

1647 - The HexBox
Energy Statement

On behalf of Reading Borough Council
Rev 3.0 / 17/10/2024/ Planning

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Audit History

Rev	Date of Issue	Status	Issued By	Checked By	Summary of Changes
1.0	15/12/2023	Preliminary	TC		
2.0	12/01/2024	Planning	TC		
3.0	17/10/2024	Planning	TC		

1 Executive Summary

1.1 Update to Energy Statement

Revision 3.0 of the Energy Statement reflects the outcome of the remodelling exercise for the reduced scheme. The overall Energy Strategy remains unchanged with the exception of:

- The proposed new development to the east of the Studio Theatre will substantially reduce the viability of PVs to the roof of the Studio Theatre and they have therefore been omitted.
- As the testing for the open loop borehole installation has proved successful the Studio Theatre will now be able to connect to the main Theatre Ground Source Heat Pump installation for heating and cooling and the generation of hot water.

1.2 Project Summary

The following Energy Statement has been prepared by Skelly and Couch Ltd, on behalf of Reading Borough Council, to support their planning application for the extension of the Hexagon Theatre to provide a new Studio Theatre.

The proposal for the HexBox scheme is to:

- Demolition of an existing extension and provision of a new Studio Theatre.
- Internal alterations to the Hexagon to enable this.
- Provision of new roof plant for the extension (located on the roof of the Hexagon Theatre).
- Provision of a foyer, Rehearsal Room, Community Room, workshop, and back of house ancillary spaces.

Further associated works include landscaping (at ground and roof level).

This sustainability strategy statement has been written to demonstrate how the scheme design meets the requirements of the Reading Borough Council and any relevant National policies and regulations, regarding sustainable development.

1.3 The Site

1.3.1 Location

The Site is located within the Minster Quarter of Reading and is bounded by the A329 to the west, Multi-Storey student residential accommodation to the north and open park land to the southeast. The

ground level extension to the north of the Hexagon Theatre is to be predominantly demolished to enable the Project.



Figure 1 Site location

1.4 Client sustainability aspirations

Reading Borough Council has declared a climate emergency in 2019 and is seeking a strategic and coordinated approach across the Borough to mitigate climate change. The Council's Climate Emergency Action Plan sets out a commitment to work towards achieving a carbon neutral Reading by 2030.

2 Planning Context and Policies

2.1 Introduction

The HexBox development will be expected to comply with the Reading Local Plan 2019 to meet its energy objectives.

The Local Plan sets out strategic planning requirements and how the council seeks to address the demands of the borough’s residents and built environment. Additional detail is provided in the Sustainable Design and Construction Supplementary Planning Document 2019 which sets out the content of the Sustainability Statement in support of a planning application.

Many of the policies in the plan are applicable to major developments, for which the definition is developments over 1,000m² Internal area. It is considered that the HexBox will therefore be regarded as a major development.

This purpose of this Energy Statement is to demonstrate how the energy related aspects of the HexBox scheme meet the requirements of the local planning policy and BREEAM Energy and Emissions standards.

The key related policies in the Plan are as follows:

CC2 – Sustainable Design and Construction

CC2: SUSTAINABLE DESIGN AND CONSTRUCTION

Proposals for new development, including the construction of new buildings and the redevelopment and refurbishment of existing building stock, will be acceptable where the design of buildings and site layouts use energy, water, minerals, materials and other natural resources appropriately, efficiently and with care and take account of the effects of climate change.

To meet these requirements:

- All major non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM ‘Excellent’ standards, where possible;
- All minor non-residential developments or conversions to residential are required to meet the most up-to-date BREEAM ‘Very Good’ standard as a minimum;
- All non-residential development or conversions to residential should incorporate water conservation measures so that predicted per capita consumption does not exceed the appropriate levels set out in the applicable BREEAM standard. Both residential and non-residential development should include recycling greywater and rainwater harvesting where systems are energy and cost effective.

CC4 – Decentralised Energy

CC4: DECENTRALISED ENERGY

In meeting the sustainability requirements of this plan, developments of the sizes set out below shall demonstrate how consideration has been given to securing energy for the development from a decentralised energy source.

Any development of more than 20 dwellings and/ or non-residential development of over 1,000 sq m shall consider the inclusion of decentralised energy provision, within the site, unless it can be demonstrated that the scheme is not suitable, feasible or viable for this form of energy provision.

Where there is existing decentralised energy provision present within the vicinity of an application site, further developments of 10 dwellings or more or non-residential development of 1,000 sq m or more will be expected to link into the existing decentralised energy network or demonstrate why this is not feasible.

3 Energy and Carbon Strategy

3.1 Introduction

This section of the report summarises the measures taken to reduce operational carbon emissions of the proposed development. Each measure is assessed using a standard energy modelling methodology and the overall effect of the savings are compared to policy benchmarks.

3.1.1 Carbon Targets

Operational Carbon

The Local Plan sets out the required levels of carbon reduction in the table below:

Table 3.1: Required level of sustainability standard

	Size of Development	Required Standard
New-build residential	Minor (fewer than 10 dwellings)	19% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations
	Major (10 dwellings or more)	Zero Carbon (or if unachievable, a minimum 35% improvement in the dwelling emission rate over the target emission rate, as defined in the 2013 Building Regulations and planning contribution to offset remaining carbon emissions to zero)
Creation of new residential units through conversion from other uses and/or major refurbishment	Minor (fewer than 10 dwellings)	BREEAM 'Very Good'
	Major (10 dwellings or more)	BREEAM 'Excellent'
Non-residential development (including development for non-C3 residential)	Minor (less than 1,000 sq. m of floorspace)	BREEAM 'Very Good'
	Major (1,000 sq. m of floorspace or more)	BREEAM 'Excellent'
Non-residential refurbishment (including refurbishment for non-C3 residential)	Minor (less than 1,000 sq. m of floorspace)	BREEAM 'Very Good'
	Major (1,000 sq. m of floorspace or more)	BREEAM 'Excellent'

The HexBox development will therefore need to achieve an Energy Performance Ratio for New Construction (EPRNC) of 0.70 to achieve the Minimum Standard for a BREEAM Excellent Rating.

3.2 Energy, Carbon and Environmental Strategy

The design strategies adopted to minimise operational energy consumption and associated carbon emissions can be categorised using the following low energy and carbon design hierarchy:

- 1) **Be lean:** use less energy and manage demand during operation, good passive design and efficient services and controls to minimise energy consumption.
- 2) **Be clean:** exploit local energy resources (such as secondary heat) and supply energy for heating and cooling efficiently and cleanly.
- 3) **Be green:** maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

The following sections described in more detail the measures adopted under each stage of the hierarchy and the associated carbon emissions.

3.3 Operational Carbon Savings

3.3.1 The Energy and Carbon Assessment

Operation carbon savings have been simulated using the approved Dynamic Simulation Software:

EDSL Tas
with Part L2 (2021) – England Compliance

The model assesses the performance of the proposed building using the National Calculation Method, but runs hourly calculations, using a standard dataset for weather and activity areas and call on common databases of construction and service elements.

Each model generates reports on:

- Summary of Inputs
- HVAC summary
- Solar gain
- CO₂ emissions comparison
- SBEM Auxiliary energy (non-regulated loads based on standard benchmarks – not true predicted energy usage)
- Fuel usage
- Category usage, i.e. energy use per m² for heating, hot water, lighting etc
- Annual demand & consumption
- Monthly demand & consumption
- Hourly demand and consumption

Images from the energy model are shown to the right.

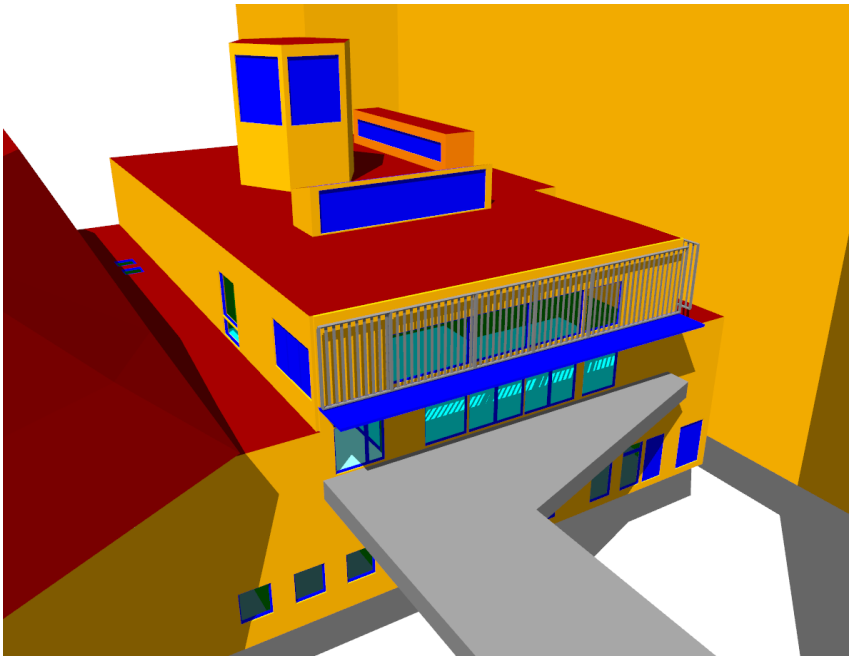


Figure 2 EDSL Tas 3D Thermal Model

Weather Data

London Weather File – TRY

Building Use Type

General Assembly and Leisure, Night Clubs, and Theatres

Activity Schedule

NCM Database – NCM D2 University

3.4Step 1 – Minimising Energy Demand [Be Lean]

Fabric First and Efficient Building Systems

The first step of the adopted energy hierarchy is to reduce energy use through both passive and active lean design measures. The basic principles of passive design adopted are as follows:

- High performance insulated fabric, including minimising thermal bridging and good detailing.
- Airtight construction.
- Balanced G-value and light transmittance (LT) glazing to optimise solar gains and internal daylight levels.
- Promotion of natural ventilation and passive cooling techniques where possible.

The basic principles of active design efficiency savings include:

- Efficient Simultaneous Heating and Cooling Heat Pump Technology
- BMS controls, timeclocks, TRVs etc
- The use of mechanical ventilation with heat-reclaim in the winter months.
- Enhanced insulation to pipework and storage vessels
- Efficient low flow shower and tap fittings.
- High efficacy LED lighting, better than 100 lm/W.

Efficient Building Envelope

Improved Insulation Levels

A summary of the minimum allowable building envelope requirements in the current Building Regulations are outlined below. Whilst these limiting U-vales are allowable it should be noted that the new elements of the building will be compared to a notional building that has lower U-values therefore it is prudent to set these as a minimum target.

The table also includes target U-values for this project approximately in line with the current London Energy Transformation Initiative (LETI) standard. These values are typical values and there may be minor local variations during the course of the design.

Building Element	B'Regs Limiting U-Value (W/m²K)	Notional Building U-Values (W/m²K)	Target U-Values (W/m²K)
Roof	0.16	0.15	0.12
Walls	0.26	0.18	0.15
Floors	0.18	0.15	0.12
Windows	1.6	1.4	1.2
Doors and Vent Panels	1.6	1.9	1.2
Rooflights	2.2	2.1	1.2

Airtightness

An airtightness test will be required for a building of this size and some allowance will be made for the contractor to carry out this test and construction methods that will be required to ensure the building complies.

The design is targeting an infiltration rate of better than 3 m³/h/m² @ 50 Pa in line with current LETI standards.

Glazing Ratios – Balance between daylight, heat loss and overheating

The building form and façade design has been driven by a series of energy studies to find the right balance between glazing ratios for good levels and uniformity of daylight whilst minimising heat loss, glare and overheating. The following measures have been adopted:

- External Shading to reduce unwanted solar gain.
- The use of selective coating to obtain specific g values for glazing to limit heat gain where no natural shading is available, whilst still maximising daylight transmission.

Natural Ventilation and Passive Cooling

The buildings will be designed to maximise natural ventilation outside of the heating season to the Foyer and Auditorium.

Foyer:

A secure means of nighttime ventilation will be provided by low and high level louvres with thermally insulated and automated louvres behind. They will be controlled on temperature and CO₂ levels in the space. During periods of high occupancy and peak summer the doors to the foyer at podium level will be left open for boost ventilation.

Auditorium:

A secure means of nighttime ventilation will be provided by low and high level louvres with thermally insulated and automated louvres behind. A thermally insulated supply plenum will run from roof level to the ground floor acoustically attenuated sub-stage plenum with a dedicated acoustically attenuated exhaust chimney at roof level. The automated louvres will be controlled on temperature and CO₂ levels in the space in order to minimise fan energy use. During periods of high occupancy and peak summer/winter a mechanical supply fan will be brought on to provided heated air in winter and cooled air in summer.

Efficient Building Systems

The following active efficiency measures are proposed:

- High efficiency Electric Ground Source Heat Pumps

- Compensated and optimise control of heating system.
- Thermostatic control of all heated spaces
- Variable speed pumping and fans
- Demand controlled mechanical ventilation (where provided), either by carbon dioxide, humidity, or temperature monitoring
- Mechanical ventilation with high efficiency heat recovery
- Simple and non-intrusive automatic controls
- Energy sub-metering and monitoring
- High efficacy LED lighting
- Daylight Dimming and Occupancy switching.

3.5 Step 2 – Efficient Energy Use [Be Clean]

The second step of the energy hierarchy approach is to produce the required energy in as efficient a manner as possible through the use of low carbon energy networks.

There is currently no district energy infrastructure within the vicinity of the site however as part of the Reading Borough Council Climate Emergency Action Plan they have commissioned an extraction and discharge borehole test on the site with the intention that a Ground Source Heat Pump (GSHP) installation will be provided as the heat source for the Hexagon Campus and potentially linked to a wider District Energy Network for the Minster Quarter. This GSHP installation will provide heating, cooling and hot water for the Hexagon Studio Theatre.

This is also advantageous for the local air quality, as heat pumps do not emit any pollutants into the atmosphere.

At present the design allows for a seasonal COP of 4.08 for heating provision and 3.27 for hot water provision. The cooling has been modelled with an SEER of 4.23.

3.6Step 3 – Supply Energy from Renewable or Low Carbon Sources [Be Green]

Ground Source Heat Pumps (GSHP) are proposed to provide low carbon heating and cooling to the new Hexagon Studio theatre, as part of the wider decarbonisation strategy for the existing Hexagon Theatre.

Due to the position of the building in proximity to the site of proposed tall buildings, which are due to be constructed shortly, and would increase the shading on the Hexagon Studio Theatre roof, in addition to shading from other surrounding structures, it is not possible to optimise a photovoltaic installation on the roof of the Hexagon Studio Theatre.

3.7Carbon Savings

The Carbon Savings for Regulated (due to heating, cooling, ventilation, lighting and ancillaries associated with these systems) and Unregulated (due to equipment loads) for the proposed scheme are shown in the table below.

	Total regulated emissions (Tonnes CO ₂ / year)	CO ₂ savings (Tonnes CO ₂ / year)	Percentage savings (%)
Part L 2021 TER	7.0		
BER	6.52	0.48	6.9%
TER+ Unregulated emissions	17.3		
BER+ Unregulated emissions	16.86	0.44	2.5%

These figures have been determined using the Part L modelling methodology that does not enable the hybrid ventilation to the Auditorium to be accurately reflected and are therefore a conservative estimate of overall savings.

For the conversion of unregulated emissions, a carbon factor of 0.136 kgCO₂/kWh has been used, in accordance with Part L 2021 methodology.