Policy Bicester 10*, it includes the development's requirement to comply with Policies ESD 1 – 5, these policies are elaborated below.

3.2.1.1 POLICY ESD 1: MITIGATING AND ADAPTING TO CLIMATE CHANGE

Policy ESD 1 states:

Measures will be taken to mitigate the impact of development within the district on climate change. At a strategic level, this will include:

- *Distributing growth to the most sustainable locations as defined in this Local Plan*
- *Delivering development that seeks to reduce the need to travel and which encourages sustainable travel options including walking, cycling and public transport to reduce dependence on private cars*
- *Designing developments to reduce carbon emissions and use resources more efficiently, including water (see Policy ESD 3 Sustainable Construction)*
- *Promoting the use of decentralised and renewable low carbon energy where appropriate (see Policies ESD 4 Decentralised Energy Systems and ESD 5 Renewable Energy)*

3.2.1.2 POLICY ESD 2: ENERGY HEIRARCHY AND ALLOWABLE SOLUTIONS

Policy ESD 2 states:

In seeking to achieve carbon emissions reductions, we will promote an 'energy hierarchy' as follows:

- *Reducing energy use, in particular by the use of sustainable design and construction measures*

- *Supplying energy efficiently and giving priority to decentralised energy supply*
- *Making use of renewable energy*
- *Making use of allowable solutions*

3.2.1.3 POLICY ESD 3: SUSTAINABLE CONSTRUCTION

Policy ESD 3 states:

…Cherwell District is in an area of water stress and as such the Council will seek a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day.

All new non-residential development will be expected to meet at least BREEAM 'Very Good' with immediate effect, subject to review over the plan period to ensure the target remains relevant. The demonstration of this standard should be set out in the Energy Statement.

The strategic site allocations identified in this Local Plan are expected to provide contributions to carbon emissions reductions and to wider sustainability.

All development proposals will be encouraged to reflect high quality design and high environmental standards, demonstrating sustainable construction methods including but not limited to:

- *Minimising both energy demands and energy loss*
- *Maximising passive solar lighting and natural ventilation*
- *Maximising resource efficiency*
- *Incorporating the use of recycled and energy efficient materials*
- *Incorporating the use of locally sourced building materials*
- *Reducing waste and pollution and making adequate provision for the recycling of waste*
- *Reducing the impact on the external environment and maximising opportunities for cooling and shading (by provision of open space and water, planting, and green roofs, for example); and*
- *Making use of the embodied energy within buildings wherever possible and re-using materials where proposals involve demolition or redevelopment*

3.2.1.4 POLICY ESD 4: DECENTRALISED ENERGY SYSTEMS

Policy ESD 4 states the following…

The use of decentralised energy systems, providing either heating (District Heating (DH)) or heating and power (Combined Heat and Power (CHP)) will be encouraged in all new developments.

A feasibility assessment for DH/CHP, including consideration of biomass fuelled CHP, will be required for:

- *All residential developments for 100 dwellings or more*
- *All residential developments in off-gas areas for 50 dwellings or more*

- *All applications for non-domestic developments above 1000m^2 floorspace.*

…Where feasibility assessments demonstrate that decentralised energy systems are deliverable and viable, such systems will be required as part of the development unless an alternative solution would deliver the same or increased benefit.

3.2.1.5 POLICY ESD 5: RENEWABLE ENERGY

Policy ESD 5 states:

The Council supports renewable and low carbon energy provision wherever any adverse impacts can be addressed satisfactorily. The potential local environment, economic and community benefits of renewable energy schemes will be a material consideration in determining planning applications.

…A feasibility assessment of the potential for significant on-site renewable energy provision (above any provision required to meet national building standards) will be required for:

- *All residential developments for 100 dwellings or more*
- *All residential developments for off-gas areas for 50 dwellings or more*
- *All applications for non-domestic developments above 1000m^2 floorspace*

Where feasibility assessments demonstrate that on site renewable energy provision is deliverable and viable, this will be required as part of the development unless an alternative solution would deliver the same or increased benefit.

4. PROPOSED 'LEAN, CLEAN AND GREEN' ENERGY HIERARCHY

To address Building Regulation's ADL2 and Policies ESD 1 – 5, the adoption of an energy hierarchy known as 'Lean, Clean and Green' shall be proposed. This energy hierarchy originated from *The London Plan*, used to minimise carbon dioxide emissions from buildings within the Greater London Area.

The proposed lean, clean and green energy hierarchy will be followed to demonstrate that intrinsically low energy buildings can be achieved and that carbon emissions can be reduced to the requirements of Building Regulations. The definitions are described:

- **Lean** – Reduce the energy demand and energy loss by designing efficiency into the thermal fabric of the building, focusing on air tightness, thermal mass and thermal bridging. Increase energy efficiency and controls of internal building services, such as lighting, heating, air-conditioning and ventilation.
- **Clean** – Supply energy efficiently via the use of a local District Heat Network or another form of decentralised energy supply.
- **Green** – The potential use of LZC technologies to offset carbon emissions and energy usage, if feasible and required to comply with Building Regulation's ADL2.

Under 'Lean', passive design measures shall be incorporated. These shall include good building fabric performance, glazing systems offering good solar control and daylight dimming control for the artificial lighting system.

The following energy/carbon assessment shall provide the methodology and results of each element and highlight what Policy it addresses.

5. ENERGY AND CARBON ASSESSMENT

An initial energy assessment based on using the worst permissible building fabric efficiencies, heating and cooling efficiencies and lighting efficacies shall be performed. This assessment shall serve as the 'baseline' comparator for each element of the energy hierarchy.

All energy/carbon calculations were undertaken using software programme IES: Virtual Environment which is a Dynamic Simulation Model (DSM) tool accredited by the Department of Communities and Local Government for the generation Energy Performance and BRUKL Certification.

Table 1: Schedule of Drawings and Documents

REF	TITLE	REVISION	FROM
23022-TP-001	Site Location Plan	-	Cornish Architects
23022-TP-002	Proposed Site Plan	-	Cornish Architects
23022-TP-004	Unit 13 Ground and First Floor Plans	-	Cornish Architects
23022-TP-005	Unit 13 Second Floor and Roof Plan	-	Cornish Architects
23022-TP-006	Unit 13 Section	-	Cornish Architects
23022-TP-007	Unit 13 Elevations	-	Cornish Architects
23022-TP-008	Unit 14 Ground and First Floor Plans	-	Cornish Architects
23022-TP-009	Unit 14 Second Floor and Roof Plan	-	Cornish Architects
23022-TP-010	Unit 14 Section	-	Cornish Architects
23022-TP-011	Unit 14 Elevations	-	Cornish Architects
23022-TP-012	Unit 15 Ground and First Floor Plans	-	Cornish Architects
23022-TP-013	Unit 15 Second Floor and Roof Plan	-	Cornish Architects
23022-TP-014	Unit 15 Section	-	Cornish Architects
23022-TP-015	Unit 15 Elevations	-	Cornish Architects

The CL2.1 SBEM Weather Location Look-up tool was used to determine the suitable weather file for the development. Using the post area 'OX', the weather file applicable is Swindon_Brize_Norton_TRY. This weather file shall be used for all analysis.

5.1 BASELINE MODEL

The baseline model shall be set using the following building fabric and building services strategy and efficiencies.

Table 2: Unit 13 – 15's Building Envelope Performance

ELEMENT	WORST PERMISSIBLE
External Wall U-value	0.26 W/m^2.K
Roof U-value	0.18 W/m^2.K
Ground Floor Slab U-value	0.18 W/m^2.K
Door U-value	1.60 W/m^2.K
Window U-value (frame & glass)	1.60 W/m^2.K
Window g-value / light transmission	0.40 / 70%
Rooflight U-value (frame & glass)	2.10 W/m^2.K
Rooflight g-value / light transmission	0.43 / 49%
Air Permeability	3.0 m^3/(h.m^2) @ 50Pa

Table 3: Thermal Model Zone and System Assignment

ZONE	SYSTEM
Open Plan Flexible Employment Spaces	Traditional fan coil unit system with heating via LTHW gas-fired boiler and electric-powered vapour compression cycle external chiller. Fresh air ventilation via void-mounted mechanical ventilation heat recovery units.
Reception	Traditional fan coil unit system with heating via LTHW gas-fired boiler and electric-powered vapour compression cycle external chiller. Natural/passive ventilation only.
All Circulation Areas	Electric panel heaters with fresh air ventilation via void-mounted mechanical ventilation heat recovery units.
Toilets and Showers	Electric panel heaters with extract ventilation via remote extraction fan
Large Shell Workspace Areas	Unheated (frost protection to 5°C only)

Table 4: Thermal Model HVAC System Description

SYSTEM	SYSTEM DESCRIPTION
Mechanical Ventilation Heat Recovery Units	Specific Fan Power = 1.5 W/(l/s). Heat recovery efficiency = 75%
LTHW Gas-Fired Boiler	Heating efficiency = 93%
Electric-Powered Vapour Compression Cycle Chillers	Cooling SEER= 6.0
General Domestic Hot Water Services	Local instantaneous electric water heaters
Cleaner's Store Domestic Hot Water Services	Local storage electric water heaters with total cumulative storage capacity of 70 litres. Insulation thickness of 10mm, factory insulated.

Table 5: Thermal Model Electrical Lighting Performance

ROOM	LUMINAIRE EFFICACY (LLM/CW) unless otherwise stated	DESIGN ILLUMINANCE (LUX)	OCCUPANCY DETECTION	DAYLIGHT CONTROL	PARASITIC POWER (W/M^2)
Open Plan Flexible Employment Spaces	95	500	Manual On/Auto Off	Photocell control dimming	0.10
Reception	95	300	None	Photocell control dimming	0.10
Landing	95	200	Auto On/Off	Photocell control dimming	0.10
Circulation Areas	95	200	Auto On/Off	No daylight control	0.10
Toilets	95	200	Auto On/Off	No daylight control	0.10
Large Shell Workspace Areas	95	100	Auto On/Off	No daylight control	0.10

5.1.1 BASELINE RESULTS

By implementing the worst permissible building fabric and building services efficiencies, the building does not comply with Building Regulations Part L2 and does not achieve an EPC rating of 'A'. The results are as follows:

Table 6: Thermal Model 'As Designed' Carbon Emission Results and EPC Rating

Building		Unit 13	Unit 14	Unit 15
Target Emission Rate (TER)	($kg.CO_2/m^2.annum$)	3.28	2.77	4.32
Target Primary Energy Rate (TPER)	kWh/m^2	30.79	25.9	25.6
Building Emission Rate (BER)	($kg.CO_2/m^2.annum$)	5.13	4.44	4.32
Building Primary Energy Rate (BPER)	kWh/m^2	48.97	41.15	40.98
Building Regulations Compliance?		No	No	No
EPC Rating		B	B	B

Below is the breakdown of the energy consumption, extracted directly from the BRUKL document…

Unit 13

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	8.11	5.76
Cooling	1.8	1.57
Auxiliary	10.15	7.12
Lighting	9.27	11.14
Hot water	4.42	3.98
Equipment*	35.89	35.89
TOTAL**	**33.74**	**29.59**

* 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	7.85
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*7.85*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	54.5	48.67
Primary energy [kWh_{PE}/m²]	48.97	30.79
Total emissions [kg/m²]	5.13	3.28

Unit 14

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	7.78	4.98
Cooling	1.39	1.47
Auxiliary	7.42	5.37
Lighting	7.7	9.35
Hot water	4.32	3.89
Equipment*	33.93	33.93
TOTAL**	**28.61**	**25.06**

* 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	6.75
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*6.75*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	46.43	43.77
Primary energy [kWh_{PE}/m²]	41.15	25.9
Total emissions [kg/m²]	4.44	2.77

Unit 15

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	6.47	3.98
Cooling	1.64	1.56
Auxiliary	7.61	5.43
Lighting	8.14	9.73
Hot water	4.44	4
Equipment*	34.85	34.85
TOTAL**	**28.29**	**24.7**

* 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	6.72
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*6.72*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	46.35	41.32
Primary energy [kWh_{PE}/m²]	40.98	25.6
Total emissions [kg/m²]	4.32	2.67

Figure 3: Baseline BRUKL Output Document results

5.2 LEAN

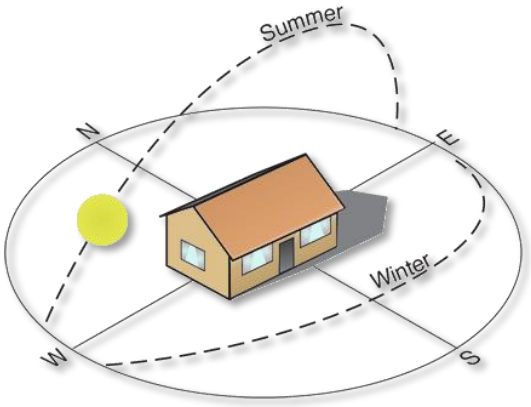
The Sustainability Statement shall investigate and identify the opportunities to implement passive design solutions in order to reduce the demands for the energy consuming building services for the building.

Passive design measures have been considered as a means to reduce the total heating, cooling, lighting loads and energy consumption with the aim of reducing the total heating/cooling energy demand and carbon emission rate.

5.2.1 PASSIVE DESIGN SOLUTIONS

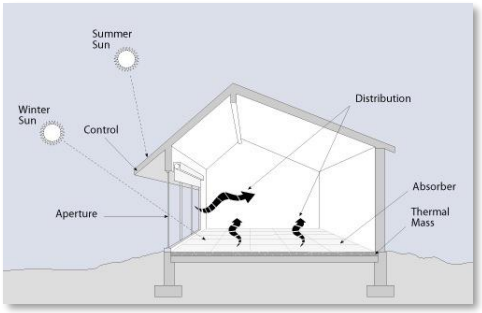
The table below summarises the main passive design solutions and their benefits:

BUILDING LAYOUT	
Description	Rooms must also be located to take advantage of the sun in order to reduce energy use, but different types of rooms differ in solar requirements. North, east, west and south facing rooms each having different solar gains and receive different amounts of daylight.
Advantages	South facing – Workspaces, particularly open plan areas: • Good daylight for the majority of the day. • Solar gain for most of the day and throughout the year. • Good passive solar gain in winter. East facing – Open plan, entrance lobby and tea point areas: • Good morning light. • Solar gain in the morning throughout the year providing initial warming. • Cooler in the late afternoon during lunch hours. West facing – Large shell workspace areas where occupants are working within spaces that utilise building material with high thermal mass, i.e. exposed concrete. • Good afternoon daylight. • Good direct solar gain for thermal mass heating of workspaces in the night for pre-heating.
Disadvantages	South facing rooms may require horizontal shading to prevent overheating during summer months. West facing rooms may overheat in the later afternoon during most of the year, and they may require vertical shading to prevent excessive overheating and glare in the afternoon. North facing rooms are not suitable for habitable spaces because they have lower levels of daylight during parts of the year and have little/no solar gain. Garage, laundry, bathroom, toilet, workroom and stairs would work best as north facing rooms/areas.

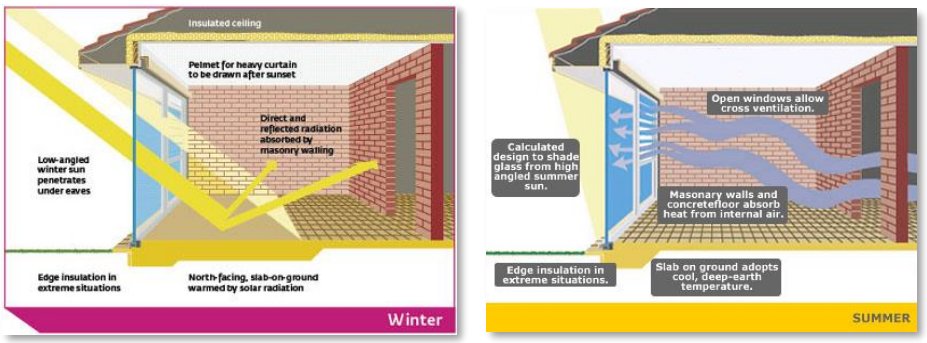
BUILDING ORIENTATION	
Description	The orientation of the building will have a strong impact on the solar gains. Very high solar gains are undesirable as they can lead to overheating of the building, however the right amount of solar gain is desirable as it will reduce the heating and lighting demands. Through the correct orientation of the building energy loads can be minimised and solar gains can be maximised. The glazed areas and the thermal properties of the glass are fundamental to the building's energy consumption. The specification of the glass will provide a balance between the light it lets through and the amount of solar gain it reflects away. 
Advantages	• Reduced need for artificial lighting and heating. • No extra costs for building.
Disadvantages	• The correction location is needed depending on factors such as climate and building size. • Old buildings may need costly upgrades to maximise benefits.

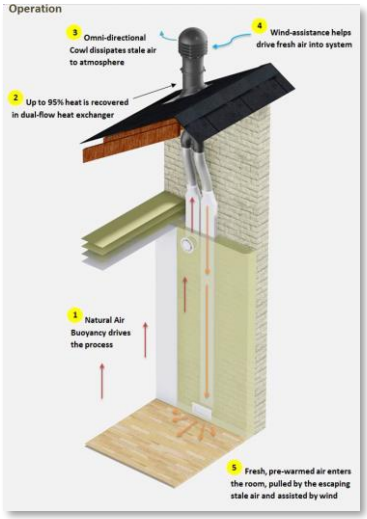
BUILDING FORM	
Description	The shape or form of a building can greatly improve the occupant comfort. The building form determines the airflow pattern around the building, which will have a direct effect on the ventilation. The shape of the building will also influence heat losses, as more compact shapes are more efficient in storing heat. The depth of the building is likely to have an influence on the requirements for artificial lighting, the deeper the building the higher the need will be for artificial lighting.
Advantages	Costs would be reduced as energy usage is lessened.
Disadvantages	Certain building types that are more beneficial for heating and energy (small, high-rise, cylindrical) are less likely to be used.

BUILDING FABRIC	
Description	Good building design and use of building fabrics can allow for reduced heating and cooling loads, lower energy use and lower carbon emissions.
Advantages	Building fabrics aim to: • Protect building occupants from weather (wind, rain, solar radiation, snow etc.). • Regulate indoor environment (temperature, humidity, moisture etc.). • Prevent noise transmission. • Provide safety e.g., prevent spread of fire or smoke. • Provide views into and out of the building.
Disadvantages	It is more difficult to improve the performance of existing buildings through the building fabric. Retrofitting, i.e., the provision of materials that were not original fitted during original manufacture/construction, can be used in these cases. Retrofitting can include: • Improvements to air tightness. • Introduction of double glazing. • Installation of cavity wall insulation. • Internal/external solid wall insulation. However, retrofitting could be costly and time consuming.

THERMAL MASS OR OTHER FABRIC THERMAL STORAGE	
Description	A material that has thermal mass in one with the capacity to absorb, store and release the sun's heat energy. The density and levels of conductivity aid in stabilising the internal temperature of a building. Thermal mass can be used to keep a structure cool during the summer and release stored heat to keep the building warmer in the winter. These materials are most commonly used in flooring or inside walls so they can store and release energy from the sun. Such materials are generally dense such as concrete, brick and ceramic tile. 
Advantages	• Reduction in energy fuels as less mechanical heating and cooling will be required.
Disadvantages	• Most beneficial in hotter climates. • Is heavily dependent upon the weather. • Thermal mass alone cannot create a thermally comfortable building.

BUILDING OCCUPANCY TYPE	
Description	Commercial buildings have different characteristics to residential buildings, for example, higher ventilation requirements, varied occupancy trends, greater heating gains internally from lighting and equipment. Therefore, commercial buildings benefit more from passive cooling. Residential buildings generally experience higher night-time occupancies and lower internal heat gains.

DAYLIGHTING STRATEGY	
Description	Using daylighting is a key strategy for passive design. Allowing more sunlight into the building impacts the visual comfort and thermal comfort. A daylighting system can be comprised of features such as skylights and windows but is coupled with a daylight-responsive lighting control system. Daylighting involves a balance between heat gains and losses, glare control and variations in daylight availability. All window sizes and spacing, glass selection, the reflection of interior finishes and the location of any interior partitions must be evaluated. 
Advantages	• Reliable source of light. • Reducing electric lighting and saving energy.
Disadvantages	• Daylighting components are normally integrated within the original design on the building, so it may not be possible to retrofit.

VENTILATION STRATEGY	
Description	Natural ventilation can provide and move fresh air without the need for mechanical equipment. This can provide a significant reduction in the building's energy usage through the elimination of mechanical air conditioning systems. Natural ventilation depends heavily upon pressure differences to move fresh air through buildings. Therefore, the amount of ventilation is likely to depend on the size and placement of openings in the building. 
Advantages	• Can save between 10-30% in total energy consumption.
Disadvantages	• Buildings within areas with high acoustic levels will be less suitable for natural ventilation as the noise pollution level will be increased. • Buildings in locations with poor air quality may also be less suitable. • Cannot reduce the humidity of incoming air.

ADAPTATION TO CLIMATE CHANGE	
Description	Due to the constantly changing climate and future scenarios for possible climate change, it is unlikely that the nature of weather will remain the same throughout a building's lifetime. Climate change modelling has suggested a future increase in global temperatures, coupled with an increase in rainfall and more extreme events such as tropical storms. It is important to take this into consideration during the design stage of the building. Several passive design strategies could be used to mitigate against future fluctuations in climate, these include: • Thermal mass to reduce the internal temperature variation. • Insulation to reduce the rate of heat transfer through the building structures. • External shading of the vulnerable building services. • A suspended floor to mitigate against possible increased flooding. • Provide landscaping to reduce cooling requirements within the building. • Raise buildings off the ground in flood prone areas. • Maximise summer cooling through natural ventilation.

5.2.2 APPROPRIATE SOLUTIONS

The table below summarises the design solutions which are considered appropriate for the development:

MEASURE	REASON FOR USE
Building Fabric	Improved thermal performance for the external wall, roof and glazing and good airtightness to reduce heating energy consumption. Improve glazing solar transmittance to reduce incoming solar gain entering the occupied and air-conditioned space.
Building Form	Spaces with access to daylight from side-lit glazing can take advantage by having glazing on both sides of the unit. Currently the building's design implements this.
Adaptation to Climate Change	The air-conditioning system can be sized for a future climate scenario. This will need to be executed by the project's mechanical contractor.

5.2.3 EXCLUDED SOLUTIONS

The table below summarises the design solutions which are not appropriate for the development, and why:

MEASURE	REASON FOR EXCLUSION
Thermal Mass or Other Fabric Thermal Storage	No inclusion of thermal mass or other fabric thermal storage is proposed for the development. It is assumed that as the building is a typical employment unit, the internal walls will be plasterboard and the internal floor will have a carpet finish. No exposed concrete is assumed.
Building Layout	There are no building layout features that are directly influenced by passive design as the majority of the space is open plan flexible employment space.
Daylight Strategy	Most windows are near full height and curtain walls are incorporated into the reception to take full advantage of the sunlight. All areas already have photocell dimming incorporated into their design, where it is applicable.
Building Orientation	Unit's orientation is limited due to constraints in location of the service yard area, access road and car parks. There are no current alternative orientation of the building proposed
Building Occupancy Type	The units are constructed to a standard open plan Category A specification so variations in occupancy or heat gains are unknown at this point.
Ventilation Strategy	Natural ventilation cannot be provided as the unit's façade are facing the car park area and access road, which will introduce issues in indoor air quality

5.2.4 IMPLEMENTED SOLUTIONS

The table below summarises the design solutions that were implemented into the new development.

MEASURE	REASON FOR USE
Building Fabric	Improved thermal performance for external wall, roof and glazing and good air tightness to reduce heating demand and consumption for the building. Improved glazing solar transmittance to reduce incoming solar gains and cooling demand and consumption for the building.
Adaptation to Climate Change	The air-conditioning system can be sized for a future climate scenario. This will need to be executed by the project's mechanical contractor. The sizing calculations for the air-conditioning system is to be performed by the appointed contractor.

To implement the above solution, the building shall adopt the building fabric and air tightness highlighted in the table below. It is aimed to be above the Building Regulation's Part L2's notional requirements for building fabric performance, where possible.

The 'Adaptation to Climate Change' shall be implemented by the mechanical designer at RIBA Stage 4, utilising CIBSE's future weather files to size the cooling capacities of the air-conditioning system.

Table 7: Building Envelope Performance

ELEMENT	WORST PERMISSIBLE	PROPOSED
External Wall U-value	0.26 W/m^2.K	0.24 W/m^2.K
Roof U-value	0.18 W/m^2.K	0.16 W/m^2.K
Ground Floor Slab U-value	0.18 W/m^2.K	0.18 W/m^2.K
Window U-value (frame & glass)	2.20 W/m^2.K	1.40 W/m^2.K
General Window g-value / light transmission	-	0.27 / 51%
Reception Curtain Wall g-value / light transmission	-	0.27 / 51%
Rooflight U-value (frame & glass)	-	1.30 W/m^2.K
Rooflight g-value / light transmission	-	0.43 / 49%
Air Permeability	5.0 m^3/(h.m^2) @ 50Pa	3.0 m^3/(h.m^2) @ 50Pa

5.2.5 IMPROVED M&E BUILDING SERVICES EFFICIENCY AND CONTROL

Table 8: Thermal Model HVAC System Description

SYSTEM	SYSTEM DESCRIPTION
Mechanical Ventilation Heat Recovery Units	Specific Fan Power = 1.5 W/(l/s). Heat recovery efficiency = 75%
LTHW Gas-Fired Boiler	Heating efficiency = 93%
Electric-Powered Vapour Compression Cycle Chillers	Cooling SEER = 6.0
General Domestic Hot Water Services	Local instantaneous electric water heaters
Cleaner's Store Domestic Hot Water Services	Local storage electric water heaters with total cumulative storage capacity of 70 litres. Insulation thickness of 10mm, factory insulated.

Table 9: Thermal Model Electrical Lighting Performance

ROOM	LUMINAIRE EFFICACY (LLM/CW) unless otherwise stated	DESIGN ILLUMINANCE (LUX)	OCCUPANCY DETECTION	DAYLIGHT CONTROL	PARASITIC POWER (W/M^2)
Open Plan Flexible Employment Spaces	120	500	Manual On/Auto Off	Photocell control dimming	0.10
Reception	120	300	None	Photocell control dimming	0.10
Landing	120	200	Auto On/Off	Photocell control dimming	0.10
Circulation Areas	120	200	Auto On/Off	No daylight control	0.10
Toilets	120	200	Auto On/Off	No daylight control	0.10
Large Shell Workspace Areas	95	100	Auto On/Off	Photocell control dimming	0.10

5.2.6 LEAN RESULTS

By implementing the proposed building fabric and building services efficiencies, the building does not yet comply with Building Regulations Part L2 Criterion One and does not yet achieve an EPC rating of 'A'. The results are as follows:

Table 10: Thermal Model 'As Designed' Carbon Emission Results and EPC Rating

Building		Unit 13	Unit 14	Unit 15
Target Emission Rate (TER)	(kg.CO_2/m^2.annum)	3.28	2.77	2.67
Target Primary Energy Rate (TPER)	kWh/m^2	30.79	25.9	25.6
Building Emission Rate (BER)	(kg.CO_2/m^2.annum)	4.83	4.12	4
Building Primary Energy Rate (BPER)	kWh/m^2	46.35	38.46	38.04
Building Regulations Compliance?		No	No	No
EPC Rating		B	B	A

Below is the breakdown of the energy consumption, extracted directly from the BRUKL document…

Unit 13

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	7.42	5.76
Cooling	1.67	1.57
Auxiliary	9.76	7.12
Lighting	8.61	11.14
Hot water	4.42	3.98
Equipment*	35.89	35.89
TOTAL**	**31.88**	**29.59**

* 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	7.85
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*7.85*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	50.34	48.67
Primary energy [kWh_{PE}/m²]	46.35	30.79
Total emissions [kg/m²]	4.83	3.28

Unit 14

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	7.07	4.98
Cooling	1.43	1.47
Auxiliary	7.22	5.37
Lighting	6.66	9.35
Hot water	4.32	3.89
Equipment*	33.93	33.93
TOTAL**	**26.69**	**25.06**

* 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	6.75
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*6.75*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	44.98	43.77
Primary energy [kWh_{PE}/m²]	38.46	25.9
Total emissions [kg/m²]	4.12	2.77

Unit 15

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	5.91	3.98
Cooling	1.6	1.56
Auxiliary	7.33	5.43
Lighting	6.97	9.73
Hot water	4.44	4
Equipment*	34.85	34.85
TOTAL**	**26.25**	**24.7**

* 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	6.72
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*6.72*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	44.02	41.32
Primary energy [kWh_{PE}/m²]	38.04	25.6
Total emissions [kg/m²]	4	2.67

Figure 4: Lean BRUKL Output document results.

From the results, the percentage reduction on the heating/cooling demand, building energy consumption and total carbon emissions are shown below…

Table 11: Unit 13 – 15 percentage reduction on building energy consumption, heating/cooling demand and carbon emission rate

		Parameter		
Building	**Energy Hierarchy Stage**	TOTAL BUILDING ENERGY CONSUMPTION (kWh/m^2)	HEATING & COOLING ENERGY DEMAND (MJ/m^2)	BUILDING EMISSION RATE (kg.CO_2/m^2.annum)
Unit 13	**Baseline**	33.74	54.50	5.13
	Lean	31.88 (5.51%)	50.34 (7.63%)	4.83 (5.85%)
	Clean	-	-	-
	Green	-	-	-
	Total Reduction from Baseline	5.51%	7.63%	5.85%
Unit 14	**Baseline**	28.61	46.43	4.44
	Lean	26.69 (6.71%)	44.98 (3.12%)	4.12 (7.21%)
	Clean	-	-	-
	Green	-	-	-
	Total Reduction from Baseline	6.71%	3.12%	7.21%
Unit 15	**Baseline**	28.29	46.35	4.32
	Lean	26.25 (7.21%)	44.02 (5.03%)	4.00 (7.41%)
	Clean	-	-	-
	Green	-	-	-
	Total Reduction from Baseline	7.21%	5.03%	7.41%

This demonstrates compliance with the following items for each policy…

POLICY	ITEM
Policy ESD 1	Designing developments to reduce carbon emission and use resources more efficiently, including water (regarding water, this shall be covered by BREEAM NC V6 Pre-Assessment)
Policy ESD 2	Reducing energy use, in particular by the use of sustainable design and construction measures
Policy ESD 3	Minimising both energy demands and energy loss

5.3 CLEAN

This stage of the energy hierarchy shall investigate the feasibility of connecting onto an existing district heat network (DHN), in-line with Policy ESD4.

5.3.1 POLICY ESD 4: DESCENTRALISED ENERGY SYSTEMS

Decentralised energy systems – which includes combined heat and power, district heating, biomass – have been considered with respect to each building's hot water usage (warehouse usage). Due to the hot water profile of the buildings, decentralised energy systems are deemed to be unfeasible at this outline stage for the employment units. However, should future tenants require a centralised hot water system for the building, then decentralised energy systems shall be considered.

The closest decentralised energy centre is the Ardley Energy Recovery Facility (ERF), located approximately 5.3 km from the development, which produces electricity from the incineration of non-recyclable waste. The facility exports the electricity generated to the national grid which is then freely available via the conventional electricity providers. The facility can also generate waste heat which can be utilised locally via heating water mains. This offers potential for the hot water to be generated via this medium. The constituent parts for any energy centre can be maximised via the use of biomass fuelled CHP or gas fired CHP (profile dependant) to offer heating and electric supply. It should be considered that the Ardley ERF is local to the site and already offers waste recovery electrical supply.

If district heating mains are available from the Ardley ERF, there is potential for the buildings' hot water to be generated via this medium. Hot water can be generated via a plate heat exchanger which can heat-up cold water stored within a hot water calorifier up to 60^{o}C, this can be interfaced to an electric or gas boiler to top-up any unmet demands.

The flexible employment spaces are currently proposed to be heated and cooled via an air source heat pump system which represents the most practical system for this size and type of space. Integration to a heat network is not possible for this type of system so the units will not benefit from any heat network. The efficiency of the air source heat pumps system can still achieve very good efficiency ratings, so we don't assess this non interface potential as a negative.

At this current stage, the building has potential for a wide range of hot water demand, as the building is currently designed to a Category A industry standard. This makes the feasibility of connection to a local heat network, whether private or public, very difficult to assess. On the current basis that the building will consist of flexible employment spaces to be used as needed by the operator, the provision and connection to a decentralised heat network would be unfeasible at this current time.

To facilitate the potential for future heat network delivery however, the buildings could be provided with service ducts capable of supporting the routing of heating mains from the site boundary to the building. This means a clear and unobstructed below ground service strip finishing in service ducts routing through the ground floor slab into the building.

Overleaf shows the location of both the Ardley ERF and the new development.

Figure 5: Location of Ardley ERF with respect to the location of the new development.

5.3.2 CLEAN RESULTS

As per Section 5.3.1, there are no changes to the energy and carbon results due to the infeasibility of connecting onto the nearest Energy Centre.
This demonstrates compliance with the following items for each policy…

POLICY	ITEM
Policy ESD 1	Designing developments to reduce carbon emission and use resources more efficiently, including water (regarding water, this shall be covered by BREEAM NC V6 Pre-Assessment)
Policy ESD 4	Please refer to Section 5.3.1

5.4 GREEN

A list of commercially available low and zero carbon technologies are described below. This section shall highlight which technologies could be considered either appropriate or unfeasible for this development.

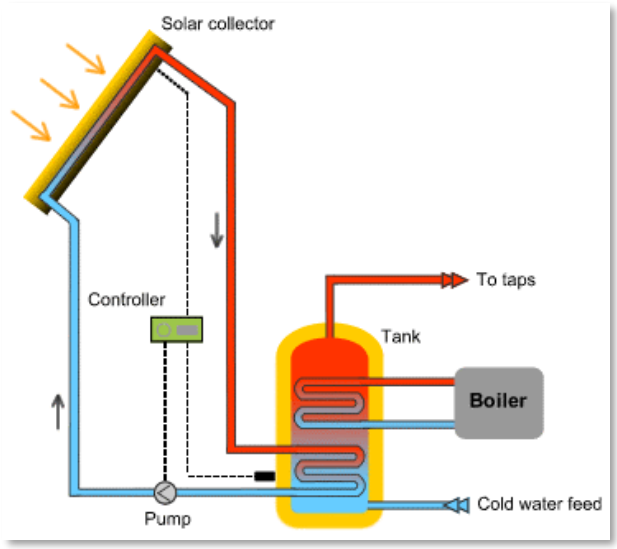
5.4.1 AVAILABLE TECHNOLOGIES

SOLAR HOT WATER

Description: Solar water heating systems use energy from the sun to heat water. A fluid within the wall/roof mounted panel is heated by the sun. The fluid is then used to heat water.

There are two types of collectors available:

- Flat plate
- Evacuated tube



Advantages

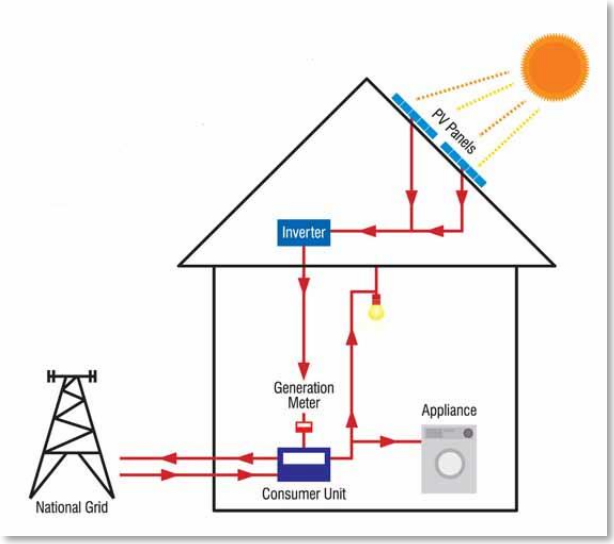
- Government Renewable Heat Incentive payments.
- Relies on a natural source (the sun).
- Low maintenance.

Disadvantages

- Panels ideally need to face South and at an incline of 30º to the horizontal.
- The system must be unshaded.

PHOTOVOLTAICS (PV)

Description: Photovoltaic (PV) systems convert energy from the sun into electricity through semi-conductor cells, connected together in mounted modules.



Advantages

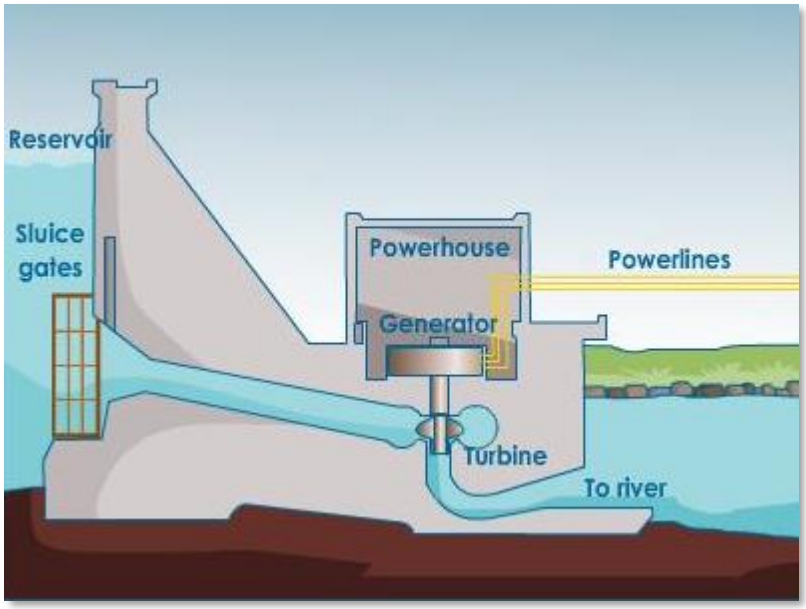
- Panels can be incorporated into the building.
- Government Feed in Tariff payments.
- Relies on a natural source (the sun).
- Low maintenance.
- Silent in operation.
- No emissions.

Disadvantages

- PV panels ideally need to face South and at an incline of 30º to the horizontal.
- The system must be unshaded.
- Amount of energy generated is dependent upon the daylight availability.

HYDRO POWER

Description: Hydro power is the process of using river water to generate electricity. Water is used to drive a turbine to generate electricity.



Advantages

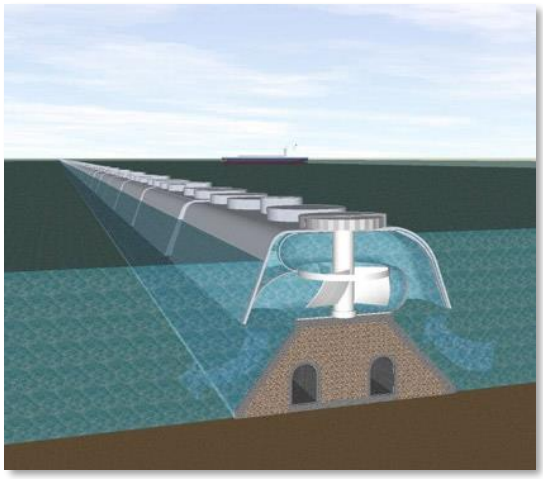
- Government Feed in Tariff payments.
- Surplus energy can be sold to the grid.
- Low running and maintenance costs.

Disadvantages

- Installation is expensive.
- Very site specific – need an adequate water supply all year round.

TIDAL & WAVE POWER

Description: Tidal/wave power is the process of using tidal waves to generate electricity. Water is used to drive a turbine to generate electricity.



Advantages

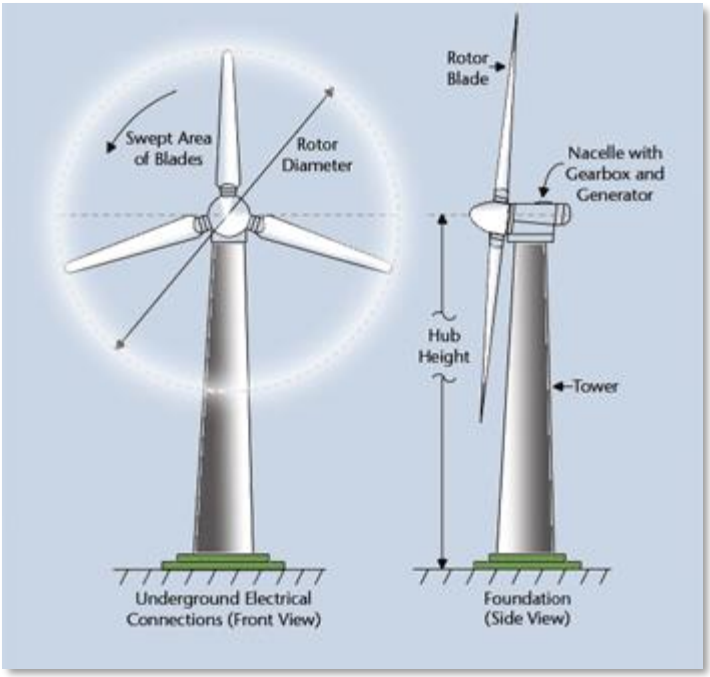
- Government Feed in Tariff payments.
- Surplus energy can be sold to the grid.
- Low running and maintenance costs.
- The tide moves a huge amount of water each day and has the potential to produce a lot of energy.

Disadvantages

- Installation is expensive.
- Very site specific – requires a tidal location.

WIND TURBINES

Description: Wind turbines harness the power of the wind to generate electricity through a vertical or horizontal axis propeller which harnesses the kinetic energy in wind and converts it to electrical power through a generator. Requires an average wind speed greater than 5m/s according to CIBSE TM 38. (Refer to https://www.rensmart.com/Maps to find the average wind speed for the site.)



Advantages

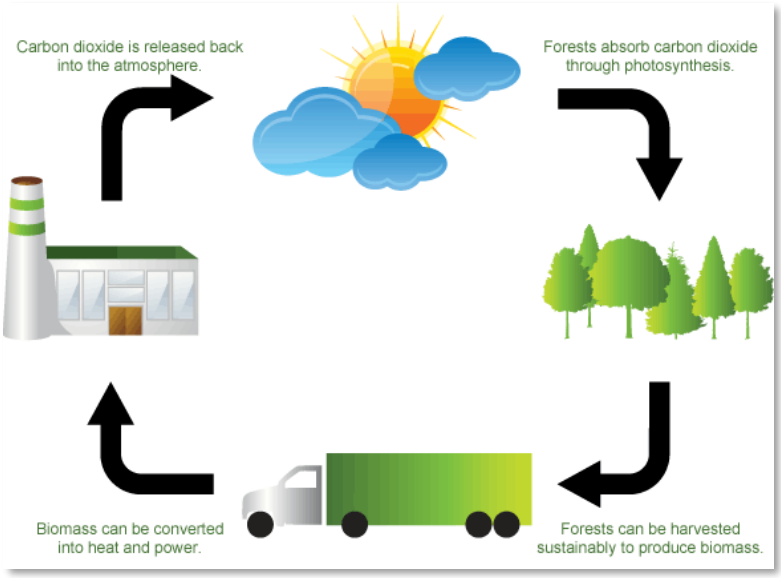
- Wind is free.
- Surplus energy can be sold to the grid.
- Extremely beneficial in exposed or coastal sites.

Disadvantages

- Highly dependent on the speed of the wind at the site of the turbine.
- Wind speed is dependent upon location within the UK and nearby obstructions.
- Very visible.
- High noise levels.
- Creates a flickering shadow.

BIOMASS

Description: Wood is burned to provide heat to either a single room, a central heating system or to heat water.



Advantages

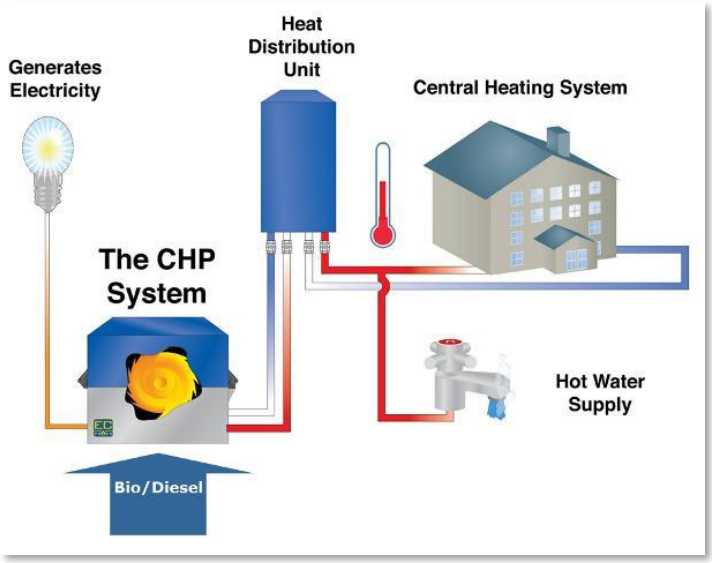
- May be eligible for Renewable Heat Incentives.
- Affordable fuel.

Disadvantages

- Wood is renewable but trees take a longer time to grow than to burn.
- CO_2 emitted when wood is burned.
- Requires regular deliveries of wood pellets.
- The chimney must be carefully considered as it is generally significantly taller than the building.

COMBINED HEAT AND POWER (CHP)

Description: A CHP system generates heat and electricity simultaneously through an internal combustion engine that drives an electrical alternator.



Advantages

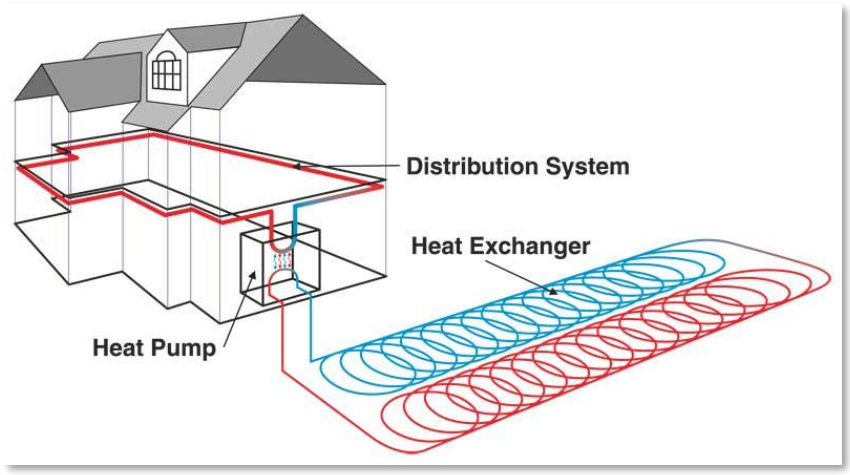
- Electricity generated as a by-product of heat.
- Can burn a variety of fuels, such as natural gas, diesel oil, or biofuels such as bioethanol.
- Government Feed in Tariff payments.
- Easy installation.
- Cheap maintenance costs.

Disadvantages

- Typically powered by mains gas or LPG.

GROUND SOURCE HEAT PUMPS

Description: Ground source heat pumps extract heat from the ground via pipes buried in the ground. The pipes contain a fluid which is heated, this heat can then be used for heating or hot water.



Advantages

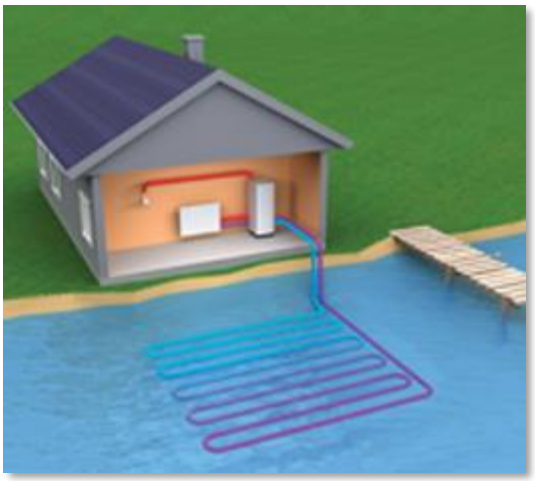
- Government Renewable Heat Incentive payments.
- Can be used throughout the entire year as the ground remains at a consistent temperature.

Disadvantages

- The ground must be suitable for digging a trench or boreholes.
- Require regular maintenance.
- Initial installation can be expensive.

WATER SOURCE HEAT PUMPS

Description: Water source heat pumps absorb heat from a water source which can then be used for heating or hot water.



Advantages

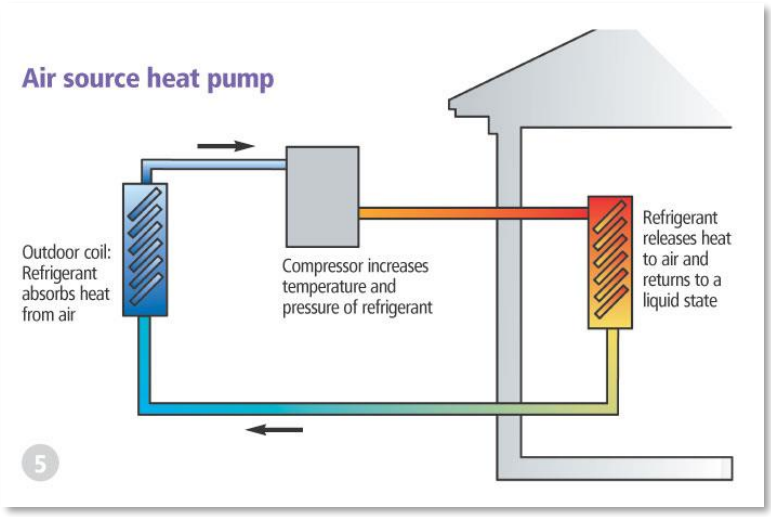
- Government Renewable Heat Incentive payments.
- High rate of heat transfer.

Disadvantages

- Require regular maintenance.
- The ground must be suitable for digging a trench or boreholes.
- Site specific as it requires an adequate water source.

AIR SOURCE HEAT PUMPS

Description: Air source heat pumps absorb heat from the outside air which can then be used for heating or hot water.



Advantages

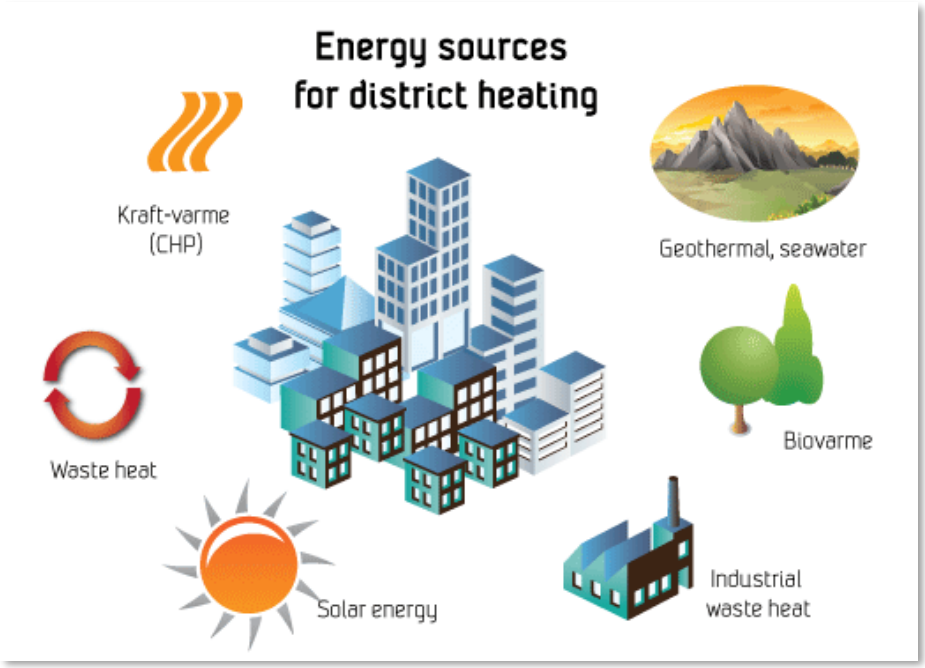
- Government Renewable Heat Incentive payments.
- Relatively low capital costs.

Disadvantages

- Require regular maintenance.
- Requires additional plant space.

COMMUNITY/DISTRICT HEATING

Description: A centralised heating network supplies heat from a central source to businesses/homes through a network of pipes carrying hot water.



Advantages

- Cost-effective.
- Government funding often available.

Disadvantages

- Expensive installation.
- Often requires existing network to allow a connection.

5.4.2 APPROPRIATE TECHNOLOGIES

The tables below summarise the technologies which could be considered feasible for use on this development:

Table 12: Appropriate LZC Technology Information

TECHNOLOGY	REASON FOR USE
Air Source Heat Pumps (VRV/F Air-conditioning)	Industry standard heating/cooling equipment suitable for flexible employment spaces. Its high efficiency will ensure low energy consumption.
Photovoltaics	Unit 13 – 15 will have allocated spaces on the roof available for PV installation. As the building currently does not achieve an EPC rating of 'A' and Building Regulations Part L2 compliance, this technology shall be implemented.

5.4.3 EXCLUDED TECHNOLOGIES

A number of technologies have been excluded due to location or resource availability; these have been summarised in the table below:

Table 13: Excluded LZC Technology Information

TECHNOLOGY	REASON FOR EXCLUSION
Hydro Power	There is no suitable water source to allow for a hydroelectric power installation.
Tidal & Wave Power	There is no suitable water source to allow for a tidal or wave power installation.
Ground Source Heat Pumps	Ground source heat pumps can be suitable for this development, however, capital cost will be greater than air source heat pumps. As the price difference between electricity and gas fuel can sometimes be a factor of three, payback will potentially be very long.
Water Source Heat Pumps	There is no suitable water source to enable the installation of a water source heat pump system.
Solar Hot Water	The domestic hot water demand is low due to the building activity and capital cost would outweigh any potential energy saving.
Wind Turbines	The average wind speed shown in RenSMART's wind map show it is generally below or equal to 5.0 m/s. Wind turbines require average wind speeds greater than 5.0 m/s to generate meaningful amount of energy.
Biomass	Unit 13 – 15 are flexible employment units which have a hot water operational profile unsuitable for this technology. However, spare ducts shall be provided within site for future connections onto any future decentralised energy networks

TECHNOLOGY	REASON FOR EXCLUSION
Combined Heat and Power	Unit 13 – 15 are flexible employment units which have a hot water operational profile unsuitable for this technology. However, spare ducts shall be provided within site for future connections onto any future decentralised energy networks, should the hot water system calls for traditional gas-fired hot water system.
Community / District Heating	Unit 13 – 15 are flexible employment units which have a hot water operational profile unsuitable for this technology. However, spare ducts shall be provided within site for future connections onto any nearby district heating network.

5.4.4 IMPLEMENTED TECHNOLOGIES

Unit 13 – 15 shall implement the relevant appropriate technologies highlighted previously, which are Air-Source Heat Pumps and Photovoltaic Panels. The three-storeyed section of the flexible employment spaces' air-conditioning system is now replaced with the full electric Air-Source Heat Pump system.

Table 14: Thermal Model Zone and System Assignment

ZONE	SYSTEM
Open Plan Flexible Employment Spaces	VRV/F with mechanical ventilation with heat recovery via central air handling unit with thermal wheel
Reception	VRV/F with natural ventilation
All Circulation Areas	Electric panel heaters with natural ventilation
Large Shell Employment Workspaces	Unconditioned
Toilets and Showers	Electric panel heaters with mechanical ventilation with heat recovery via central air handling unit with thermal wheel
Cleaner's Store	Electric panel heaters with mechanical ventilation with heat recovery via central air handling unit with thermal wheel

Table 15: Thermal Model LZC System Description

LOW AND ZERO CARBON TECHNOLOGY	SYSTEM DESCRIPTION
VRV/F Air-Conditioning System (Air-Source Heat Pumps)	Heating efficiency: SCOP = 4.0. Cooling efficiency: SEER = 6.0

Table 16: Thermal Model Renewable Technology Information to EPC Rating of 'A'.

BUILDING/ RENEWABLE TECHNOLOGY	DESCRIPTION
Unit 13 / Photovoltaic Panels	321m^2 of monocrystalline photovoltaic panels mounted on the roof with inclination of 6° and an orientation of 229° from North. Cell efficiency is 20.1%, degradation factor of the modules is 0.99 and solar conversion factor is 0.96.
Unit 14 / Photovoltaic Panels	225m^2 of monocrystalline photovoltaic panels mounted on the roof with inclination of 6° and an orientation of 229° from North. Cell efficiency is 20.1%, degradation factor of the modules is 0.99 and solar conversion factor is 0.96.
Unit 15 / Photovoltaic Panels	297m^2 of monocrystalline photovoltaic panels mounted on the roof with inclination of 6° and an orientation of 229° from North. Cell efficiency is 20.1%, degradation factor of the modules is 0.99 and solar conversion factor is 0.96.

The amount of Photovoltaic Panels for each employment unit highlighted above are the maximum amount, placed outside of rooflights and areas/perimeters required to safely maintain the roof gutters, rooflights and Photovoltaic Panels.

5.4.5 GREEN RESULTS

By implementing the proposed building fabric and building services efficiencies, the building now complies with Building Regulations Part L2 Criterion One and achieves an EPC rating of 'A'. The results are as follows…

Table 17: Thermal Model 'As Designed' Carbon Emission Results and EPC Rating

Building		Unit 13	Unit 14	Unit 15
Target Emission Rate (TER)	(kg.CO_2/m^2.annum)	3.03	2.63	2.64
Target Primary Energy Rate (TPER)	kWh/m^2	32.43	28.17	28.40
Building Emission Rate (BER)	(kg.CO_2/m^2.annum)	1.30	1.10	1.21
Building Primary Energy Rate (BPER)	kWh/m^2	12.76	10.70	12.09
Building Regulations Compliance?		Yes	Yes	Yes
EPC Rating		A	A	A

Overleaf is the breakdown of the energy consumption, extracted directly from the BRUKL document…

Unit 13

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

	Actual	Notional
Heating	3.24	3.18
Cooling	0.74	0.9
Auxiliary	2.72	5.54
Lighting	8.61	11.14
Hot water	4.42	3.98
Equipment*	35.89	35.89
TOTAL**	**19.72**	**24.74**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	11.81	2.9
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*11.81*	*2.9*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	33.57	31.28
Primary energy [kWh$_{PE}$/m^2]	12.76	32.43
Total emissions [kg/m^2]	1.3	3.03

Unit 14

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

	Actual	Notional
Heating	2.79	2.74
Cooling	0.6	0.94
Auxiliary	2.04	4.11
Lighting	6.66	9.35
Hot water	4.32	3.89
Equipment*	33.93	33.93
TOTAL**	**16.41**	**21.04**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	9.8	2.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*9.8*	*2.07*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	30.25	28.75
Primary energy [kWh$_{PE}$/m^2]	10.7	28.17
Total emissions [kg/m^2]	1.1	2.63

Unit 15

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

	Actual	Notional
Heating	2.22	2.14
Cooling	0.73	1.05
Auxiliary	2.1	4.12
Lighting	6.97	9.73
Hot water	4.44	4
Equipment*	34.85	34.85
TOTAL**	**16.46**	**21.05**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	8.88	1.9
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*8.88*	*1.9*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	28.46	25.79
Primary energy [kWh$_{PE}$/m^2]	12.09	28.4
Total emissions [kg/m^2]	1.21	2.64

Figure 6: Green BRUKL Output document results

From the results, the percentage reduction on the heating/cooling demand, building energy consumption and total carbon emissions are as follows…

Table 18: Percentage reduction on building energy consumption, heating/cooling demand and carbon emission rate

		Parameter		
Building	**Energy Hierarchy Stage**	TOTAL BUILDING ENERGY CONSUMPTION (kWh/m^2)	HEATING & COOLING ENERGY DEMAND (MJ/m^2)	BUILDING EMISSION RATE (kg.CO_2/m^2.annum)
Unit 13	**Baseline**	33.74	54.5	5.13
	Lean	31.88 (5.51%)	50.34 (7.63%)	4.83 (5.85%)
	Clean	-	-	-
	Green	19.72 (38.14%)	33.57 (33.31%)	1.30 (73.08%)
	Total Reduction from Baseline	43.66%	40.95%	78.93%
Unit 14	**Baseline**	28.61	46.43	4.44
	Lean	26.69 (6.71%)	44.98 (3.12%)	4.12 (7.21%)
	Clean	-	-	-
	Green	16.41 (38.52%)	30.25 (32.75%)	1.10 (73.30%)
	Total Reduction from Baseline	45.23%	35.87%	80.51%
Unit 15	**Baseline**	28.29	46.35	4.32
	Lean	26.25 (7.21%)	44.02 (5.03%)	4.00 (7.41%)
	Clean	-	-	-
	Green	16.46 (37.30%)	28.46 (35.35%)	1.21 (69.75%)
	Total Reduction from Baseline	44.51%	40.37%	77.16%

The number of BREEAM Ene01 credits each building achieves is 8 credits.

This demonstrates compliance with the following items for each policy…

POLICY	ITEM
Policy ESD 1	Designing developments to reduce carbon emission and use resources more efficiently, including water (regarding water, this shall be covered by BREEAM NC V6 Pre-Assessment)
Policy ESD 2	Supplying energy efficiently and giving priority to decentralised energy supply. Making use of renewable energy. Making use of allowable solutions.
Policy ESD 3	Minimising both energy demands and energy loss
Policy ESD 4	Please refer to Section 5.3.1
Policy ESD 5	All items

6. BREEAM NEW CONSTRUCTION SCHEME V6

Under Policy ESD 3, the new development is required to achieve a BREEAM NC V6 rating of at least 'Very Good'. The BREEAM UK New Construction scheme (Building Research Establishment Environmental Assessment Method) is an environmental performance standard which new, non-domestic buildings in the UK can be assessed against. Within the scheme, there are rating benchmarks that a building may achieve through good or best practice, these ratings are:

BREEAM RATING	% SCORE
Outstanding	≥ 85
Excellent	≥ 70
Very Good	≥ 55
Good	≥ 45
Pass	≥ 30
Unclassified	< 30

Each rating represents performance equivalent to:

- Outstanding: Less than the top 1% of UK new non-domestic buildings (innovator)
- Excellent: Top 10% of UK new non-domestic buildings (best practice)
- Very Good: Top 25% of UK new non-domestic buildings (advanced good practice)
- Good: Top 50% of UK new non-domestic buildings (intermediate good practice)
- Pass: Top 75% of UK new non-domestic buildings (standard good practice)

How a building achieves any of the above ratings is by assessing how it is managed, constructed and operated. This is broken down into categories, which are:

  - Management,
  - Health and Wellbeing,
  - Energy,
  - Transport,
  - Water,
  - Materials,
  - Waste,
  - Land Use and Ecology, and
  - Pollution

Another category is 'Innovation', though it is optional. Each category includes criteria a building may meet to achieve one or more credits. These credits will add up to score an overall BREEAM rating.

For this development, Unit 13 – 15 shall aim to achieve a BREEAM V6 rating of 'Very Good', with scope of achieving 'Excellent'. This development's BREEAM NC V6 Pre-Assessment shall account for the following overleaf:

- Material efficiency
- Use of recycled & sustainably sourced aggregates
- Construction waste management (construction resource efficiency)
- Reduction of energy use & carbon emissions
- Energy monitoring
- Low carbon design
- Water consumption

In specific response to the items set out in Policy ESD 3 and 4, the appropriate BREEAM credits to be targeted are:

ITEM	ASSOCIATED AND TARGETED BREEAM CREDIT FOR POLICY ESD 3
Maximising resource efficiency	Mat 06 – Material Efficiency Wst 01 – Construction Waste Management Wat 01 – Water consumption
Incorporating the use of recycled and energy efficient materials	Wst 02 – Use of recycled and sustainably sourced aggregates Mat 06 – Material efficiency – Minimise environmental impact of materials
Incorporating the use of locally sourced building materials	Mat 3 – Responsible sourcing of construction materials
Reducing the impact on the external environment and maximising opportunities for cooling and shading (by provision of open space and water, planting, and green roofs, for example); and	Hea 07 – Safe and healthy surroundings Land use and Ecology Section
Making use of the embodied energy within buildings wherever possible and re-using materials where proposals involve demolition or redevelopment	Mat 06 - Material Efficiency Wst 06 – Design for disassembly and adaptability
Employing low flow sanitaryware, which includes WCs; Urinals; taps (WHBs, kitchen taps and waste disposal unit); showers; baths; dishwashers; and washing machines.	Wat 01 – Water Consumption
Employing an energy monitoring system which shall collect water usage data via pulsed output water meters and sub-meters	Wat 02 – Water Monitoring
Employing a water leak detection system that will cause a visual/audible alarm if there is a leak within the water distribution system. Toilets shall be provided with solenoid valves to shut off the water supply in case taps are left on.	Wat 03 – Water Leak Detection

7. CONCLUSION

The aim of minimising building energy usage, carbon emissions and embodied carbon shall be met by employing the design strategy described in this report. The extent to how energy efficient the building is shall focus on complying with…

- Building Regulation's ADL2 and Policies ESD 1, 2, 4 & 5 (in terms of carbon emissions and energy efficiency),
- and Policy ESD 3 (in terms of BREEAM Rating of 'Very Good', however, with scope to achieve 'Excellent')
- EPC rating of 'A'

To meet the above energy efficiency targets, high performance building fabric, highly efficient Air-Source Heat Pumps and Photovoltaic Panels shall be implemented.

The amount of Photovoltaic Panels for each employment unit are the maximum amount, placed outside of rooflights and areas/perimeters required to safely maintain the roof gutters, rooflights and Photovoltaic Panels.

APPENDIX A

UNIT 13 – 15 BREEAM NC V6 PRE-ASSESSMENT

Scott White and Hookins

Project:	**Bicester Gateway / Catalyst 4 - Units 13, 14 & 15**
Scheme:	**BREEAM UK New Construction Version 6.1**
Target level:	**Excellent**
Stage:	**Design Stage**
Date:	**04/03/2024**
Revision:	**3.0**

Pass	30%
Good	45%
Very Good	55%
Excellent	70%
Outstanding	85%

Design Stage RAG rating Key:

- Design stage evidence received
- Design stage evidence awaited but current feedback it is prepared/ readily available
- Design stage evidence awaited & feedback suggests be needed urgently if credits are to be achieved/ con
- Credits not currently targeted

Current Targeted' Rating Total:	**74.20%**	
Equating to BREEAM:	**Excellent**	(Provided all "minimum standard" issues are met)
Total if all 'Additional Potential' Credits are also achieved:	**78.40%**	
Equating to BREEAM:	**Excellent**	(Provided all "minimum standard" issues are met)
Current Evidence Received Total	**4.75%**	
Equating to BREEAM:	**No Rating**	

BREEAM Version 6 Assumptions

Project scope	**Shell and Core**
Building type (main description)	**Industrial**
Sub-group	**Warehouse**
Assessment stage	**Design Stage**
Building floor area (GIA)	**11833 m2 (A 4156; B 3154; C 4522)**
Building floor area (NIFA)	**10733 m2**
Is the building designed to be untreated?	**No**
Building services - heating system type	**Air system**
Building services - cooling system type	**Air conditioning**
Are commercial or industrial-sized refrigeration and storage systems specified?	**No**
Are building user lifts present?	**Yes**
Are building user escalators or moving walks present?	**No**
Are laboratories present?	**No**
Are there fume cupboard(s) and/or other containment devices present?	**No**
Does the building have external areas within the boundary of the assessment development?	**Yes**
Are there statutory requirements, or other issues outside of the control of the project, that impact the ability to provide outdoor space?	**No**
Are there any systems specified that contribute to the unregulated energy load?	**N/A**
Are the post-occupancy stage credits targeted in Ene 01 issue?	**No**

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Man 01 Project Brief and Design							
Man 01a Project delivery planning	**One credit - Project delivery planning** 1. Prior to completion of the Concept Design, the project delivery stakeholders (see Definitions) meet to identify and define for each phase of project delivery: 1.a Roles 1.b Responsibilities 1.c Contributions. 2. Consider each one of the following items when defining roles, responsibilities and contributions for each key phase of the project: 2.a End user requirements 2.b Aims of the design and design strategy 2.c Particular installation and construction requirements of limitations 2.d Occupiers' budgets and technical expertise in maintaining any proposed systems 2.e Maintainability and adaptability of the proposals 2.f Operational energy (see Assessment scope) 2.g Requirements for the production of project and end user documentation 2.h Requirements for commissioning, training and aftercare support. Where the building occupants are not known, the list of considerations above still applies. The appropriate project delivery stakeholder considers each item, based on likely scenarios of building occupancy. 3. The project team demonstrates how the project delivery stakeholders' contributions and the consultation process outcomes influence the following: 3.a Initial Project Brief 3.b Project Execution Plan (see Definitions) 3.c Communication Strategy (see Definitions) 3.d Concept Design	Meeting minutes. Summary document of roles and responsibilities.	**1**	**0**	**1**	Design Team	EARLY ACTION CREDIT To be reviewed further with team **One potential credit**
Man 01b Stakeholder consultation (interested parties)	**One credit - Stakeholder consultation (interested parties)** 4. Prior to completion of the Concept Design, the design team consult with all interested parties (see Definitions) on matters that cover the minimum consultation content (see Methodology). 5. Demonstrate how the stakeholder contributions and consultation exercise outcomes influence the Initial Project Brief and Concept Design. 6. Prior to completion of the detailed design (RIBA Stage 4, Technical Design or equivalent), all interested parties (see Definitions) give and receive consultation feedback.	A list of interested parties consulted. A consultation plan setting out the process and the scope of the consultation. Agenda/minutes from the consultation meetings. Documentation demonstrating consultation feedback and subsequent actions. Additional information.	**1**	**0**	**0**	Design Team	**Credit not targeted**
Man 01c Prerequisite	**Prerequisite for BREEAM Advisory Professional (Concept and Developed Design)** 8. The project team, including the client, formally agree strategic performance targets (see Definitions) early in the design process, see Definitions, (with the support of the BREEAM AP where appointed).	Appointment letter.	**-**		**-**	BREEAM AP	Required for Man01c or d credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Man 01c BREEAM AP (Concept Design)	**One credit - BREEAM AP (Concept Design)** 9. Involve a BREEAM AP in the project at an appropriate time and level to: 9.a Work with the project team, including the client, to consider the links between BREEAM issues and assist them in maximising the project's overall performance against BREEAM, from their appointment and throughout Concept Design. 9.b Monitor progress against the performance targets (see Definitions) agreed under criterion 8 above throughout all stages after their appointment where decisions critically impact BREEAM performance. 9.c Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 8. 9.d Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. 9.e Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.	Relevant section/clauses of the building specification or contract. Project programme, indicating the dates by which the key work stages (Preparation and Design) are to be completed. Meeting notes/minutes, recorded correspondence or schedules that can demonstrate BREEAM issues are a regular agenda item and AP attendance. The AP progress report (for each work stage).	**1**	**1**	**0**	BREEAM AP	Parkway acting as BREEAM AP **One credit targeted**
Man 01d BREEAM AP (Developed Design)	**One credit - BREEAM AP (Developed Design)** 10. Criteria 8 and 9 has been achieved. 11. Involve the BREEAM AP in the project at an appropriate time and level to: 11.a Work with the project team, including the client, to consider the links between BREEAM issues and to assist them in maximising the project's overall performance against BREEAM throughout Developed Design. 11.b Monitor progress against the performance targets agreed under criterion 8 throughout all stages where decisions critically impact the specification and tendering process and the BREEAM performance. 11.c Proactively identify risks and opportunities related to the achievement of the targets agreed under criterion 8. 11.d Provide feedback to the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. 11.e Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team.		**1**	**1**	**0**	BREEAM AP	Parkway acting as BREEAM AP **One credit targeted**
Man 02 Life cycle cost and service life planning - **Credits for each one of the three parts are awarded independently from one another**							
Man 02a Elemental life cycle cost	**Two credits - Elemental life cycle cost** 1. A competent person (see Definitions) carries out an outline, entire asset LCC plan at process Stage 2 (equivalent to Concept Design - RIBA Stage 2) together with any design options appraisals in line with 'Standardised method of life cycle costing for construction procurement' PD 156865:2008(6). 2. The elemental LCC plan: 2.a Provides an indication of future replacement costs over a period of analysis as required by the client (e.g.20,30,50 or 60 years); 2.b Includes service life, maintenance and operation cost estimates. The study period should ideally be agreed by the client, in line with the design life expectancy of the building. However, where the life expectancy of the building is not yet formally agreed (due to very early design stages), the default design life of 60 years should be used for modelling purposes (in line with the UK default). 3. Demonstrate, using appropriate examples provided by the design team, how the elemental LCC plan has been used to influence building and systems design and specification for minimise life cycle costs and maximise critical value.	Relevant sections of the feasibility stage life cycle cost analysis report / documentation. Relevant sections of the feasibility stage appraisal documentation. Elemental LCC plan.	**2**	**2**	**0**	Cost Consultant	**Two credits targeted**

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Man 02b Component level LCC options appraisal	**One credit - Component level LCC options appraisal** 4. A competent person develops a component level LCC options appraisal by the end of Process Stage 4 (equivalent to Technical Design - RIBA Stage 4) in line with PD 456865:2008. The component level LCC includes (where present): 4.a Envelope, e.g. classing, windows, or roofing 4.b Services, e.g. heat source, cooling source or controls 4.c Finishes, e.g. walls, floors or ceilings 4.d External spaces, e.g. alternative hard landscaping, boundary protection. The Component level LCC option appraisal should review all of the above component types (where present). However, you do not need to consider every single example cited under each component; only a selection of those most likely to draw valued comparisons. This is to ensure that a wide range of options are considered and help focus the analysis on components which would benefit the most from appraisal. 5. Demonstrate, using appropriate examples provided by the design team, how the component level LCC options have been used to influence building and systems design and specification to minimise life cycle costs and maximise critical value. **Note:** 1.0 Component level LCC plan must include all component types installed by the developer.	Relevant sections of the component level life cycle cost analysis report / documentation. Evidence of how this has influenced building and systems specification/design. Component level LCC options appraisal plan.	**1**	**0**	**1**	Cost Consultant	Would allow innovation credit to be targeted)if Mat 01 a/b also completed) - to be reviewed again closer to the time. **One potential credit**
Man 02a Capital cost reporting	**One credit - Capital cost reporting** 6. Report the capital cost for the building in pounds per square meter of gross internal floor area (£k/m²) as part of the submission to BRE. See also Methodology and Additional information.	Provide capital cost report.	**1**	**1**	**0**	Parkway	**One credit targeted**
Man 03 Responsible construction practices - Minimum standards one credit RCM for Excellent, two credits RCM for Outstanding							
Man 03a Prerequisite	**Prerequisite - Legally harvested and traded timber** 1. All timber and timber-based products used during he construction process of the project are 'legally harvested and traded timber' (see Definitions). For other materials there are no prerequisite requirements at this stage.	Relevant section/clauses of the building specification or contract OR A signed and dated letter of commitment to meet the relevant criteria OR Timber Policy	-		-	Parkway	Required for Man03 credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Man 03b Environmental management	**One credit - Environmental management** 3. All parties who at any stage manage the construction site (e.g. the principal contractor, the demolition contractor) operate an EMS covering their main operations. The EMS must: 3.a Be third party certified, to ISO 14001:2015(10), EMAS (EU Eco-Management and Audit Scheme) or equivalent standard; OR 3.b In compliance with BS 8555:2016(11) have: 3.b.i Appropriate structure 3.b.ii Reached implementation stage phase four 'implementation and operation of the environmental management system' 3.b.ii Completed the defined phase audits one to four. 4. All parties who at any point manage the construction site (e.g. the principal contractor, the demolition contractor) implement best practice pollution prevention policies and procedures on site in accordance with Working at construction and demolition sites: PPG6, Pollution Prevention Guidelines(12).	Relevant section/clauses of the building specification or contract OR A signed and dated letter of commitment to meet the relevant criteria OR 3rd party certified EMS certificate	**1**	**1**	**0**	Parkway	**One credit targeted**
Man 03c Prerequisite	**Prerequisite - BREEAM AP** 5. The client and the contractor formally agree performance targets.	Letter confirming targets have been agreed.	-		-	Parkway	Required for Man03d credit to be achieved. "Met" in targeted column indicates pre-requisite achieved
Man 03d BREEAM AP (site)	**One credit - BREEAM AP (site)** 6. Involve a BREEAM AP in the project at an appropriate time and level to: 6.a Work with the project team, including the client, to consider the links between BREEAM issues and assist them in achieving, and if possible, going beyond the design intent, to maximise the project's performance against the agreed performance targets throughout the Construction, Handover and Close Out stages. 6.b Monitor construction progress against the performance targets agreed under criterion 5 above throughout all stages where decisions critically impact BREEAM performance. 6.c Proactively identify risks and opportunities related to the procurement and construction process and the achievement of the targets agreed under criterion 5. 6.d Provide feedback to the constructors and the project team as appropriate, to support them in taking corrective actions and achieving their agreed performance targets. 6.e Monitor and, where relevant, coordinate the generation of appropriate evidence by the project team and the provision to the assessor.	The AP appointment letter. Relevant section/clauses of the building specification or contract Project programme indicating the dates by which the key work stages (Preparation and Design) are to be completed. Meeting notes/minutes, recorded correspondence or schedules that can demonstrate BREEAM issues are a regular agenda item and AP attendance. The AP progress report (for each work stage).	**1**	**1**	**0**	Parkway	Parkway acting as AP **One credit targeted**
Man 03e Responsible construction management	**Up to two credits - Responsible construction management** 7. One credit: Achieve items listed as required for one credit in table 4.1. 8. Two credits: Achieve criterion 7. 9. Achieve 6 additional items in table 4.1.	Use BREEAM recognised responsible construction management scheme to support in this process e.g. Considerate Construction Scheme and Fleet Operator Recognition Scheme.	**2**	**2**	**0**	Parkway	**Two credits targeted**
Man 03f Monitoring of construction site impacts	**Up to two credits - Monitoring of construction site impacts** 10. Assign responsibility to an individual for monitoring, recording and reporting energy usage, water consumption and transportation data (where measured) resulting from all on-site construction processes (and dedicated off-site manufacturing) throughout the build programme. To ensure the robust collection of information, this individual must have the appropriate authority and responsibility to request and access the data required. Where appointed, the BREEAM AP could perform this role.	Relevant section/clauses of the building specification or contract OR A formal letter of commitment from the client/developer	-		-	Parkway	Required for Man03g and h credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Man 03g Utility consumption	**First monitoring credit - Utility consumption** **Energy consumption** 11. Achieve criterion 10. 12. Set targets for the site energy consumption to kWh (and where relevant, litres of fuel used) as a result of the use of construction plant, equipment (mobile and fixed) and site accommodation. 13. Monitor and record data for the energy consumption described in criterion 12. 14. Report the total carbon dioxide emissions (total kgCO2/project value) from the construction process via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking). **Water consumption** 15. Achieve criterion 10. 16. Set targets for the potable water consumption (m³) arising from the use of construction plant, equipment (mobile and fixed) and site accommodation. 17. Monitor and record data for the potable water consumption described in criterion 16. 18. Use the collated data to report the total net water consumption (m³), i.e. consumption minus any recycled water use from the construction process via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).	Relevant section/clauses of the building specification or contract OR A formal letter of commitment from the client/developer	**1**	**1**	**0**	Parkway	**One credit targeted**
Man 03h Transportation of construction materials and waste	**Second monitoring credit - transportation of construction materials and waste** 19. Achieve criterion 10. 20. Set targets for transportation movements and impacts resulting from delivery of the majority of construction materials to site and construction waste from site. As a minimum cover: 20.a Transportation of materials from the point of supply to the building site, including any transport, intermediate storage and point of supply (see Definitions). Monitor as a minimum: 20.a.i Materials used in major building elements (i.e. those defined in BREEAM issue Mat 01 Environmental impacts from construction products - Building life cycle assessment (LCA). 20.a.ii Ground works and landscaping materials. 20.b Transportation of construction waste from the construction gate to the waste disposal processing or recovery centre gate. This monitoring must cover the construction waste groups outlined in the projects resource management plan. 21. Monitor and record data from the transportation movements as described in criterion 20. 22. Using the collated data, report separately for materials and waste, the total transport-related carbon dioxide emissions (kgCO2-eq), plus total distance travelled (km) via BREEAM Projects (for the purposes of potential future BREEAM performance benchmarking).	Relevant section/clauses of the building specification or contract OR A formal letter of commitment from the client/developer	**1**	**1**	**0**	Parkway	**One credit targeted**

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	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Man 04 Commissioning and handover - Minimum standards one credit commissioning schedule & responsibilities for Very Good, Excellent & Outstanding Criterion 11 BUG for Very Good, Excellent & Outstanding							
Man 04a Commissioning - testing schedule and responsibilities	**One credit - Commissioning - testing schedule and responsibilities** 1. Prepare a schedule of commissioning and testing. The schedule identifies and includes a suitable timescale for commissioning and re-commissioning of all complex and non-complex building services and control systems and for testing and inspecting building fabric. 2. The schedule identifies the appropriate standards for all commissioning activities to be conducted, where applicable, in accordance with: 2.a Current Building Regulations 2.b BSRIA guidelines (16) 2.c CIBSE guidelines (17) 2.d Other appropriate standards (see Methodology). Exclude from the assessment any process of manufacture-related equipment specified as part of the project. However, include such equipment in cases where they form an integral part of the building HVAC services, such as heat recovery systems. 3. Where a BMS is specified: 3.a Carry out commissioning of air and water systems when all control devices are installed, wired and functional. 3.b Include physical measurements of room temperatures, off-coil temperatures and other key parameters, as appropriate, in commissioning results. 3.c The BMS or controls installation should be running in auto with satisfactory internal conditions prior to handover. 3.d All BMS schematics and graphics (if BMS is present) are fully installed and functional to user interface prior to handover. 3.e Fully train the occupier or facilities team in the operation of the system. 4. Appoint an appropriate project team member to monitor and programme pre-commissioning, commissioning and testing. Where necessary include re-commissioning activities on behalf of the client. 5. The principal contractor accounts for the commissioning and testing programme, responsibilities and criteria within their budget and main programme of works. Allow the required time to complete all commissioning and testing activities prior to handover. **Note:** 1.0 Commissioning testing schedule and responsibilities and design and preparation is applicable according to the scope of services being specified or installed.	Appointment letter or commissioning responsibilities schedules Relevant section/clauses of the building specification or contract Principal Contractors programme Commissioning schedule	**1**	**1**	**0**	Parkway	**One credit targeted**
Man 04b Commissioning - design and preparation	**One credit - Commissioning - design and preparation** 6. Achieve criteria 1 to 5. 7. During the design stage, the client or the principal contactor appoints an appropriate project team member (see criterion 4), provided they are not involved in the general installation works for the building services systems, with responsibility for: 7.a Undertaking design reviews and giving advise on suitability for ease of commissioning. 7.b Providing commissioning management input to construction programming and during installation stages. 7.c Management of commissioning, performance testing and handover or post-handover stages. For buildings with complex building services and systems, this role needs to be carried out by a specialist commissioning manager (see Definitions).	Appointment letter or commissioning responsibilities schedules Relevant section/clauses of the building specification or contract Principal Contractors programme Commissioning schedule	**1**	**1**	**0**	Parkway	**One credit targeted**
Man 04c Testing and inspecting building fabric	**One credit - Testing and inspection building fabric** 8.Achieve criteria 1 to 5. 9. Complete post-construction testing and inspection to quality-assure the integrity of the building fabric, including continuity of insulation, avoidance of thermal bridging and air leakage paths (this is through air tightness testing and thermographic survey). A suitably qualified professional (see Definitions) undertakes the survey and testing in accordance with the appropriate standard. 10. Rectify any defects identified during post-construction testing and inspection prior to building handover and close out. Any remedial work must meet the required performance characteristics for the building or element as defined at design stage (see Methodology).	Appointment letter or commissioning responsibilities schedules Relevant section/clauses of the building specification or contract Principal Contractors programme Commissioning schedule	**1**	**1**	**0**	Parkway	**One credit targeted**
Man 04d Rating Min Standard	**Rating Related Min Standard- Very Good Rating and Above** BUG criteria as outlined in 11 below is fully met.	Building User Guide	**-**		**-**		Required for Good rating or above to be achieved. "Met" in targeted column indicates achieved
Man 04d Handover	**One credit - Handover** 11. Prior to handover, develop two building user guides (see Methodology) for the following users: 11.a A non-technical user guide for distribution to the building occupiers. 11.b A technical user guide for the premises facilities managers. A draft copy is developed and discussed with users first (where the building occupants are known) to ensure the guide is most appropriate and useful to potential users. 12. Prepare two training schedules timed appropriately around handover and proposed occupation plans for the following users: 12.a A non-technical training schedule for the building occupants. 12.b A technical training schedule for the premises facilities managers. **Note** 1.1 The guides and training schedules include, as far as possible, all relevant sections regarding the services and fabric installed. On completion of works the building owner, agent or user, hands it over to the fit-out contractor, who can then complete the relevant sections based on the fit-out strategy.	Building User Guide Training schedule	**1**	**1**	**0**	Parkway	**One credit targeted**
Section Total			**18**	**15**	**2**	**0**	
Weighted Section Total		11%	**11.00**	**9.16**	**1.22**	**0.00**	
Hea 01 Visual Comfort							
Hea 01b Daylighting (building type dependent)	**Up to two credits - Daylighting (building type dependent)** 4 Daylighting criteria have been met using either of the following options: 4.a The relevant building areas meet good practice daylight factors and other criteria as outlined in Table 5.1 and Table 5.2 OR 4.b The relevant building areas meet good practice average and minimum point daylight illuminance criteria as outlined in Table 5.3.	Daylighting calculations.	**1**	**0**	**0**	M&E	**Credit not targeted**
Hea 01c View Out	**One credit - View out** 5. 95% of the floor area in 95% of spaces for each relevant building area provides an adequate view out (see Adequate View Out definition*). 6. In addition, the building type criteria for Prisons, multi-residential and healthcare are outlined in Table 5.6. *Where relevant building areas are within 8m of an external wall which as a window or permanent opening, and the window/opening is ≥20% of the surrounding wall area. Where the room depth is greater than 8m, the percentage of window or opening must instead be the same as, or greater than, than values in Table 1.0 BS8206:Part 2. The view out must be a view of a landscape or buildings (rather than just sky) at seated level (1.2-1.3m) with the relevant building areas and should ideally be through an external window. A view into an internal courtyard or atrium will comply provided the distance from the opening to the back wall of the courtyard/atrium is at least 10m. The view cannot be an internal view across the room, as this is likely to become obstructed by partitions, filing cabinets etc. An internal view cannot offer the additional benefits of an external view. **Note:** 1.0 If it is not possible to confirm which areas of the building will contain workstations, benches or desks, all areas of the building designed for or likely to be occupied by workstations, benches or desks, must comply with the relevant criteria.	Design drawings Relevant section/clauses of the building specification or contract Window schedule	**1**	**1**	**0**	Architect	**One credit targeted**
Hea 01d Internal and external lighting levels, zoning and control	**One credit - Internal and external lighting levels, zoning and control** 10. All external lighting located within the construction zone is specified in accordance with BS5489-1:2013 Code for the practice for the design of road lighting. Lighting of roads and public amenity areas(35) and BS EN 12464-2:2014(36) Light and lighting - Lighting of workplaces- Part 2:Outdoor workplaces. External lighting should provide illuminance levels that enable users to perform outdoor visual tasks efficiently and accurately, especially during the night. 11. Where no external light fittings are specified (either separate from or mounted on the external building façade or roof), the criteria relating to external lighting do not apply and the credit can be awarded on the basis of compliance with criteria 8–9.c above.	Design drawings and/or room data sheets/schedules Relevant section/clauses of the building specification or contract OR A letter of formal confirmation of compliance from the relevant design team member. Further information 'Additional Information'	**1**	**1**	**0**	M&E	**One credit targeted**
Hea 02 Indoor Air Quality							
Hea 02a Prerequisite	**Prerequisite - Indoor Air Quality (IAQ) Plan** 1. A site-specific indoor air quality plan has been produced and implemented in accordance with Guidance Note 6 (GN06). The objective of the plan is to facilitate a process that leads to design, specification and installation decisions and actions that minimise indoor air pollution during occupation of the building. The indoor air quality plan must consider the following: 1.a Removal of contaminant sources 1.b Dilution and control of contaminant sources, including: 1.b.i Air quality requirements of specialist areas such as laboratories, where present 1.c Procedures for pre-occupancy flush out and purge ventilation 1.d Third party testing and analysis 1.e Maintaining good indoor air quality in-use 1.f Any relevant local authority plans or policies (for example, Air Quality Management Areas or Local Air Quality Action Plans)	Indoor air quality plan	**-**	**-**	**-**		
Hea 02b Ventilation	**One credit - Ventilation** 2. The building has been designed to minimise the indoor concentration and recirculation of pollutants in the building as follows: 2.a Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation **Note:** 1.0 If ventilation systems are not within the remit of the shell and core developer, compliance can be demonstrated through the building servicing strategy where this is predetermined by the built form or core service provision.	Relevant section/clauses of the building specification or contract Design drawings	**1**	**0**	**0**	M&E	**Credit not targeted**

BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Hea 04 Thermal comfort						
Hea 04a - Thermal modelling **Note:** 2.0 The issue is not applicable to industrial units that only contain an operational or storage area and are without office space or other occupied spaces. **One credit - Thermal modelling** 1. Thermal modelling has been carried out using software in accordance withCIBSEAM11(78) Building Energy and Performance Modelling. 2. The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSEAM11). 3. The modelling demonstrates that: 3.a For air-conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design(79), Table 1.5;or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type) 3.b For naturally ventilated buildings: 3.b.i Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5. Or other appropriate industry standard (where this sets a higher or more appropriate requirement or level for the building type) 3.b.ii The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in either of the following standards as appropriate; CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings(80) or CIBSE TM59:Design methodology for the assessment of overheating risk in homes(81) 4. For air-conditioned buildings, the PMV(predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool. **Note:** 1.1 Thermal modelling assumptions must be reasonable and represent typical use patterns and loads given the parameters and function of the building. Thermal modelling may need to be completed on the basis of a typical notional layout.	Relevant section/clauses of the building specification or contract or correspondence (e.g. letter, email or meeting minutes) from the design team Thermal modelling results TOR data from the design team	**1**	**1**	**0**	M&E	**One credit targeted**
Hea 04b - Design for future thermal comfort **One credit - Design for future thermal comfort** 5. Criteria 1 to 4 are achieved. 6. The thermal modelling demonstrates that the relevant requirements set out in criterion 3 above are achieved for a projected climate change environment (see Definitions). 7. Where criterion 6 above is not met, the project team demonstrates how the building has been adapted, or designed to be easily adapted in future using passive design solutions in order to subsequently meet the requirements under criterion 6 above 8. For air-conditioned buildings, the PMV and PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.		**1**	**1**	**0**	M&E	**One credit targeted**
Hea 05 Acoustic performance						
Hea 05a Acoustic performance **One credit - Acoustic performance** 1. The building meets the appropriate acoustic performance standards and testing requirements defined in the relevant table within the technical manual: 1.b Indoor ambient noise level. OR 2. A Suitably qualified acoustician (SQA) is appointed to define a bespoke set of performance requirements for all function areas in the building. The bespoke performance requirements use the three acoustic principles defined in criterion Hea 05 Acoustic performance - Criterion 1, above, setting out the performance requirements for each and the testing regime required. **Note:** 1.0 Alternative means of compliance: The basic built form has a large impact on the acoustic performance of the building and would be outside the control of the tenant. A suitably qualified acoustician (SQA) must carry out a quantifiable assessment of the specification of the build form, construction and any external factors likely to affect the indoor ambient noise levels. The SQA must then confirm the developer's works will enable a future tenant utilising a typical fit-out and specification to meet the levels required to demonstrate compliance. 1.1 Bespoke performance requirements: When assessing criteria 2 below for a shell and core or shell only building, only Indoor ambient noise level below should be assessed.	Professional report / study and calculations from the acoustician. Letter of appointment or other confirmation demonstrating when the acoustician was appointed. Relevant section/clauses of the building specification or contract and/or formal letter from the project team regarding commitments	**1**	**0**	**0**	Acoustician	**Credit not targeted**
Hea 06 Security						
Hea 06a Security of site and building **One credit - Security of site and building** 1. A Suitably Qualified Security Specialist (SQSS) conducts an evidence-based Security Needs Assessment (SNA) during or prior to Concept Design (RIBA Stage 2 or equivalent). The purpose of the SNA will be to identify attributes of the proposal, site and surroundings which may influence the approach to security for the development . 2. The SQSS develops a set of security controls and recommendations for incorporation into the proposals. Those controls and recommendations shall directly relate to the threats and assets identified in the preceding SNA. 3. The controls and recommendations shall be incorporated into proposals and implemented in the as-built develop. **Note**: 1.0 If the SQSS is unable to make complete recommendations due to the speculative nature of the assessment, then the credit may still be available. The SQSS must confirm that they have addressed all parts of the project where it is feasible to do so, based on the information available to them at the time of assessment. In relation to the influence of the occupiers on security, the SQSS shall clearly document their assumptions in the SNA.	Design drawings (including a scaled site plan), AND/OR relevant sections of the specification highlighting all necessary compliant features and dimensions. Security Needs Assessment.	**1**	**0**	**0**	Security specialist / architect	**Credit not targeted**
Hea 07 Safe and healthy surroundings						
Hea 07a Safe access **One credit - Safe access** Where external site areas form part of the assessed development the following apply: 1. Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to offsite cycle paths where applicable. 2. Dedicated and safe footpaths are provided on and around the site providing suitable links for the following: 2.a The site entrance to the building entrance, 2.b Car parks(where present)to the building entrance 2.c The building to outdoor space 2.d Connecting to off-site paths where applicable. 3 Pedestrian drop-off areas are designed off, or adjoining to, the access road and should provide direct access to other footpaths. Where vehicle delivery access and drop-off areas form part of the assessed development, the following apply: 4. Delivery areas are not accessed through general parking areas and do not cross or share the following: 4.a pedestrian and cyclist paths 4.b outside amenity areas accessible to building users and general public. 5. There is a dedicated parking or waiting area for goods vehicles with appropriate separation from the manoeuvring area and staff and visitor car parking. 6. Parking and turning areas are designed for simple manoeuvring according t other type of delivery vehicle likely to access the site, thus avoiding he need for repeated shunting.	Correspondence from or a copy of the report/feedback from the ALO/CPDA/Security Consultant confirming: • Scope of their advice/involvement • The stage of design in which their advice was sought • Summary of their recommendations Design drawings AND/OR relevant sections of the specification or contract	**1**	**0**	**0**	Architect	**Credit not targeted**
Hea 07 Outside space **One credit - Outside space** 7. There is an outside space providing building users with an external amenity area.	Design drawings	**1**	**0**	**0**	Architect / Client	**Credit not targeted**
Section Total		**10**	**4**	**0**	**0**	
Weighted Section Total	8%	**8.00**	**3.20**	**0.00**	**0.00**	
Ene 01 Reduction of energy use and carbon emissions - Minimum standards for four credits for Energy Performance for Excellent and six credits for Energy Performance & four credits for Energy Modelling and Reporting for Outstanding						
Ene 01a Energy performance **Up to nine credits - Energy performance** 1 Calculate an Energy Performance Ratio for New Construction (EPR NC). Compare the EPR NC achieved with the benchmarks in Table 6.1 and award the corresponding number of BREEAM credits. See notes 1.1 and 1.2. Table 6.1 Ene 01 EPR_{NC} benchmark scale BREEAM credits: 1 2 3 4 5 6 7 8 9 EPR_{NC}: 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 AND zero net regulated CO_2 emissions*. Minimum standards: Rating: Excellent (4 credits to be achieved (equivalent to an EPR_{NC} of at least 0.4)); Outstanding (6 credits to be achieved (equivalent to an EPR_{NC} of at least 0.6) and 4 credits for Energy modelling and reporting.); Minimum requirements: Requires a performance improvement progressively better than the relevant national building regulations compliant standard (see Energy performance on the facing page).	A copy of the Building Regulations Output Document from the approved software, as follows: 1. England Wales (Part L): Approved Documents checks (BRUKL Output Document) 2. Scotland (Section 6): Specification checks 3. N. Ireland (Part F): Approved Documents checks (BRUKL Output Document) 4. Where relevant for multi-residential buildings, a copy of the calculations based on design stage SAP outputs. The output documents must be based on the "As designed" stage of analysis. output documents from the approved software reflecting performance at the as-built stage of analysis. This must account for any changes to the specification during construction and the measured air leakage rate, ductwork leakage and fan performances(as required by building regulations).	**9**	**7**	**0**	M&E	**Seven credits targeted.**

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	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Ene 01b Prediction of operational energy consumption	**Four credits - Prediction of operational energy consumption** **2. Achieve criterion 2 in Ene 04 Low carbon design.** 3. Estimate the occupancy, energy use for unregulated energy loads and management practices. 4. Undertake detailed energy modelling to predict the building energy consumption. 5. Undertake sensitivity analysis to determine the factors that can significantly impact building energy consumption. 6. Based on the results of the sensitivity analysis, and in discussion with the project team, the client and the prospective occupier devise scenarios to explore how high impact factors might influence the building energy consumption. 7. Undertake scenario modelling and use these findings to inform improvements to design of the building and to operational, maintenance, and handover strategies. 8. Determine an energy target for the building based on the results of the scenario modelling. 9. At the post-construction stage, the scenario modelling should be repeated to reflect the post construction .building specification and, if necessary, adjust the energy target. **Note:** 1.1 For the energy modelling, if the building services efficiencies and performance specifications are not known (i.e. they are not within the remit of the shell and core developer and will be provided as part of the fit-out works), services complying with the minimum energy efficiency standards or backstop levels required by the relevant notional building regulations should be used. 1.2 For the energy modelling, the design team can use the performance specifications confirmed within a green fit-out agreement that is contractually required from the tenants in their fit-out works. This rule applies only to those areas of the building that the scope of the green fit-out agreement covers. Speculative areas of the assessed building not fitted out or covered by the scope of such agreement must follow the note 1.1	Passive design analysis report. An energy modelling report which details: – The modelling software and weather files used. – How the predicted occupancy, unregulated energy loads, and management practices have been determined. – The factors considered for the sensitivity analysis. – The scenarios that have been modelled. – The results of the sensitively analysis and scenario modelling. – The energy performance target set for the building. – Recommendations for improvements to the design of the building and to operational, maintenance, and handover strategies. Confirmation of the suitably qualified energy modeller's qualifications and experience.	**4**	**4**	**0**	M&E	**Four credits targeted**
Ene 02 Energy monitoring - Minimum standards one credit for first sub-metering credit for Very Good, Excellent & Outstanding							
Ene 02a Sub metering of end-use categories	**One credit - Sub-metering of end-use categories** 1. Install energy metering systems so that at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories(see Methodology). 2. Meter the energy consumption in buildings according to the total useful floor area: 2.a If the area is greater than 1,000 m², by end-use category with an appropriate energy monitoring and management system. 2.b If the area is less than 1,000 m², use either: 2.b.i an energy monitoring and management system or 2.b.ii separate accessible energy sub-meters with pulsed or other open protocol communication outputs, for future connection to an energy monitoring and management system (see Definitions). 3. Building users can identify the energy consuming end uses, for example through labelling or data outputs.	Relevant section/clauses of the building specification or contract. Design drawings	**1**	**1**	**0**	M&E	**Minimum standard for Very Good rating and above** **One credit targeted**
Ene 02b Sub metering of high energy load and tenancy areas	**One credit - Sub-metering of high energy load and tenancy areas** 4. Monitor a significant majority of the energy supply with: 4.a An accessible energy monitoring and management system for: 4.a.i tenanted areas or 4.a.ii relevant function areas or departments in single occupancy buildings. OR 4.b Separate accessible energy sub-meters with pulsed or other open protocol communication outputs for future connection to an energy monitoring and management system for: 4.b.i tenanted areas or 4.b.ii relevant function areas or departments in single occupancy buildings. 5. Sub-meter per floor plate in large single occupancy or single-tenancy buildings with one homogeneous function, for example hotel bedrooms, offices. **Note:** 1.1 Criteria 4 and 5, meters must be installed on the energy supply to each separate tenanted unit or floor plate within the assessed development.	Relevant section/clauses of the building specification or contract. Design drawings	**1**	**1**	**0**	M&E	**One credit targeted**
Ene 03 External lighting							
Ene 03a External lighting	**One credit - External lighting** 1. No external lighting (which includes lighting on the building, at entrances and signs). OR 2. External light fittings within the construction zone with: 2.a Average initial luminous efficacy of not less than 70 luminaire lumens per circuit Watt 2.b Automatic control to prevent operation during daylight hours 2.c Presence detection in areas of intermittent pedestrian traffic	Relevant section/clauses of the building specification or contract - Evidence received Design drawings	**1**	**1**	**0**	M&E	**One credit targeted**
Ene 04 Low carbon design							
Ene 04a Passive design analysis	**One credit - Passive design analysis** 1. Achieve the first credit Hea 04 Thermal comfort: One credit - Thermal modelling to demonstrate that the building design delivers appropriate thermal comfort levels in occupied spaces. 2. The project team analyses the proposed building design and development during Concept Design to identify opportunities for the implementation of passive design measures (see Passive design analysis). 3. Implement passive design measures to reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumption in line with the passive design analysis findings. 4. Quantify the reduced total energy demand and carbon dioxide (CO_2-eq) emissions resulting from the passive design measures.	Copy of Passive Design Analysis Results from a dynamic simulation model demonstrating the reduced energy demand and CO_2 emissions from the specified passive design measures.	**1**	**1**	**0**	M&E	**One credit targeted**
Ene 04b Free cooling	**One credit - Free cooling** 5. Achieve the passive design analysis credit. 6. Include a free cooling analysis (see Free cooling analysis) in the passive design analysis carried out under criterion 2. 7. Identify opportunities for the implementation of free cooling solutions. 8. The building is naturally ventilated or uses any combination of the free cooling strategies listed in Free cooling analysis	Results from a dynamic simulation model and other used methods demonstrating that the free cooling strategy can meet the building's cooling demand.	**1**	**0**	**0**	M&E	**Credit not targeted**
Ene 04c Low and zero carbon technologies	**One credit - Low zero carbon feasibility study** 9. An energy specialist (see Definitions) completes a feasibility study (see Low and zero carbon feasibility study) by the end of Concept Design. 10. Establish the most appropriate recognised local (on-site or near-site) low or zero carbon (LZC) energy sources for the building or development (see Scope of LZC systems and how they are assessed), based on the feasibility study. 11. Specify local LZC technologies for the building or development in line with the feasibility study recommendations. 12. Quantify the reduced regulated carbon dioxide (CO_2-eq) emissions resulting from the feasibility study	Results from a dynamic simulation model demonstrating reductions in CO_2 emissions from the specified low zero carbon technology.	**1**	**1**	**0**	M&E	**One credit targeted**
Ene 06 Energy efficient transportation systems							
Ene 06a Energy consumption	**One credit - Energy consumption** 1. For specified lifts, escalators or moving walks (transportation types): 1.a Analyse the transportation demand and usage patterns for the building to determine the optimum number and size of lifts, escalators or moving walks 1.b Calculate the energy consumption in accordance with BS EN ISO 2574 Part 2 (131) or Part 3 (132) for one of the following: 1.b.i At least two systems for each transportation type OR 1.b.ii At least two arrangements of systems with 'fit for purpose' system strategies. For example for lift systems, different options could be hydraulic, traction or machine room-less lift (MRL). 1.c Consider the use of regenerative drives, subject to the requirements in Regenerative drives below 1.d Specify the transportation system with the lowest energy consumption.	For 1 to 2: Professional report / study of transportation analysis AND/OR Calculations	**1**	**1**	**0**	Lift supplier / project team	**One credit targeted**
Ene 06b Energy efficient features	**Up to two credits - Energy efficient features** 2. Achieve criterion 1. **One credit - Lifts** 3. Specify the following three energy efficient features for each lift: 3.a A standby condition for off-peak periods 3.b The lift car lighting and display lighting provides an average luminous efficacy across all fittings in the car of >70 luminaire lumens per circuit Watt 3.c Use of a drive controller capable of variable speed, variable-voltage, and variable-frequency (VVVF) control of the drive motor. 4. Specify regenerative drives where their use is demonstrated to save energy. **One credit - Escalators or moving walks** 5. Specify at least one of the following for each escalator or moving walk: 5.a A load-sensing device that synchronises motor output to passenger demand through a variable speed drive OR 5.b A passenger-sensing device for automated operation (auto walk),so the escalator operates in auto start mode when there is no passenger demand.	For 3 to 4: Relevant section/clauses of the building specification or contract - Evidence received AND EITHER Manufacturers products details OR Formal letter of commitment from the system(s) manufacturer/sup	**1**	**1**	**0**	Lift supplier / project team	**One credit targeted**
Section Total			**21**	**18**	**0**	**0**	
Weighted Section Total		14%	**14.00**	**12.00**	**0.00**	**0.00**	
Tra 01 Transport assessment and travel plan							
Tra 01a Travel plan	**Two credits – Transport assessment and Travel plan** 1. No later than Concept Design stage, undertake a site-specific transport assessment (or statement) and a draft travel plan, which can demonstrably be used to influence the site layout and built form; see Methodology. 2. The site-specific travel assessment or statement covers as a minimum: 2.a Existing travel patterns and opinions of existing building or site users towards cycling and walking, identifying constraints and opportunities, if relevant 2.b Travel patterns and transport impact of future building users 2.c Current local environment for walkers and cyclists(accounting for visitors who may be accompanied by young children) 2.d Reporting of the number and type of existing accessible amenities, see Table 7.1 below, within 500m of the site 2.e Disabled access(accounting for varying levels of disability and visual impairment) 2.f Calculation of the existing public transport Accessibility Index (AI),see Methodology 2.g Current facilities for cyclists 3. Following a transport assessment (in accordance with the requirements set out in criteria 2a-2g) develop a site-specific travel plan, that provides a long term management strategy which encourages more sustainable travel. The travel plan includes measures to increase or improve more sustainable modes of transport and movement of people and goods during the building's operation; see Methodology. 4. If the occupier is known, involve them in the development of the travel plan. 5. Demonstrate that the travel plan will be implemented post construction and be supported by the building's management in operation.	A copy of the Travel Plan. A copy of the site-specific transport survey/assessment. Design drawings demonstrating examples of design measures implemented in support the travel plan's findings. OR Where a detailed site plan is not available, a formal letter from the client confirming that measures will be implemented into the final design in support the travel plan's findings. A letter of confirmation from either the building's occupier, or in the case of a speculative development, the developer.	**2**	**2**	**0**	Transport consultant	**Two credits awarded**

	BREEAM NC Version 6 Criteria			Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Tra 02 Sustainable transport measures - Only assess against criteria that applies to the AI of the project. Ensure the issue total sums the 'available credits' for the correct AI									
Tra 02 Prerequisite	**Prerequisite** 1. Achieve criteria 3-5 in the Tra 01 Transport assessment and travel plan issue.				-		-	Client / Architect	Required for Tra02 credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Tra 02a Transport options implementation <25	**Ten credits – Transport options implementation AI<25** 2. Identify the sustainable transport measures, in Table 7.4. 3. Award credits according to the existing Accessible Index (AI) of the project, and the total number of points achieved for the options implemented, see Table 7.3. AI< 25 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 Credits | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10				10	5 0	0	Architect	**Five credits targeted**
	Total points		**5**						
Assessment option	**Public transport measures**								
1	1. The existing AI calculated in Tra 01 achieves the following: ≥ 4 for prison or MOD sites, rural location sensitive buildings, and other building group 3 ≥ 8 for all other building types	**1**	**0**				**0**	Design team	**Point not targeted**
2	2. Demonstrate an increase over the existing Accessibility Index through negotiation with local bus, train or tram companies to increase the frequency of the local service provision for the development; **OR**	**2**	**0**				**0**	Design team	**Point not targeted**
	3. Demonstrate an increase over the existing Accessibility Index. This could be through provision of a diverted bus route, a new or enhanced bus stop, or other similar solutions **OR**	**3**	**0**				**0**	Design team	**Point not targeted**
	4. Provide a dedicated service, such as a bus route or service (See Methodology).	**3**	**0**				**0**	Client	**Point not targeted**
3	5. Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure. This may include signposting to public transport, cycling, walking infrastructure or local amenities.	**1**	**0**				**0**	Design team	**Point not targeted**
Assessment options	**Private transport measures**	**Points Available**	**Points Targeted**						
4	6. Provide electric recharging stations of a minimum of 7kW for at least 10% of the total car parking capacity for the development.	**1**	**1**				**0**	Architect	**One point targeted**
5	7. Set up a car sharing group or facility to facilitate and encourage building users to car share. 8. Raise awareness of the sharing scheme with marketing and communication materials. 9. Provide priority spaces for car sharers for at least 5% of the total car parking capacity for the development. 10. Locate priority parking spaces nearest the development entrance used by the sharing scheme participants	**1**	**1**				**0**	Client / Architect/ Parkway	**One point targeted**
Assessment options	**Active travel measures**	**Points Available**	**Points Targeted**						
6	11. During preparation of the brief, the design team consults with the local authority (LA) on the state of the local cycling network and public accessible pedestrian routes, to focus on whichever the LA deems most relevant to the project, and how to improve it. 12. Agree and implement one proposition chosen with the local authority. The proposition supported by the development is additional to existing local plans and has a significant impact on the local cycling network or on pedestrian routes open to the public.	**2**	**0**				**0**	Design team	**Point not targeted**
7	13. Install compliant cycle storage spaces to meet the minimum levels set out in Table 7.5.	**1**	**1**				**0**	Architect	**One point targeted**
8	14. Option 7 has been achieved. 15. Provide at least two compliant cyclists' facilities for the building users, (including pupils where appropriate to the building type) – see Definitions for the scope of each compliant facility: – Showers; – Changing facilities; – Lockers; – Drying spaces.	**1**	**1**				**0**	Architect	**One point targeted**
9	Existing amenities: 16. At least three existing accessible amenities are present, see Table 7.6, where relevant for a Building Group	**1**	**1**				**0**	Architect	**One point targeted**
10	17. Ensure a minimum of one new accessible amenity, in accordance with Table 7.6, for the relevant Building Group, is provided. OR	**2**	**0**				**0**	Architect	**Points not targeted**
	18. Ensure more than one new accessible amenity, in accordance with Table 7.6 for the relevant Building Group, is provided.	**3**	**0**				**0**	Architect	**Points not targeted**
11	19. Implement one site-specific improvement measure, not covered by the options already listed in this issue, in line with the recommendations of the travel plan. Submit these for review by BRE.	**1-3**	**0**				**0**	Design team	**Points not targeted**
	Total points		**5**						
Section Total					**12**	**7**	**0**	**0**	
Weighted Section Total				12%	**11.5**	**6.7**	**0**	**0**	
Wat 01 Water consumption - Minimum standards one credit for Good, Very Good, Excellent & two credits for Outstanding									
Wat 01 Water consumption	**Up to five credits - Water consumption** 1. Use the BREEAM Wat 01 calculator to assess the efficiency of the domestic water-consuming components. 2. Use the standard Wat 01 method (see Methodology) to compare the water consumption (litres/person/day)for the assessed building against a baseline performance. Award BREEAM credits based upon Table 8.1 below. Where it is not possible to use the standard method, complete the assessment using the alternative Wat 01 method (see Methodology). 3. If a greywater or rainwater system (see Definitions) is specified, use its yield in L/person/day to offset potable water demand from components. 4. If a greywater or rainwater system is specified and installed: 4.a Greywater systems in compliance with BS8525-1:2010 Greywater systems- Part 1 Code of Practice (153) 4.b Rainwater systems in compliance with BS8515:2009+A1:2013 Rainwater harvesting systems- Code of practice(154) **Additionally, for those carrying out a post occupancy evaluation achieve Criterion 6 of Wat 02a:** 6 The water monitoring strategy used enables the identification of all water consumption for sanitary uses as assessed under Wat 01 (litres/person/day). **Note**: 1.0 Components to be included as a minimum: WCs, wash-hand basin taps, showers, urinals, kitchen taps: kitchenette. If the developer is not installing some of these, use the baseline values for any unknown components. All water-consuming components and greywater or rainwater systems specified and installed by the developer are assessed. Components not listed above and located within tenant areas that are not specified by the developer, but will be specified by the tenant do not need to be assessed. In cases where the end client is known and they make a commitment to specify and install specific water-consuming components, assess the issue based on the relevant information. 1.1 Where components are not specified and installed by the developer but by the tenant, the minimum standard will not prevent the assessment from achieving a BREEAM rating.			A completed copy of the BREEAM Wat 01 calculator Documentary evidence supporting the data used to complete the calculator tool. Relevant section/clauses of the building specification/ design drawings confirming technical details of 1. Sanitary components 2.Rainwater and greywater collection system OR where detailed documentary evidence is not available at this stage; Completed BREEAM Wat 01 calculator A letter of instruction to a contractor/supplier or a formal letter from the developer giving a specific undertaking, providing sufficient information to allow the water calculations to be completed.	**5**	**3**	**0**	M&E	**Three credits targeted**

Scott White and Hookins

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Wat 02 Water monitoring - Minimum standards criterion one only for all ratings except Pass							
Wat 02a Rating Min Standard	**Rating Related Min Standard- Good Rating and Above** 1 Specify a water meter on the mains water supply to each building. This includes instances where water is supplied via a borehole or other private source.	Relevant section/clauses of the building specification or contract Design drawings	-		-		Required for Good rating or above to be achieved. "Met" in targeted column indicates achieved
Wat 02a Water monitoring	**One credit - Water monitoring** 1 Specify a water meter on the mains water supply to each building. This includes instances where water is supplied via a borehole or other private source. 2 For water-consuming plant or building areas consuming 10% or more of the building's total water demand: 2.a Fit easily accessible sub-meters **OR** 2.b Install water monitoring equipment integral to the plant or area. 3 For each meter (main and sub): 3.a Install a pulsed or other open protocol communication output AND 3.b Connect it to an appropriate utility monitoring and management system, e.g. a building management system (BMS), for the monitoring of water consumption. If there is no BMS system in operation at Post Construction stage, award credits provided that the system used enables connection when the BMS becomes operational. 4 In buildings with swimming pools, or large water tanks and aquariums, fit separate sub-meters on the water supply of the above and any associated changing facilities(toilets, showers etc.) irrespective of their water consumption levels. 5 In buildings containing laboratories, fit a separate water meter on the water supply to any process or cooling loop for 'plumbed-in' laboratory process equipment, irrespective of their water consumption levels. **Additionally for those pursuing a post occupancy stage certification:** 6 The water monitoring strategy used enables the identification of all water consumption for sanitary uses as assessed under Wat 01 (litres/person/day). **Note**: 1.0 Demonstrate compliance with criterion 2 on page 199 for water-consuming plant or building areas identifiable by the developer. Do not assess water-consuming plant or building areas to be added or installed by the tenant. Where no water-consuming plants are installed by the developer, the credit is awarded based on the rest of the criteria. 1.1 Minimum standard is applicable, however the assessor may, for speculative assessments, subject to their justification and evidence from the design team, seek review by BRE.	Relevant section/clauses of the building specification or contract Design drawings	**1**	**1**	**0**	M&E	**One credit targeted**
Wat 03 Leak detection							
Wat 03a Leak detection	**One credit - Leak detection system** 1. Install a leak detection system capable of detecting a major water leak: 1.a On the utilities water supply within the buildings, to detect any major leaks within the buildings AND 1.b Between the buildings and the utilities water supply, to detect any major leaks between the utilities supply and the buildings under assessment. 2. The leak detection system is: 2.a A permanent automated water leak detection system that alerts the building occupants to the leak OR an inbuilt automated diagnostic procedure for detecting leaks 2.b Activated when the flow of water passing through the water meter or data logger is at a flowrate above a pre-set maximum for a pre-set period of time. This usually involves installing a system which detects higher than normal flowrates at meters or sub-meters. It does not necessarily require a system that directly detects water leakage along part or the whole length of the water supply system 2.c Able to identify different flow and therefore leakage rates, e.g. continuous, high or low-level, over set time periods. Although high and low-level leakage rates are not specified, the leak detection equipment installed must have the flexibility to distinguish between different flowrates to enable it to be programmed to suit the building type and owner's or occupier's usage patterns. 2.d Programmable to suit the owner's or occupier's water consumption criteria. 2.e Where applicable, designed to avoid false alarms caused by normal operation of large water consuming plant such as chillers. Where there is physically no space for a leak detection system between the utilities water meter and the building, alternative solutions can be used, provided that a major leak can still be detected.	Relevant section/clauses of the building specification or contract Design drawings Manufacturers product details	**1**	**1**	**0**	M&E	**One credit targeted**
Wat 03b Flow control devices	**One credit - Flow control devices** 3. Install flow control devices that regulate the water supply to each WC area or sanitary facility according to demand, in order to minimise undetected wastage and leaks from sanitary fittings and supply pipework. **Note:** 1.2 Assess the water supplies to WC areas or facilities as per criterion 3 regardless of whether the WC areas of facilities are fitted out or not.	Relevant section/clauses of the building specification or contract - Design drawings Manufacturers product details	**1**	**1**	**0**	M&E	**One credit targeted**
Wat 04 Water efficient equipment							
Wat 04a Water efficient equipment	**One credit - Water efficient equipment** 1. Identify all water demands from uses other than those listed under Table 8.4 that could be realistically mitigated or reduced. Where there is no water demand from uses other than domestic-scale, sanitary use components in the building, this issue is not applicable. 2. Identify systems or processes to reduce the relevant water demand (criterion 1 above), and establish, through either good practice design or specification, a demonstrable reduction in the total water demand of the building. **Note:** 1.0 Where the only non-domestic scale, non-sanitary water demand comes from an irrigation system specified or installed by the developer, then use this system to assess compliance. 1.1 Where there are no water demands beyond those of Wat 01, the issue will be filtered out.	Documentation detailing the planting and irrigation strategy Relevant section/clauses of the building specification or contract AND/OR design drawings (where necessary) Manufacturers product details	**0**	**0**	**0**	Architect / M&E	**Credit not applicable**
Section Total			**8**	**6**	**0**	**0**	
Weighted Section Total		7%	**7**	**5.25**	**0**	**0**	
Mat 01 Environmental impacts from construction products - Building life cycle assessment (LCA)							
Mat 01a Superstructure	**Up to six credits – Superstructure** **Comparison with the BREEAM benchmark during Concept Design (offices, industrial and retail buildings only)** **Superstructure (offices, industrial and retail buildings (except for Simple Buildings and where Notes 1.1 and 1.2 above apply)** 1. During the Concept Design, demonstrate the environmental performance of the building as follows: 1.a Carry out a building LCA on of the superstructure design using either the BREEAM Simplified Building LCA tool or an IMPACT Compliant LCA tool according to the methodology (see Methodology). 1.b Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications). Comparison with the BREEAM benchmark during Technical Design (offices, industrial and retail buildings only) 2. During Technical Design, demonstrate the environmental performance of the building as follows: 2.a As criterion 1.a 2.b Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design. Where a project has not achieved criterion 1, criterion 2 may still be achieved. Option appraisal during Concept Design (all building types) **3 For offices, industrial and retail building types, achieve criterion 1 (except where Notes 1.0, 1.1 and 1.2 above apply).** 4. During Concept Design, identify opportunities for reducing environmental impacts as follows: 4.a Carry out building LCA options appraisal of 2 to 4 significantly different superstructure design options (applicable to the Concept Design stage, see Methodology). 4.b Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Concept Design) according to the methodology (see Methodology). 4.c For each design option, fulfil the same functional requirements specified by the client and all statutory requirements(to ensure functional equivalency). 4.d Integrate the LCA options appraisal activity within the wider design decision-making process. Record this in an options appraisal summary document. 4.e Record the following in the Mat 01/02 Results Submission Tool: The differences between the design options; the design option selected by the client to be progressed beyond Concept Design; the reasons for selecting it and the reasons for not selecting the other design options. 4.f Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications). If the building LCA tool recognised by BREEAM and used for criteria 3 to 5 (and 6 to 9, if pursued) is not an IMPACT Compliant LCA tool and criteria 1 to 2 are applicable, then the BREEAM Simplified Building LCA tool (or an IMPACT Compliant LCA tool) shall be used for criteria 1 to 2. **Options appraisal during Technical Design (all building types)** 5 During Technical Design identify opportunities for reducing environmental impacts as follows: 5.a Carry out building LCA options appraisal of 2 to 3 significantly different superstructure design options (based on the selected Concept Design option and as applicable to the Technical Design stage, see Methodology). 5.b Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Technical Design) according to the methodology (see Methodology). 5.c As criteria 4.c to 4.e above. Where an options appraisal summary document was produced during Concept Design, update it to include the Technical Design options. 5.d Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design. Where a project has not achieved criteria 3 and 4, criterion 5 may still be achieved.	Copy of LCA. 1-2 - Mat01/02 submission results 3-4 – The options appraisal summary document – Evidence that the LCA options appraisal summary document has been received by the design team and client (meeting minutes, letter of acknowledgement) – Evidence of how the LCA design options have informed the design decision-making process(e.g. meeting minutes, documented design development showing how the LCA options have affected the design). 5 As criteria 3 to 4 6-7 - The LCA options appraisal summary document includes substructure and hard landscaping according to the criteria 8-9 - The LCA options appraisal summary document includes core building services according to the criteria 10-14 - The 'elemental LCC plan' and 'Component level LCC option appraisal; in issue Man 02 life cycle cost and service life planning'. 15-18 The third party's report: - Verifying that building LCAs accurately represent the designs under consideration - Itemising the findings of their verification checks - Evidence that the requirements of a suitably qualified third party are fulfilled	**6**	**2**	**1**	LCA consultant	LCA reports for unit 14 and 13/15 confirm produced prior to planning submission. Mat 01 calculators confirm that 3+1 credits are awarded for each study. One potential credit for technical stage - would allow an innovation credit to be achieveable. **Two credits awarded; one potential credit**
Mat 01b Substructure and hard landscaping options appraisal during Concept Design	**One credit – Substructure and hard landscaping options appraisal during Concept Design (all building types)** 6. Criteria 3 and 4 are achieved. 7. During Concept Design identify opportunities for reducing environmental impacts as follows: 7.a Carry out building LCA options appraisal of a combined total of at least six significantly different substructure or hard landscaping design options(at least two shall be substructure and at least two shall be hard landscaping). 7.b Using a building LCA tool that is recognised by BREEAM (as suitable for assessing substructure and hard landscaping during Concept Design) according to the methodology (see Methodology). 7.c As criteria 4.c to 4.f.	The LCA options appraisal summary document includes substructure and hard landscaping according to the criteria.	**1**	**1**	**0**	LCA consultant	LCA reports for unit 14 and 13/15 confirm produced prior to planning submission. Mat 01 calculators confirm that 3+1 credits are awarded for each study. **One credit awarded**

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Mat 02 Environmental impacts from construction products - Environmental Product Declarations (EPD)							
Mat 02a Specification of products with a recognised EPD	**One credit - Specification of products with a recognised environmental product declaration (EPD)** 1. Specify construction products with EPD that achieve a total EPD points score of at least 20, according to the Methodology. 2. Enter the details of each EPD into the Mat 01/02 Results Submission Tool, including the material category classification. The Mat 01/02 Results Submission Tool will verify the EPD points score and credit award.	Copies of Environmental Product Declarations A link/reference to the EPD's Product Category Rules Mat 01/02 Results Submission Tool	**1**	**0**	**0**	Parkway	**Credit not targeted**
Mat 03 Responsible sourcing of construction products - Minimum standards for criterion 1 only for all ratings							
Mat 03a Pre requisite	**Prerequisite - Legally harvested and traded timber** 1. All timber and timber-based products used on the project are legally harvested and traded timber as per the UK Government's Timber Procurement Policy (TPP) (see Definitions). Compliance with criterion 1 is a minimum requirement for achieving any BREEAM rating. There are no prerequisite requirements for other materials.	Relevant section/clauses of the building specification or contract OR A signed and dated letter of commitment to meet the relevant criteria OR Timber Policy	-		-		Required for any Mat03 credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Mat 03b Enabling sustainable procurement	**One credit - Enabling sustainable procurement** 2. A sustainable procurement plan must be used by the design team to guide specification towards sustainable construction products. The plan must: **2.a Be in place before Concept Design.** 2.b Include sustainability aims, objectives and strategic targets to guide procurement activities. Note: targets do not need to be achieved for the credit to be awarded but justification must be provided for targets that are not achieved. 2.c Include a requirement for assessing the potential to procure construction products locally. There must be a policy to procure construction products locally where possible. 2.d Include details of procedures in place to check and verify the effective implementation of the sustainable procurement plan. In addition, if the plan is applied to several sites or adopted at an organisational level it must: 2.e Identify the risks and opportunities of procurement against a broad range of social, environmental and economic issues following the process set out in BS ISO20400:2017(166)	Evidence of level of responsible sourcing achieved for each construction product. For example, certificates. Completed copy of the Mat 03 Calculator tool. Evidence to show how the Mat 03 calculator tool has been completed.	**1**	**1**	**0**	Team	**One credit targeted**
Mat 03c Measuring responsible sourcing	**Up to 3 credits - Measuring responsible sourcing** 3. Use the Mat 03 calculator tool and methodology to determine the number of credits achieved for the construction products specified or procured. Credits are awarded in proportion to the scope of the assessment and the number of points achieved, asset out in Table 9.10.		**3**	**2**	**0**	Parkway	**Two credits targeted**
Mat 05 Designing for durability and resilience							
Mat 05a Protecting vulnerable parts of the building from damage	**One credit** **Protecting vulnerable parts of the building from damage** 1. Protection measures are incorporated into the building's design and construction to reduce damage to the building's fabric or materials in case of accidental or malicious damage occurring. These measures must provide protection against: 1.a Negative impacts of high user numbers in relevant areas of the building (e.g. corridors, lifts, stairs, doors etc.). 1.b Damage from any vehicle or trolley movements within 1m of the internal building fabric in storage, delivery, corridor and kitchen areas. 1.c External building fabric damage by a vehicle. Protection where parking or manoeuvring areas are within 1 metre of the building façade and where delivery areas or routes are within 2 metres of the façade, i.e. specifying bollards or protection rails. 1.d Potential malicious damage to building materials and finishes, in public and common areas where appropriate. **Protecting exposed parts of the building from material degradation** 2. Key exposed building elements have been designed and specified to limit long and short term degradation due to environmental factors. This can be demonstrated through one of the following: 2.a The element or product achieving an appropriate quality or durability standard or design guide, see Table 9.14. If none are available, use BS7543:2015(168) as the default appropriate standard **OR** 2.b A detailed assessment of the element's resilience when exposed to the applicable material degradation and environmental factors. 3. Include convenient access to the roof and façade for cost-effective cleaning, replacement and repair in the building's design. 4. Design the roof and façade to prevent water damage, ingress and detrimental ponding. See Table 9.14 for an example list of relevant industry durability and quality standards.	Design drawings illustrating vulnerable areas/parts of the building. Design drawings and/or relevant section/clauses of the building specification or contract confirming the durability measures specified.	**1**	**1**	**0**	Parkway	**One credit targeted**
Mat 06 Material efficiency							
Mat 06a Material efficiency	**One credit - Material efficiency** 1. At the Preparation and Brief and Concept Design stages, set targets and report on opportunities and methods to optimise the use of materials. These must be done for each of the following stages. See Table 9.15: 1.a Preparation and Brief 1.b Concept Design 1.c Developed Design 1.d Technical Design 1.e Construction 2. Develop and record the implementation of material efficiency, see Table 9.15 below, during: 2.a Developed Design 2.b Technical Design 2.c Construction 3. Report the targets and actual material efficiencies achieved.	A copy of the report.	**1**	**1**	**0**	Parkway	**One credit targeted**
Section Total			**14**	**8**	**1**	**3**	
Weighted Section Total		18%	**17.5**	**10**	**1.25**	**3.75**	
Wst 01 Construction waste management - Minimum standards one credit for Outstanding							
Wst 01a Pre-demolition audit	**One credit - Pre-demolition audit** 1. Complete a pre-demolition audit of any existing buildings, structures or hard surfaces being considered for demolition. This must be used to determine whether refurbishment or reuse is feasible and, in the case of demolition, to maximise the recovery of material for subsequent high grade or value applications. The audit must cover the content of Pre-demolition audit scope and: 1.a Be carried out at Concept Design stage (RIBA Stage 2) by a competent person (see Definitions) prior to strip-out or demolition works 1.b Guide the design, consider materials for reuse and set targets for waste management 1.c Engage all contractors in the process of maximising high grade reuse and recycling opportunities 2. Make reference to the audit in the resource management plan (RMP) (see Definitions). 3. Compare actual waste arisings and waste management routes used with those forecast and investigate significant deviations from planned targets. **Note:** 1.0 Where, under the developer's ownership, no demolition will be undertaken to enable the assessed development, the pre-demolition audit credit is not applicable and therefore filtered out of the assessment.	A copy of the Resource Management Plan and, where relevant, the pre-demolition audit Relevant section/clauses of the building specification or contract AND/OR A letter from the client or their representative	**0**	**0**	**0**	Parkway	**Credit not targeted - no demolition**
Wst 01b Construction resource efficiency	**Up to three credits - Construction resource efficiency** 4. Prepare a compliant Resource Management Plan (RMP) covering: 4.a Non-hazardous waste materials (from on-site construction and dedicated off-site manufacture or fabrication, see Definitions), including demolition and excavation waste. 4.b Accurate data records on waste arisings and waste management routes. 5. Meet or improve upon the benchmarks in Table 10.1 for non-hazardous construction waste, excluding demolition and excavation waste. able 10.1 Construction waste resource efficiency benchmarks BREEAM credits / Amount of waste generated per 100 m² (gross internal floor area): m³ (actual, not bulk volume) / tonnes One credit: ≤ 13.3 / ≤ 11.1 Two credits: ≤ 7.5 / ≤ 6.5 Three credits: ≤ 3.4 / ≤ 3.2 Exemplary level: ≤ 1.6 / ≤ 1.9		**3**	**3**	**0**	Parkway	**Three credits targeted**
Wst 01c Diversion of resources from landfill	**One credit - Diversion of resources from landfill** 5. Meet, where applicable, the diversion from landfill benchmarks in Table 10.2 for non-hazardous construction waste and demolition and excavation waste generated. 6. Sort waste materials into separate key waste groups as per Table 10.3, either on-site or through a licensed contractor for recovery. able 10.2 Diversion from landfill benchmarks BREEAM credits / Type of waste / Volume / Tonnage One credit: Non-demolition 70% 80%; Demolition 80% 90%; Excavation N/A N/A Exemplary level: Non-demolition 85% 90%; Demolition 85% 95%; Excavation 95% 95%		**1**	**1**	**0**	Parkway	**One credit targeted**

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Wst 02 Use of recycled and sustainably sourced aggregates							
Prerequisite	**Prerequisite - Pre-demolition audit** 1. If demolition occurs on site, to encourage the reuse of site-won material on site, complete a pre-demolition audit of any existing buildings, structures or hard surfaces in accordance with Assessment Scope - Criterion 1.		-	-	-	Project Team	Required for Wst02 credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Wst 02a Project sustainable aggregate points	**One credit - Project Sustainable Aggregate Points** 2. Identify all aggregate uses and types on the project Table 10.5 and Table 10.6 3. Determine the quantity in tonnes for each identified use and aggregate type. 4. Identify the region in which the aggregate source is located. 5. Calculate the distance in kilometres travelled by all aggregates by transport type. 6. Enter the information into the BREEAM Wst 02 calculator to calculate the Project Sustainable Aggregate points. The corresponding number of BREEAM credits will be awarded as shown in Table 10.4 Table 10.4 Credits available relating to the Project Sustainable Aggregate points Project Sustainable Aggregate Credits: 1 — Project Sustainable Aggregate points: 3.5–6 Project Sustainable Aggregate Credits: 1 exemplary performance credit — Project Sustainable Aggregate points: >6	Completed copy of Wst 02 calculator Documentary evidence supporting the data used to complete the Calculator tool. Documentation confirming the source of recycled/secondary aggregates and that the required amount can be provided	1	0	0	Project Team	**Credit not targeted**
Wst 03 Operational waste - Minimum of one credit for Excellent & Outstanding							
Wst 03a Operational waste	**One credit - Operational waste** 1. Provide a dedicated space for the segregation and storage of operational recyclable waste generated. The space is: 1.a Clearly labelled, to assist with segregation, storage and collection of the recyclable waste streams 1.b Accessible to building occupants or facilities operators for the deposit of materials and collections by waste management contractors 1.c Of a capacity appropriate to the building type, size, number of units (if relevant) and predicted volumes of waste that will arise from daily or weekly operational activities and occupancy rates. 2. For consistent and large amounts of operational waste generated, provide: 2.a Static waste compactors or balers; situated in a service area or dedicated waste management space 2.b Vessels for composting suitable organic waste OR adequate spaces for storing segregated food waste and compostable organic material for collection and delivery to an alternative composting facility 2.c A water outlet provided adjacent to or within the facility for cleaning and hygiene purposes where organic waste is to be stored or composted on site. **Note:** 2.0 Small industrial units: For an industrial building or development site consisting of a number of smaller units, each ≤ 200m² floor area, shared facilities that meet the above criteria for the building or site as a whole are sufficient to achieve this credit.	Design drawings and/or relevant section/clauses of the building specification or contract confirming provision and scope of dedicated facilities. Project team meeting minutes / letter confirming likely building waste streams and indicative volumes.	1	1	0	Parkway	**One credit targeted**
Wst 05 Adaptation to climate change							
Wst 05a Resilience of structure, fabric, building services and renewables installation	**One credit - Resilience of structure, fabric, building services and renewables installation** 1. Conduct a climate change adaptation strategy appraisal using: 1.a A systematic risk assessment to identify the impact of expected extreme weather conditions arising from climate change on the building over its projected life cycle. The assessment covers the installation of building services and renewable systems, as well as structural and fabric resilience aspects and includes(see Methodology below): 1.a.i Hazard identification 1.a.ii Hazard assessment 1.a.iii Risk estimation 1.a.iv Risk evaluation 1.a.v Risk management. 2. Develop recommendations or solutions based on the climate change adaptation strategy appraisal, before or during Concept Design, that aim to mitigate the identified impact. 3. Provide an update during Technical Design demonstrating how the recommendations or solutions proposed at Concept Design have been implemented where practical and cost effective. Omissions have been justified in writing by the assessor.	Relevant section/clauses of the building specification or contract. Design drawings. Report/study.	1	1	0	Parkway / structural engineer	**One credit awarded**
Wst 06 Design for disassembly and adaptability							
Wst 06a Design for disassembly and adaptability - recommendations	**One credit - Design for disassembly and functional adaptability - recommendations** 1. Conduct a study to explore the ease of disassembly and the functional adaptation potential of different design scenarios (see Methodology) by the end of Concept Design. 2. Develop recommendations or solutions (see Methodology) based on the study (criterion 1 above), during or prior to Concept Design, that aim to enable and facilitate disassembly and functional adaptation.	Disassembly and functional adaptability study, implementation plan report, building adaptability and disassembly guide.	1	1	0	Architect	**One credit targeted**
Wst 06b Disassembly and functional adaptability - implementation	**One credit - Disassembly and functional adaptability – implementation** 3. Achieve criteria 1 and 2 4. Provide an update, during Technical Design, on: 4.a How the recommendations or solutions proposed by Concept Design have been implemented where practical and cost effective. Omissions have been justified inwriting to the assessor. 4.b Changes to the recommendations and solutions during the development of the Technical Design. 5. Produce a building adaptability and disassembly guide to communicate the characteristics allowing functional adaptability and disassembly to prospective tenants.	Disassembly and functional adaptability study, implementation plan report, building adaptability and disassembly guide.	1	1	0	Architect / Parkway	**One credit targeted**
Section Total			**9**	**8**	**0**	**0**	
Weighted Section Total		7%	**7**	**6.22**	**0**	**0**	
Le 01 Site selection							
Le 01a Previously occupied land	**One credit - Previously occupied land** 1 At least 75% of the proposed development's footprint is on an area of land which has previously been occupied (see Definitions).	Design drawings (including existing site plan), report or site photographs confirming: Type and duration of previous land use. Area (m2) of previous land use. Proposed site plan showing: Location and footprint (m2) of proposed development and temporary works.	1	0	0	Architect	Not achievable **Credit not targeted**
Le 01b Contaminated land	**One credit - Contaminated land** 2. A contaminated land professional's site investigation, risk assessment and appraisal has deemed land within the site to be affected by contamination. The site investigation, risk assessment and appraisal have identified: 2.a The degree of contamination 2.b The contaminant sources or types 2.c The options for remediating sources of contamination which present an unacceptable risk. 3. The client or principal contractor confirms that remediation of the site will be carried out in accordance with the remediation strategy and its implementation plan as recommended by the contaminated land professional (see Definitions).	A copy of the remediation strategy and implementation plan. Evidence to demonstrate the recommendations set out in the remediation strategy plan have been implemented.	1	0	0	Contaminated Land Professional	Not thought to be achievable **Credit not targeted**
Le 02 Identifying and understanding the risks and opportunities for the project - number of credits available depend on route							
Le 02a Prerequisite	**Prerequisite - Assessment route selection** 1. The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site. Table 11.1 Credits awarded for each assessment route Survey and evaluation: Foundation route (Route 1) 1 credit; Comprehensive route (Route 2) 1 credit Determining ecological outcomes: Comprehensive route (Route 2) 1 credit Exemplary criteria: Foundation route (Route 1) 1 credit; Comprehensive route (Route 2) 1 credit	Completed Guidance Note 34: BREEAM Ecology Risk Evaluation Checklist.	-		-	Ecologist / Project Team	Pre-requisite required for Le02 credits to be achieved. Route 1 (Foundation) has no Ecologist Route 2 (Comprehensive) with Ecologist

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Le 02b Survey and evaluation	**Comprehensive route (Route 2)** 3. A Suitably Qualified Ecologist (SQE) carried out a survey and evaluation (see Methodology) for the site early enough to influence site preparation works, layout and, where necessary, strategic planning decisions (typically Preparation and brief stage) (see Definitions). 4. The SQE's survey and evaluation determines the site's ecological baseline (see Definitions), including: a. Current and potential ecological value and condition of the site, and related areas within the zone of influence. b. Direct and indirect risks to current ecological value from the project c. Capacity and feasibility for enhancement of the site's ecological value of the site and, where relevant, areas within the zone of influence. 5. Recommendations and data collected from the survey and evaluation are shared with appropriate project team members to influence decisions made for activities during site preparation, design and construction works, which can support ecological features (see Methodology and Definitions). **Determining ecological outcomes** **Foundation and Comprehensive routes (Routes 1 and 2)** 6. Survey and evaluation criteria relevant to the chosen route (criterion 2 if following the Foundation route or Criteria 3-5 above for the Comprehensive route). 7. The project team liaise and collaborate with representative stakeholders (see Methodology) early enough to influence key planning decisions (typically Concept Design stage) to: 7.a Identify the optimal ecological outcomes for the site. 7.b Identify, appraise and select measures to meet the optimal ecological outcomes for the site (criterion 7.a), in line with the mitigation hierarchy of action, according to the route being used (see Definitions): **Foundation route**: 1. Avoidance; 2. Protection **Comprehensive route**: 1. Avoidance; 2. Protection; 3. Reduction or limitation of negative impacts; 4. On site compensation and; 5. Enhancement, considering the capacity and feasibility within the site, or where viable, off-site.	A copy of the Ecological Survey and Evaluation document. Note: A phase 1 habitat assessment or other equivalent type of assessment can act as acceptable evidence as long as it can be shown that they cover the content of the assessment criteria.	**2**	**2**	**0**	Ecologist / Project Team	**Two credits targeted**
Le 03 Managing negative impacts on ecology - credits available depend on route							
Le 03a Prerequisite	**Prerequisite – Ecological risks and opportunities** 1. LE02's 'Survey and evaluation and Determining ecological outcomes' criteria have been achieved using the Foundation route (Route 1) or the Comprehensive route (Route 2) Table 11.2 Credits awarded according to assessment route Planning and measures on-site: Foundation route (Route 1) 1 credit; Comprehensive route (Route 2) 1 credit Managing negative impacts: Foundation route (Route 1) 1 credit; Comprehensive route (Route 2) 1 or 2 credits		-		-	Ecologist	Required for Le03 credits to be achieved.
Le 03b Planning liaison, implementation and data	**One credit – Planning and measures on-site** **Routes 1 and 2** 2. Further planning to avoid and manage negative ecological impacts on-site is carried out (see Methodology) early enough to influence the concept design and design brief as well as site preparation planning (typically Concept Design stage). 3. On-site measures for managing negative ecological impacts during site preparation and construction are implemented in-practice (e.g. mitigation measures to protect existing ecological features) (see Methodology). 4. Criteria 2-3 are based on input from the project team in collaboration with representative stakeholders and data collated as part of the 'Determining ecological outcomes' in Le02 Ecological risks and opportunities (see Methodology).		**1**	**1**	**0**	Ecologist	**One credit targeted**
Le03c Managing negative impacts of the project	**Up to two credits – Managing negative impacts of the project** **Comprehensive route (Route 2) (up to two credits)** 7. Criteria 2-4 have been achieved. 8. Negative impacts from site preparation and construction works have been managed according to the mitigation hierarchy, in line with the SQE's recommendations (see Methodology) and, either: a. No overall loss of (see Definitions) ecological value has occurred (2 credits) OR where criterion 8a is not possible: b. The loss of ecological value has been minimised (Minimising Loss) (1 credit)		**2**	**1**	**0**	Ecologist	**One credit targeted**
Le 04 Change and enhancement of ecological value - credits available depends on route							
Le 04a Prerequisite	**Prerequisite - Managing negative impacts on ecology** 1. Criterion 6 (for Foundation route) or 8 (for Comprehensive route) in Le03 has been achieved. 2. The client or contractor confirms compliance is monitored against all relevant UK, EU or international legislation relating to the ecology of the site. able 11.3 Credits awarded by ecological assessment route Ecological enhancement: Foundation route (Route 1) N/A; Comprehensive route (Route 2) 1 credit Change and enhancement of ecology: Foundation route (Route 1) 1 credit; Comprehensive route (Route 2) up to 3 credits		-		-	Ecologist / Project Team	Required for Le 04 credits to be achieved.
Le 04b Liaison, implementation and data collation. Change and enhancement of ecology	**One credit - Ecological enhancement** **Comprehensive route (Route 2) only** 4. Measures have been implemented that enhance ecological value, which are based on input from the project team and SQE in collaboration with representative stakeholders and data collated as part of the 'Determining ecological outcomes' in Le02 (see Methodology). Measures are implemented in the following order: a. On site, and where this is not feasible, b. Off site within the zone of influence. 5. Data collated are analysed and where potentially valuable, provided to the local environmental records centres nearest to, or relevant for, the site.	Ecologist's report Design drawings including proposed and existing (pre-development) site plan/survey Written confirmation from the client/design team confirming how the ecologist's recommendations will be implemented.	**1**	**1**	**0**	Ecologist / Project Team	**One credit targeted**
Le 04c Enhancement of ecology	**Up to three credits - Change and enhancement of ecology** **Comprehensive route (Route 2) only** 6. Up to three credits are awarded based on the change in ecological value occurring as a result of the project. This must be calculated in accordance with the process set out in GN36 - BREEAM, CEEQUAL and HQM Ecology Calculation Methodology - Route 2. Credits are awarded in line with the Reward Scale table in GN36 where there are no residual impacts on protected sites or irreplaceable habitats.	Ecologist's report Design drawings including proposed and existing (pre-development) site plan/survey Written confirmation from the client/design team confirming how the ecologist's recommendations will be implemented.	**3**	**1**	**0**	Ecologist / Project Team	**One credit targeted**
Le 05 Long term ecology management and maintenance - number of credits available depends on route							
Le 05a Perquisite	**Prerequisite - Statutory obligations, planning and site implementation** 1. The client or contractor has confirmed that compliance is being monitored against all relevant UK, EU and international standards relating to the ecology of the site. 2. The following must be achieved, according to the route being assessed: a. Foundation route (Route 1) - criterion 6 in Le03 has been achieved . b. **Comprehensive route (Route 2) - criterion 8 in Le03 has been achieved, and at least one credit under Le 04 for 'Change and Enhancement of Ecology' has been awarded.** ible 11.4 Credits awarded by ecological assessment route Management and maintenance throughout the project: Foundation route (Route 1) 1 credit; Comprehensive route (Route 2) 1 credit Landscape and ecology management plan: Comprehensive route (Route 2) 1 credit		-			Ecologist / Project Team	Required for Le05 credits to be achieved. Clarification from BRE confirms this refers to *any* LE 04 credit.
Le 05b Ecology management and maintenance	**One credit - Management and maintenance throughout the project - Foundation and Comprehensive routes (Route 1 and Route 2)** 3. Measures have been implemented to manage and maintain ecology throughout the project. These measures are based on input from the project team in collaboration with representative stakeholders and data collated as part of the 'Determining ecological outcomes' in Le02 (see Methodology). To ensure the optimal ecological outcomes agreed in Le02 are met in-practice, these measures must monitor and review the effectiveness of the mitigation and enhancement measures in place for Le03 and Le04 to ensure they are implemented. 4. A section on Ecology and Biodiversity has been included as part of the tenant or building owner information supplied, to inform the owner or occupant of local ecological features, value and biodiversity on or near the site (see Methodology). This should include detailed management and maintenance plans as required by landscape and asset managers as well as relevant parts of the handover information for occupiers written in a format that encourages understanding and supportive behaviours. **One credit - Landscape and ecology management plan (or similar) development - One credit for Route 2, to be included as part of Route 1 evidence, but no additional credit given** 5. A Landscape and Ecology Management Plan, or equivalent, has been developed in accordance with BS42020:2013 Section 11.1 covering at least the first five years after project completion as a minimum and including: a. Actions and responsibilities of relevant individuals, prior to handover b. The ecological value and condition of the site at handover and how this is expected to develop and change over time c. Identification of opportunities for ongoing alignment with activities beyond the development project, which supports the aims of BREEAM's Strategic Ecology Framework d. Identification and guidance to trigger appropriate remedial actions to address previously unforeseen impacts e. Clearly defined and allocated roles and responsibilities for delivering the plan 6. The landscape and management plan or similar will be updated to support maintenance of the ecological value of the site (see sections relating to Maintenance and Monitoring in CIEEM, CIRIA, IEMA, for helpful guidance).	Ecologist's report Design drawings including proposed and existing (pre-development) site plan/survey Written confirmation from the client/design team confirming how the ecologist's recommendations will be implemented.	**2**	**2**	**0**	Ecologist / Project Team	**Two credits targeted**
Section Total			**13**	**8**	**0**	**0**	
Weighted Section Total		15%	**15**	**9.23**	**0**	**0**	

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Pol 01 Impacts of refrigerants							
Pol 01a No refrigerant use	**Three credits - No refrigerant use** 1. No refrigerant use within the installed plant or systems. **OR** alternatively, where the building does use refrigerants, the three credits can be awarded as follows: **Prerequisite** 2. All systems with electric compressors comply with the requirements of BS EN378:2016 (207) (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice(208) **Two credits - Impact of refrigerant** 3. The direct effect life cycle CO_2 equivalent emissions (DELC) of ≤ 100 CO_2-eq/kW. For systems which provide cooling and heating, the worst performing output based on the lower of kW cooling output and kW heating output is used to complete the calculation. To calculate the DELC, refer to the relevant definitions in Methodology below and Additional information. **OR** 4. All refrigerants used have a global warming potential (GWP) ≤ 10. **OR** One credit - Impact of refrigerant 5. Systems using refrigerants have a DELC of ≤ 1000 kgCO_2-eq/kW cooling and heating capacity. **One credit - Leak detection** 6. All systems are hermetically sealed or only use environmentally benign refrigerants(see Leak detection and Hermetically sealed systems). **OR** 7.Where the systems are not hermetically sealed: 7.a Systems have: 7.a.i A permanent automated refrigerant leak detection system, that is robust and tested, and capable of continuously monitoring for leaks. **OR** 7.a.ii An inbuilt automated diagnostic procedure for detecting leakage is enabled. 7.b In the event of a leak, the system must be capable of automatically responding and managing the remaining refrigerant charge to limit loss of refrigerant (see Automatic isolation and containment of refrigerant)**.** **Note** 1.0 If the building is designed to avoid the need for refrigerant-containing building services, so no refrigerant use will be specified for the fit-out, the available credits can be awarded by default.	Completed copy of Pol 01 calculator tool. Documentary evidence supporting the data used to complete the calculator tool. A copy of the specification clause or letter from the M&E engineer / system manufacturer confirming relevant refrigeration type and system information.	**3**	**2**	**0**	M&E	2 achieved on Catalyst 5-6 and targeted on 7-8, asumed same could be achievable here. **Two credits targeted**
Pol 02 Local air quality							
Pol 02a Local air quality	**Up to two credits - Local air quality** 1. All heating and hot water is supplied by non-combustion systems. For example, only powered by electricity. **OR alternatively;** 2. Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels set in Table 12.4 and Table 12.5. The measurements must be provided by manufacturers. Must determine whether the development is in a high or low pollution zone (methodology).		**2**	**2**	**0**	M&E	No gas **Two credits targeted**
Pol 03 Flood and surface water management							
Pol 03a Prerequisite	**Prerequisite** 1. An appropriate consultant is appointed to carry out and demonstrate the development's compliance with all criteria.		**-**		**-**	Civil Engineer	Required for Any Pol03 credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Pol 03b Flood resilience	**Up to two credits - Flood resilience** **Two credits - Low flood risk** 2. A site-specific flood risk assessment (FRA) confirms the development is in a flood zone that is defined as having a low annual probability of flooding. The FRA takes all current and future sources of flooding into consideration (see Sources of flooding). **One credit - Medium or high flood risk** 3. A site-specific FRA confirms the development is in a flood zone that is defined as having a medium or high annual probability of flooding and is not in a functional floodplain. The FRA must take all current and future sources of flooding into consideration (see Sources of flooding). For smaller sites refer to Level of detail required in the FRA for smaller sites, which overrides criterion 2 above. 4. To increase the resilience and resistance of the development to flooding, one of the following must be achieved: 4.a The ground level of the building and access to both the building and the site, are designed (or zoned) so they are at least 600 mm above the design flood level of the site's flood zone (see 600 mm threshold). 4.b The final design of the building and the wider site reflects the recommendations made by an appropriate consultant in accordance with the hierarchy approach outlined in section 5 of BS 8533:2017 (214)		**2**	**2**	**0**	Civil Engineer	Flood maps show this site to be in flood zone 1 **Two credits targeted**
Pol 03c Prerequisite	**Prerequisite for surface water run-off credits** 5. Surface water run-off design solutions must be bespoke, i.e. they must take account of the specific site requirements and natural or man-made environment of and surrounding the site. The priority levels detailed in the Methodology must be followed, with justification given by the appropriate consultant where water is allowed to leave the site.		**-**		**-**	Civil Engineer	Required for Pol03d or Pol03e credits to be achieved. "Met" in targeted column indicates pre-requisite achieved
Pol 03d Surface water run off - rate	**One credit - Surface Water Run-Off - Rate** 6. For brownfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) shows a 30% improvement for the developed site compared with the pre-developed site. This should comply at the 1-year and 100-year return period events. 7. For greenfield sites, drainage measures are specified so that the peak rate of run-off from the site to the watercourses (natural or municipal) is no greater for the developed site than it was for the pre-development site. This should comply at the 1-year and 100-year return period events. 8. Relevant maintenance agreements for ownership, long term operation and maintenance of all specified SuDS are in place. 9. Calculations include an allowance for climate change. This should be made in accordance with current best practice planning guidance (see definitions).	Calculation results for the pre-and post-development peak rate of run-off.	**1**	**1**	**0**	Civil Engineer	**One credit targeted**
Pol 03e Surface water run off - volume	**One credit - Surface Water Run-Off - Volume** 10. Flooding of property will not occur in the event of local drainage system failure (caused either by extreme rainfall or a lack of maintenance);**AND** **EITHER** 11. Drainage design measures are specified so that the post-development run-off volume, over the development lifetime, is no greater than it would have been prior to the assessed site's development. This must be for the 100-year 6-hour event, including an allowance for climate change (see criterion 14). 12. Any additional predicted volume of run-off for this event is prevented from leaving the site by using infiltration or other SuDS techniques. **OR** (only where criteria 11 and 12 cannot be achieved): 13. Justification from the appropriate consultant indicating why the above criteria cannot be achieved, i.e. where infiltration or other SuDS techniques are not technically viable options. 14. Drainage design measures are specified so that the post-development peak rate of run-off is reduced to the limiting discharge. The limiting discharge is defined as the highest flowrate from the following options: 14.a The pre-development one-year peak flowrate 14.b The mean annual flowrate (Qbar) 14.c 2L/s/ha. For the one-year peak flowrate, the one-year return period event criterion applies. 15. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS are in place. 16. For either option, above calculations must include an allowance for climate change; this should be made in accordance with current best practice planning guidance	Information showing the proposed drainage solution, system failure flood flow routes, potential flood ponding levels and ground floor levels. Calculation results for the pre-and post-development volume of run-off. Calculation results of the limiting discharge.	**1**	**1**	**0**	Civil Engineer	**One credit targeted**
Pol 03f Minimising watercourse pollution	**One credit - Minimising watercourse pollution** 17. There is no discharge from the developed site for rainfall up to 5 mm (confirmed by the appropriate consultant). 18. Areas with a low risk source of watercourse pollution, an appropriate level of pollution prevention treatment is provided, using appropriate SuDS techniques. 19. Areas with a high risk of contamination or spillage of substances, such as petrol and oil, have separators(or an equivalent system) are installed in surface water drainage systems. 20. Chemical or liquid gas storage areas have a means of containment fitted to the site drainage system (i.e. Shutoff valves). This is to prevent the escape of chemicals to natural water courses in the event of a spillage or bunding failure. 21. All water pollution prevention systems have been designed and installed in accordance with the recommendations of documents such as the SuDS manual(215) and other relevant industry best practice. They must be bespoke solutions taking account of the specific site requirements and natural or man-made environment of and surrounding the site. 22.A comprehensive and up to date drainage plan of the site will be made available for the building or site occupiers. 23. Relevant maintenance agreements for the ownership, long term operation and maintenance of all specified SuDS must be in place.	The consultants report detailing the design specifications, calculations and drawings to support the 5mm rainfall discharge criteria. Design drawings and/or relevant section/clauses of the building specification or contract indicating 1. High and low risk areas of the site 2. Specification of SUDS, source control systems, oil/petrol separators and shut-off valves as appropriate A letter or other formal correspondence from the project team: 1. Confirming water pollution prevention systems are designed in accordance with PPG3 and the SUDS manual (where appropriate) 2. Outlining indicative examples of compliance with PPG3 and the SUDS manual 3. Confirming a copy of the drainage plan will be produced and handed over to the building occupier. 4. Confirming design of all external storage and delivery areas is in compliance with relevant Pollution Prevention Guidance 5. Outlining indicative examples of compliance with the PPG.	**1**	**0**	**1**	Civil Engineer	Will credit also be achievanle on this scheme? **One potential credit**
Pol 04 Reduction of night time light pollution							
Pol 04a Reduction of night time light pollution	**One credit - Reduction of night time light pollution** 1. External lighting pollution has been eliminated through effective design that removes the need for external lighting. This does not adversely affect the safety and security of the site and its users. *OR* alternatively, where the building does have external lighting, one credit can be awarded as follows: 2. The external lighting strategy has been designed in compliance with Table 2 (and its accompanying notes) of the Institution of Lighting Professionals (ILP) Guidance notes for the reduction of obtrusive light, 2011(221). 3. All external lighting (except for safety and security lighting) can be automatically switched off between 23:00 and 07:00. 4. If safety or security lighting is provided and will be used between 23:00 and 07:00, this part of the lighting system complies with the lower levels of lighting recommended during these hours in Table 2 of the ILP guidance notes. 5. Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements.(221)	Design drawings Relevant section/clauses of the building specification or contract or external lighting design data/calculations In the case of the external lighting design, the M&E engineer or lighting designer must provide indicative examples of where and how the strategy complies with the assessment criteria.	**1**	**1**	**0**	M&E	**One credit targeted**

Scott White and Hookins

	BREEAM NC Version 6 Criteria	Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Pol 05 Reduction of noise pollution							
Pol 05a Reduction of noise pollution	**One credit - Reduction of noise pollution** 1. There are no noise-sensitive areas within the assessed building or within 800 m radius of the assessed site. **OR** 2. Where there are noise-sensitive areas within the assessed building or noise-sensitive areas within 800 m radius of the assessed site, a noise impact assessment compliant with BS4142:2014(222) is commissioned. Noise levels must be measured or determined for: 2.a Existing background noise levels: 2.a.i at the nearest or most exposed noise-sensitive development to the proposed assessed site. 2.a.ii including existing plant on a building, where the assessed development is an extension to the building 2.b Noise rating level from the assessed building. 3. The noise impact assessment must be carried out by a suitably qualified acoustic consultant. 4. The noise level from the assessed building, as measured in the locality of the nearest or most exposed noise sensitive development, must be at least 5dB lower than the background noise throughout the day and night. 5. If the noise sources from the assessed building are greater than the levels described in criterion 4, measures have been installed to attenuate the noise at its source to a level where it will comply with the criterion	For 1: Design drawings highlighting: 1. All existing and proposed noise-sensitive buildings local to, and within, the site boundary 2. Proposed sources of noise from the new development 3. Distance (m) from these buildings to the assessed development. For 2 to 3: The acoustician's report, acoustician's qualifications and professional status. **OR** Relevant section/clauses of the building specification or contract requiring a noise assessment by a suitably qualified acoustician in compliance with BS 4142:1997. **OR** A letter from the client or design team confirming that they will appoint an acoustician to carry out a noise assessment in compliance with BS 4142:1997 For 4: Acoustician's report with recommendations for noise attenuation measures. **AND EITHER** A marked-up design plan highlighting the specification of the acoustician's attenuation measures **OR** A formal letter from the client or design team confirming where relevant, that attenuation measures recommended by an appointed suitably qualified acoustician will be installed	**1**	**1**	**0**	Acoustic Consultant / Parkway	**One credit targeted**
Section Total			**12**	**10**	**1**	**0**	
Weighted Section Total		9%	**9**	**7.5**	**0.75**	**0**	
Innovation - Exemplary Level Criteria							
Man 03i Responsible Construction Management	23. Achieve all items in Table 4.1.	As Man 03 evidence.	**1**	**1**	**0**	Principal Contractor	**One credit targeted**
Hea 01i Daylighting	14. Daylighting criteria have been met using either of the following options: 14.a Relevant building areas meet exemplary daylight factors and the relevant criteria in Table 5.8. 14.b Relevant building areas meet exemplary average and minimum point daylight illuminance criteria in Table 5.9.	As Hea 01 evidence.	**1**	**0**	**0**	Architect	Not achievable. **Credit not targeted**
Hea 06i Security of site and building	4. A compliant risk based security rating scheme has been used. The performance against the scheme has been confirmed by independent assessment and verification.	As Hea 06 evidence.	**1**	**0**	**0**	SQSS	Expensive to achieve. **Credit not targeted**
Ene 01i Beyond zero net regulated carbon and carbon negative	**Up to two credits - Beyond zero net regulated carbon** 10. The building achieves an EPR NC ≥ 0.9 and zero net regulated CO_2-eq emissions (see Definitions on page 143). 11. Energy generation from on-site and near-site LZC sources is sufficient to offset carbon emissions from regulated energy use plus a percentage of emissions from unregulated energy use. 12. Award the exemplary credits based on the percentage of additional emissions from unregulated energy that are offset by LZC sources (see Table 6.2 below). **Three credits - Carbon negative** 13. The building is deemed carbon negative where > 100% (see Table 6.2 below) of carbon emissions from unregulated (and regulated) energy use are offset by energy generated from on-site and near-site LZC sources (see Definitions on page 143).	1. The total carbon neutral energy generation (kWh/yr) 2. The source of the carbon neutral energy 3. Calculated estimate of energy consumption from unregulated systems or process(kWh/yr) (only required if confirming zero regulated carbon or carbon negative exemplary credits) 4. Calculated estimate of exported energy surplus(only required if confirming carbon negative status).	**3**	**0**	**0**	M&E	**Credits not targeted**
Ene 01iii Post occupancy stage	14. Achieve 'Four credits - Prediction of operational energy consumption' (criteria 2 to 9). 15. Achieve maximum available credits in Ene 02 Energy monitoring on page 148. In addition, preschools, primary schools, law courts, prisons and multi-residential buildings must meet the requirements of the second credit for sub-metering of high energy load and tenancy areas. 16. The client or building occupier commits funds to pay for the post-occupancy evaluation. 16.a Where performance targets are set in relation to external rating schemes (e.g. a DEC, UK NABERS energy for offices, or BREEAM In-Use rating), confirm that an assessor will be appointed to report on the actual energy consumption compared with the target set in criterion 8 or 9, OR 16.b Where the energy performance target is project specific, the funds committed to pay for the post occupancy evaluation explicitly include provision for third party verification of the operational energy performance. 17. The energy model (criterion 4 on the previous page) is saved so that it can be rerun post occupancy. This can be achieved by either: 17.a Submitting the model to BRE, OR 17.b Reporting the building owner, or named third party, who has access to the model and permission to use or share it	Evidence of commitment to proceed to the post occupancy evaluation and report the building energy consumption in use.	**2**	**0**	**0**	M&E	**Credits not targeted**
Wat 01i Water consumption	7. Achieve criteria 1 to 4 (and if applicable 5 or 6 above). 8. The water consumption (litres/person/day)for the assessed building achieves the 65% improvement described as exemplary performance in Table 8.1		**1**	**0**	**0**	M&E	**Credit not targeted**
Mat 01i Core building services options appraisal during Concept Design	8. Criteria 3 to 4 are achieved. 9. During Concept Design identify opportunities for reducing environmental impacts as follows: 9.a Carry out building LCA options appraisal of at least 3 significantly different core building services design options. 9.b Use a building LCA tool that is recognised by BREEAM (as suitable for assessing core building services during Concept Design) according to the methodology (see Methodology). 9.c As criteria 4.c to 4.f.	As Mat 01 evidence.	**1**	**1**	**0**	LCA consultant	LCA reports for unit 14 and 13/15 confirm produced prior to planning submission. Mat 01 calculators confirm that 3+1 credits are awarded for each study. **One credit awarded**
Mat 01ii LCA and LCC alignment	**One credit – LCA and LCC alignment (all building types)** 10. Achieve criteria 3 to 5. 11. Achieve Elemental LCC plan and Component Level LCC options appraisal credits(Man 02 Life cycle cost and service life planning). 12. Include design options appraised for criteria 3 to 4 (and 6 to 7 and 8 to 9, if pursued) during Concept Design in Assessment scope - The elemental LCC plan. 13. Include the design options appraised for criterion 5 during Concept Design in the 'Component level LCC option appraisal' (in Man 02 Life cycle cost and service life planning). 14. Integrate the aligned LCA and LCC options appraisal activity within the wider design decision-making process. Record this in an options appraisal summary document including the relevant cost information from the 'elemental LCC plan' and 'Component level LCC option appraisal'.	As Mat 01 evidence.	**1**	**0**	**1**	LCA consultant	**One potential credit**
Mat 01iii Third party verification	15. Criteria 1 to 7 (as applicable to the building type) are achieved. 16. A suitably qualified third party (see Definitions) either carries out the building LCA work or verifies the building LCA work (if by others), and produces a report describing how they have checked the building LCA work accurately represent the designs under consideration during Concept Design and Technical Design with reference to the requirements of criteria 1 to 7 (and 8 to 14 if pursued). 17. For each LCA option, itemise in the report the checks made by the suitably qualified third party including, as a minimum, the quality requirements shown in Table 9.4. 18. Include details of the suitably qualified third party's relevant skills and experience and a declaration of their third party independence from the project client and design team in the report		**1**	**1**	**0**	LCA consultant	**One credit targeted**
Mat03i Measuring responsible sourcing	3 Use the Mat 03 calculator tool and methodology to determine the number of credits achieved for the construction products specified or procured. Credits are awarded in proportion to the scope of the assessment and the number of points achieved, asset out in Table 9.10.		**1**	**0**	**0**	Parkway	**Credit not targeted**

	BREEAM NC Version 6 Criteria			Potential Design stage Evidence Approach	Credits Available	Current Targeted	Additional Potential	Resp.	Comments
Wst 01i Construction resource efficiency and diversion from landfill	7. Non-hazardous construction waste generated, excluding demolition and excavation waste, is less than or equal to the exemplary level resource efficiency benchmarks(see Table 10.1). 8. The percentage of non-hazardous construction, demolition and excavation waste (if relevant) diverted from landfill meets or exceeds the exemplary level percentage benchmarks in Table 10.2. 9. All key waste groups in Table 10.3 for diversion from landfill are covered in the RMP. 10. Waste data obtained from licensed external waste contractors is reliable and verifiable, by using data from EA/SEPA/EA Wales/NIEA Waste Return Forms or from a PAS402:2013 compliant company (see Definitions). le 10.1 Construction waste resource efficiency benchmarks REEAM credits / Amount of waste generated per 100 m² (gross internal floor area): m³ (actual, not bulk volume) / tonnes ne credit: ≤ 13.3 / ≤ 11.1 wo credits: ≤ 7.5 / ≤ 6.5 ree credits: ≤ 3.4 / ≤ 3.2 xemplary level: ≤ 1.6 / ≤ 1.9 le 10.2 Diversion from landfill benchmarks REEAM credits / Type of waste / Volume / Tonnage One credit: Non-demolition 70% 80%; Demolition 80% 90%; Excavation N/A N/A xemplary level: Non-demolition 85% 90%; Demolition 85% 95%; Excavation 95% 95%				1	1	0	Parkway	**One credit targeted**
Wst 02i	7. The Project Sustainable Aggregate Points score meets or exceeds the exemplary level performance benchmark in Table 10.4.				1	0	0	Parkway	**Credit not targeted**
Wst 05i Responding to climate change	Achievement of the following criteria demonstrates a holistic approach to the design and construction of the building's life cycle to mitigate against the impacts of climate change. To achieve an exemplary performance credit: 4. Meet criteria 1 to 3 above. 5. Meet the criteria or achieve credits of the assessment issues given in Table 10.11				1	1	0	Structural engineer	Needs 6 min for Ene 01 and Pol 03 to be confirmed. **One credit targeted**
Le 02i Ecological outcomes for the site	Determine the ecological outcomes for the site (sustainability-related activities) 11. Achieve criteria 8 to 10. 12. When determining the optimal ecological outcome for the site consider, in addition to those outlined in criteria 8 to 10, the wider site sustainability-related activities and the potential for ecosystem service related benefits. See Methodology - a list of the minimum areas for consideration. 13. Achieve the credits of the assessment issues outlined below: 13.a Both credits in Hea07 13.b Pol03 - Achieve credits for 'Surface water run-off' and 'Minimising watercourse pollution' 13.c Pol054.				1	0	0	Ecologist	**Credit not targeted**
Le 04i Change and enhancement of ecology	7. The change in ecological value occurring is calculated in accordance with the process set out in GN36 - BREEAM, CEEQUAL and HQM Ecology Calculation Methodology - Route 2. The credit is awarded as follows: 7.a Significant net gain in ecological value (percentage score of 110 or above).				1	0	0	Ecologist	**Credit not targeted**
Section Total				**Note: Maximum available is 10 credits**	**10**	**5**	**1**	**1**	
Weighted Section Total				10.0%	**10.00**	**5.00**	**1.00**	**1.00**	
				Overall Total	**110.00**	**74.26**	**4.22**	**4.75**	

APPENDIX B

UNIT 13 BRUKL OUTPUT DOCUMENT – GREEN STAGE

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

ESC2102 - Unit 13 - Be Green

As designed

Date: Thu May 09 01:39:14 2024

Administrative information

Building Details

Address: Address 1, Bicester, OX

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

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

Certifier details

Name: Kim Nguyen

Telephone number: 0121 214 8998

Address: Griffin House, 19 Ludgate Hill, Birmingham, B3 1DW

Foundation area [m²]: 706.84

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	3.03	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	1.3	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	32.43	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	12.76	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.24	0.24	ST000001:Surf[2]
Floors	0.18	0.18	0.18	ST000001:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.16	0.16	WR000000:Surf[36]
Windows** and roof windows	1.6	1.4	1.4	RC000001:Surf[0]
Rooflights***	2.2	1.3	1.3	WR000000:Surf[1]
Personnel doors^	1.6	1.6	1.6	WR000000:Surf[40]
Vehicle access & similar large doors	1.3	1.3	1.3	WR000000:Surf[38]
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = 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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Electric Panel Heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	-	0	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- VRF & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	0	1.5	0.75
Standard value	2.5*	N/A	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.

1- Electric DHW Point of use

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.005
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
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
Dis WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	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
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
Staircase	NO
Warehouse	NO
Staircase	NO
Staircase	NO
WC	NO
Dis WC	NO
Warehouse Undercroft	NO
Reception	NO
Reception Double Height	NO
Corridor	NO
WC	NO
WC	NO
WC	NO
WC	NO
Landing	NO
WC	NO
WC	NO
Landing	NO
WC	NO
WC	NO
Corridor	NO
WC	NO
WC	NO
WC	NO
WC	NO
Open Plan Office (East)	NO
Open Plan Office (South)	NO
Open Plan Office (East)	NO
Open Plan Office (South)	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
Staircase	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	95	-	-
Staircase	120	-	-
Staircase	120	-	-
WC	120	-	-
Dis WC	120	-	-
Warehouse Undercroft	95	-	-
Reception	120	80	1.688
Reception Double Height	120	80	1.688
Corridor	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
Landing	120	-	-
WC	120	-	-
WC	120	-	-
Landing	120	-	-
WC	120	-	-
WC	120	-	-
Corridor	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
Open Plan Office (East)	120	-	-
Open Plan Office (South)	120	-	-
Open Plan Office (East)	120	-	-
Open Plan Office (South)	120	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Warehouse	YES (+40%)	NO
Warehouse Undercroft	NO (-51.1%)	NO
Reception	YES (+14.5%)	NO
Reception Double Height	YES (+135.6%)	NO
Open Plan Office (East)	NO (-23.1%)	NO
Open Plan Office (South)	NO (-25.2%)	NO
Open Plan Office (East)	NO (-17.3%)	NO
Open Plan Office (South)	NO (-19.7%)	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]	4521.7	4521.7
External area [m^2]	7974.2	7974.2
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	2433.82	2326.38
Average U-value [W/m^2K]	0.31	0.29
Alpha value* [%]	26.72	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/m^2]

	Actual	Notional
Heating	3.24	3.18
Cooling	0.74	0.9
Auxiliary	2.72	5.54
Lighting	8.61	11.14
Hot water	4.42	3.98
Equipment*	35.89	35.89
TOTAL**	**19.72**	**24.74**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	11.81	2.9
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*11.81*	*2.9*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	33.57	31.28
Primary energy [kWh_{PE}/m^2]	12.76	32.43
Total emissions [kg/m^2]	1.3	3.03

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	34.1	25.1	2.4	1.7	6	3.9	4.02	4	6
	Notional	28.4	21.7	2.8	2.1	12.4	2.78	2.84	----	----
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	186.6	0	48.6	0	4.2	1.07	0	0.81	0
	Notional	221.4	0	43.6	0	6	1.41	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

UNIT 14 BRUKL OUTPUT DOCUMENT – GREEN STAGE

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

ESC2102 - Unit 14 - Be Green

As designed

Date: Wed May 08 22:02:51 2024

Administrative information

Building Details

Address: Address 1, Bicester, OX

Certifier details

Name: Kim Nguyen

Telephone number: 0121 214 8998

Address: Griffin House, 19 Ludgate Hill, Birmingham, B3 1DW

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

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

Foundation area [m²]: 490.22

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	2.63	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	1.1	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	28.17	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	10.7	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.24	0.25	00000050:Surf[1]
Floors	0.18	0.18	0.18	00000020:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.16	0.16	RM000001:Surf[3]
Windows** and roof windows	1.6	1.4	1.4	00000050:Surf[0]
Rooflights***	2.2	1.3	1.3	RM000001:Surf[2]
Personnel doors^	1.6	1.6	1.6	RM000001:Surf[4]
Vehicle access & similar large doors	1.3	1.3	1.3	RM000001:Surf[7]
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = 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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Electric Panel Heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	-	0	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- VRF & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	0	1.5	0.75
Standard value	2.5*	N/A	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.

1- Electric DHW Point of use

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.005
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
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	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
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC Acc	-	-	0.4	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
Circulation	NO
Circulation	NO
Circulation	NO
Cupboard	NO
Cupboard	NO
Cupboard	NO
Office Open	NO
Office Open	NO
Staircase	NO
Staircase	NO
Warehouse	NO
Warehouse Undercroft	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC Acc	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
Circulation	120	-	-
Circulation	120	95	1.421
Circulation	120	-	-
Cupboard	120	-	-
Cupboard	120	-	-
Cupboard	120	-	-
Office Open	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
Office Open	120	-	-
Staircase	120	95	1.421
Staircase	120	-	-
Warehouse	95	-	-
Warehouse Undercroft	95	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC Acc	120	-	-

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?
Circulation	NO (-53%)	NO
Office Open	NO (-25.5%)	NO
Office Open	NO (-23.5%)	NO
Staircase	YES (+22.9%)	NO
Warehouse	NO (-11.9%)	NO
Warehouse Undercroft	NO (-42.7%)	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]	3821	3821
External area [m^2]	5386.3	5483.1
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	1652.27	1818.34
Average U-value [W/m^2K]	0.31	0.33
Alpha value* [%]	25.01	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/m^2]

	Actual	Notional
Heating	2.79	2.74
Cooling	0.6	0.94
Auxiliary	2.04	4.11
Lighting	6.66	9.35
Hot water	4.32	3.89
Equipment*	33.93	33.93
TOTAL**	**16.41**	**21.04**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	9.8	2.07
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*9.8*	*2.07*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	30.25	28.75
Primary energy [kWh_{PE}/m^2]	10.7	28.17
Total emissions [kg/m^2]	1.1	2.63

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	44.4	25.7	3.2	1.8	6	3.9	4.02	4	6
	Notional	31.1	28.7	3.1	2.8	12.1	2.78	2.84	----	----
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	138.5	0	36	0	0.5	1.07	0	0.81	0
	Notional	179.8	0	35.4	0	0.5	1.41	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

UNIT 15 BRUKL OUTPUT DOCUMENT – GREEN STAGE

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name **Shell and Core**

ESC2102 - Unit 15- Be Green

As designed

Date: Wed May 08 22:29:54 2024

Administrative information

Building Details

Address: Address 1, Bicester, OX

Certifier details

Name: Kim Nguyen

Telephone number: 0121 214 8998

Address: Griffin House, 19 Ludgate Hill, Birmingham, B3 1DW

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.26

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.26

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

Foundation area [m²]: 704.48

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

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	2.64	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	1.21	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	28.4	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	12.09	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.24	0.24	00000061:Surf[0]
Floors	0.18	0.18	0.18	00000010:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.16	0.16	RM000002:Surf[3]
Windows** and roof windows	1.6	1.4	1.4	00000099:Surf[0]
Rooflights***	2.2	1.3	1.3	RM000002:Surf[2]
Personnel doors^	1.6	1.6	1.6	RM000002:Surf[7]
Vehicle access & similar large doors	1.3	1.3	1.3	RM000002:Surf[5]
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

$U_{a\text{-}Calc}$ = 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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Electric Panel Heaters

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.81	-	0	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- VRF & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	0	1.5	0.75
Standard value	2.5*	N/A	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.

1- Electric DHW Point of use

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1	0.005
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
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	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
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC	-	-	0.4	-	-	-	-	-	-	-	N/A
WC Acc	-	-	0.4	-	-	-	-	-	-	-	N/A
WC Acc	-	-	0.4	-	-	-	-	-	-	-	N/A

Shell and core configuration

Zone	Assumed shell?
Circulation	NO
Circulation	NO
Cupboard	NO
Cupboard	NO
Cupboard	NO
Office Open	NO
Office Open	NO
Reception	NO
Staircase	NO
Staircase	NO
Staircase	NO
Warehouse	NO
Warehouse Undercroft	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC	NO
WC Acc	NO
WC Acc	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
Circulation	120	-	-
Circulation	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
Cupboard	120	-	-
Cupboard	120	-	-
Cupboard	120	-	-
Office Open	120	-	-
Office Open	120	-	-
Reception	120	95	1.421
Staircase	120	-	-
Staircase	120	-	-
Staircase	120	-	-
Warehouse	95	-	-
Warehouse Undercroft	95	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC	120	-	-
WC Acc	120	-	-
WC Acc	120	-	-

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?
Office Open	NO (-18.2%)	NO
Office Open	NO (-24.8%)	NO
Reception	YES (+35.7%)	NO
Warehouse	NO (-1.3%)	NO
Warehouse Undercroft	NO (-62.8%)	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]	5565.7	5565.7
External area [m^2]	7460.1	7528.1
Weather	SWI	SWI
Infiltration [m^3/hm^2@ 50Pa]	3	5
Average conductance [W/K]	2227.65	2487.16
Average U-value [W/m^2K]	0.3	0.33
Alpha value* [%]	25.03	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/m^2]

	Actual	Notional
Heating	2.22	2.14
Cooling	0.73	1.05
Auxiliary	2.1	4.12
Lighting	6.97	9.73
Hot water	4.44	4
Equipment*	34.85	34.85
TOTAL**	**16.46**	**21.05**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	8.88	1.9
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*8.88*	*1.9*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	28.46	25.79
Primary energy [kWh_{PE}/m^2]	12.09	28.4
Total emissions [kg/m^2]	1.21	2.64

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] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	36.8	30.5	2.6	2.1	6	3.9	4.02	4	6
	Notional	24.6	30.7	2.5	3	11.8	2.78	2.84	----	----
[ST] Central heating using air distribution, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	159.5	0	41.5	0	0.5	1.07	0	0.81	0
	Notional	207.2	0	40.8	0	0.5	1.41	0	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

APPENDIX C

UNIT 13 ENERGY PERFORMANCE CERTIFICATE – GREEN STAGE

Energy Performance Certificate

Non-Domestic Building

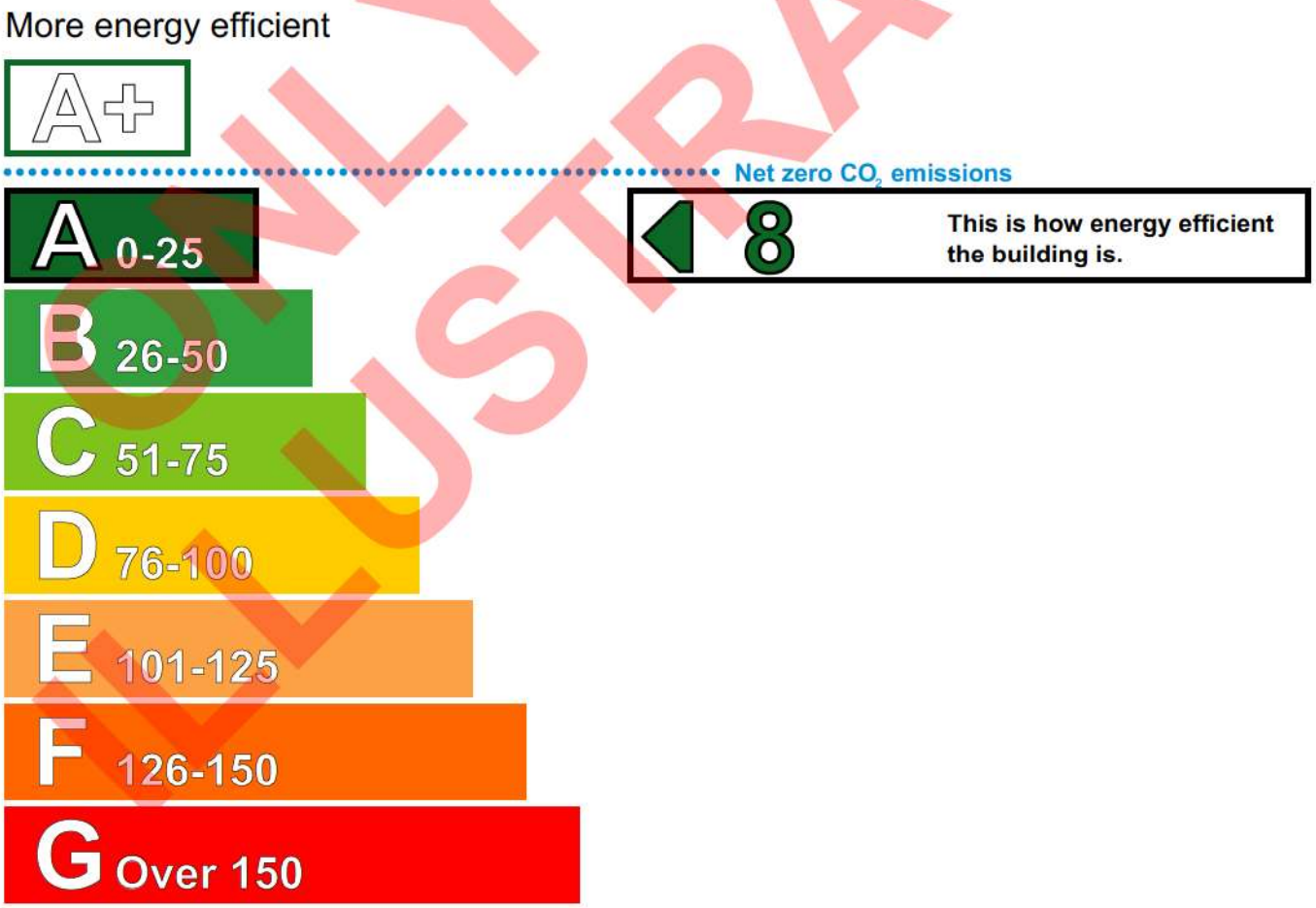
HM Government

Address 1
Address 2
Address 3
Address 4
Bicester
OX

Certificate Reference Number:
5707-4642-3882-1623-3825

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

Energy Performance Asset Rating



Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	4521.731
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	1.3
Primary energy use (kWh_{PE}/m^2 per year):	12.76

Benchmarks

Buildings similar to this one could have ratings as follows:

18 If newly built

71 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:	Virtual Environment v7.0.26 using calculation engine ApacheSim v7.0.26
Property Reference:	UPRN-000000000000
Assessor Name:	Kim Nguyen
Assessor Number:	LCEA203717
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	Trading Name
Employer/Trading Address:	Trading Address
Issue Date:	09 May 2024
Valid Until:	08 May 2034 (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: 9253-3941-1786-2092-5183

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.

UNIT 14 ENERGY PERFORMANCE CERTIFICATE – GREEN STAGE

Energy Performance Certificate

Non-Domestic Building

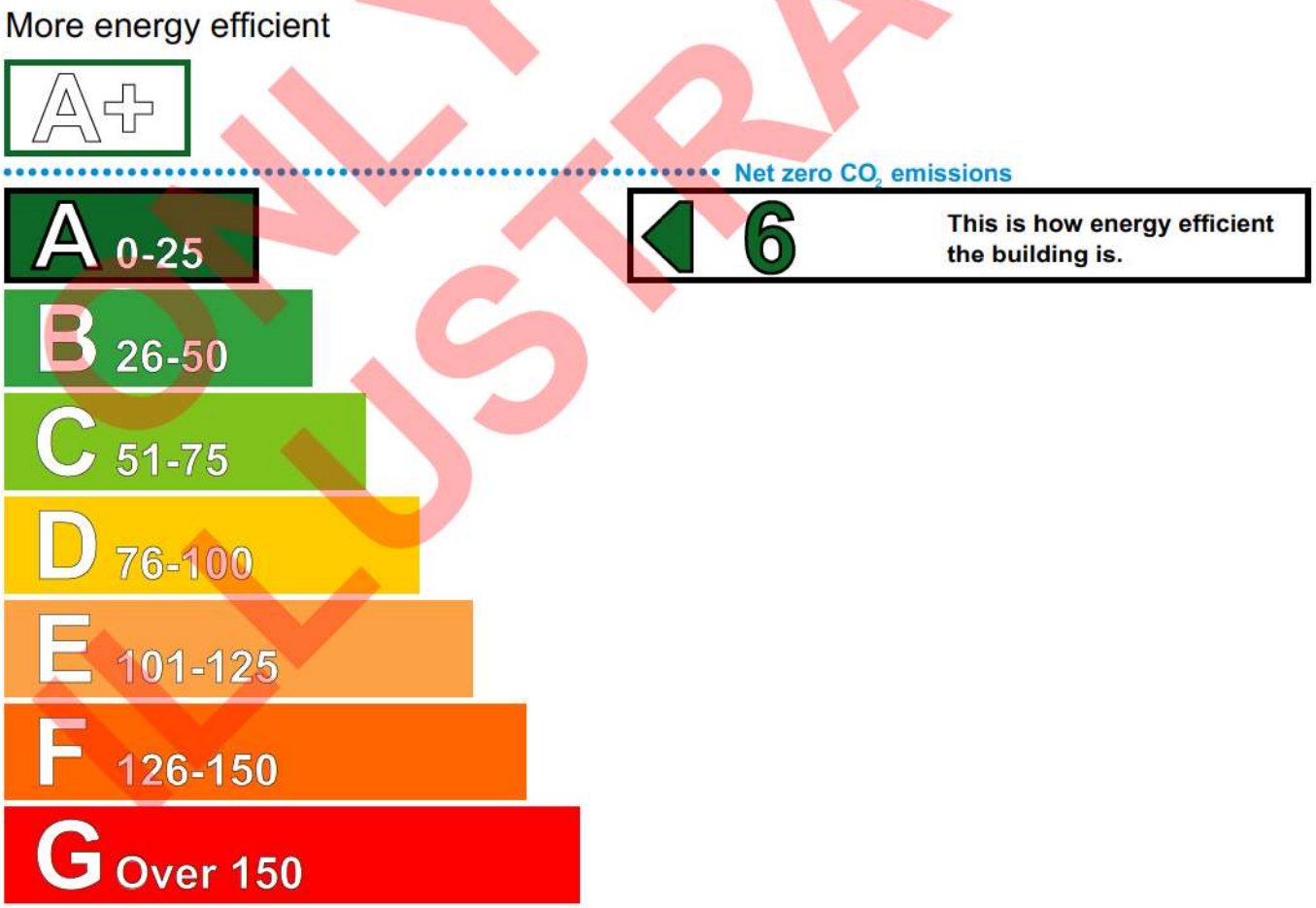
HM Government

Address 1
Address 2
Address 3
Address 4
Bicester
OX

Certificate Reference Number:
7425-9568-9041-0854-3528

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

Energy Performance Asset Rating



Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	3821.014
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	0.87
Primary energy use (kWh_{PE}/m^2 per year):	8.11

Benchmarks

Buildings similar to this one could have ratings as follows:

15 If newly built

62 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:	Virtual Environment v7.0.26 using calculation engine ApacheSim v7.0.26
Property Reference:	UPRN-000000000000
Assessor Name:	Kim Nguyen
Assessor Number:	LCEA203717
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	Trading Name
Employer/Trading Address:	Trading Address
Issue Date:	08 May 2024
Valid Until:	07 May 2034 (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: 3181-3673-9273-5202-1985

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.

UNIT 15 ENERGY PERFORMANCE CERTIFICATE – GREEN STAGE

Energy Performance Certificate

Non-Domestic Building

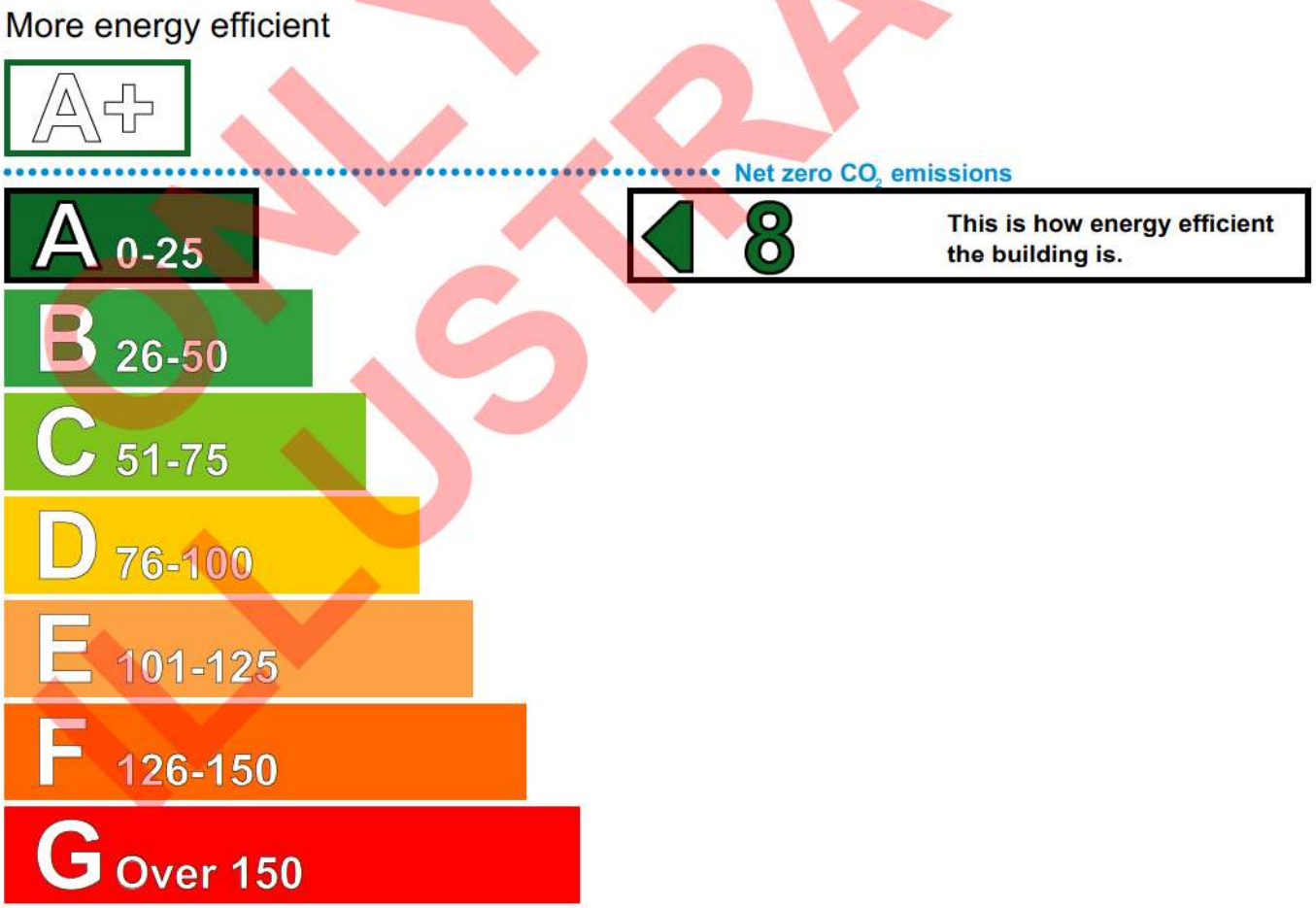
HM Government

Address 1
Address 2
Address 3
Address 4
Bicester
OX

Certificate Reference Number:
5175-9009-9071-7846-9892

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

Energy Performance Asset Rating



Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	5565.680
Building complexity:	Level 5
Building emission rate ($kgCO_2/m^2$ per year):	1.21
Primary energy use (kWh_{PE}/m^2 per year):	12.09

Benchmarks

Buildings similar to this one could have ratings as follows:

18 If newly built

71 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:	Virtual Environment v7.0.26 using calculation engine ApacheSim v7.0.26
Property Reference:	UPRN-000000000000
Assessor Name:	Kim Nguyen
Assessor Number:	LCEA203717
Accreditation Scheme:	CIBSE Certification Limited
Assessor Qualifications:	NOS5
Employer/Trading Name:	Trading Name
Employer/Trading Address:	Trading Address
Issue Date:	08 May 2024
Valid Until:	07 May 2034 (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: 7620-0103-6828-8520-2019

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