BATTERY GREEN

AT

LOWESTOFT

PLANNING ENERGY STATEMENT

Rev – October 2023

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Version Control

Version	Prepared by	Checked By	Date Authorised	Comment
P01	**Tom Shaw**	**Andrew Holmes**	**October 2023**	**-**

Executive Summary

ALH Design (ALH) have been instructed to undertake a detailed energy analysis for the proposed development of the new Battery Green performance centre off Battery Green Road in Lowestoft.

This Energy Statement is intended to support the planning application and our approach to design follows the requirements as determined by current industry standards, government approved documents (inclusive of the Approved Document L 2021) and in alignment with the sustainability ambitions of the following documents;

- The National Planning Policy Framework 2021
- East Suffolk Council - Waveney Local Plan 2019
- Emerging Lowestoft Neighbourhood Plan

This Energy Statement has been written in specific response to Policy WLP8.28 of the Waveney Local Plan (2019) which relates to 'Sustainable Construction' methods:

"Proposals for major residential development of 10 or more houses and commercial development schemes of 1,000sqm or more of floorspace should demonstrate through the submission of a sustainability statement that, where practical, they have incorporated:

- *Improved efficiency of heating, cooling, and lighting of buildings by maximising daylight and passive solar gain through the orientation and design of buildings.*
- *Sustainable water management measures such as the use of sustainable drainage systems, green roofs and/or rainwater harvesting systems.*
- *Locally sourced and recycled materials.*
- *Renewable and low carbon energy generation into the design of new developments. Larger schemes should explore the scope for District heating.*
- *Minimising construction waste, including designing out waste during the design stage, selecting sustainable and efficient building materials and reusing materials where possible.*
- *Accessible and unobtrusive sustainable waste management facilities such as adequate provision of refuse/recycling/composting bin storage.*

All new office and school developments in Waveney of equal or greater than 1,000sqm gross floorspace are required to achieve the British Research Establishment Environmental Assessment Method 'Very Good' standard or equivalent unless it can be demonstrated that it is not viable or feasible to do so."

Note – the new Battery Green performance centre is more than the 1000m^2 threshold stated within Policy WLP8.28 of the Waveney Local Plan (2019) therefore it is a requirement that our proposals meet the requirements. However, on the basis that the building is neither an office or school, but

rather a performance/leisure centre, the requirement for BREEAM is precluded and as such does not form part of the design.

To demonstrate how the new Battery Green performance centre complies with the over 1000m^2 requirement, the following pages of this report here-within discuss how sustainability measures have been integrated into the ALH design proposals inclusive of:

- Low air permeability target reducing associated heat losses
- Extensive glazing systems supporting occupant daylight needs
- Highly efficient building fabric limiting heat losses and gains and reducing associated plant loads
- LED lighting design complete with comprehensive control systems
- Daylighting control lighting systems in facade facing rooms with windows to minimise energy consumed by lighting systems
- Low carbon technologies (air source heat pumps) for the provision of space heating and hot water
- Optimised control of space heating to achieve internal design temperatures on time
- Low SFP mechanical ventilation systems complete with heat recovery
- Large photovoltaic system to offset carbon emissions
- Flow limiting devices on all water outlets to reduce daily water use

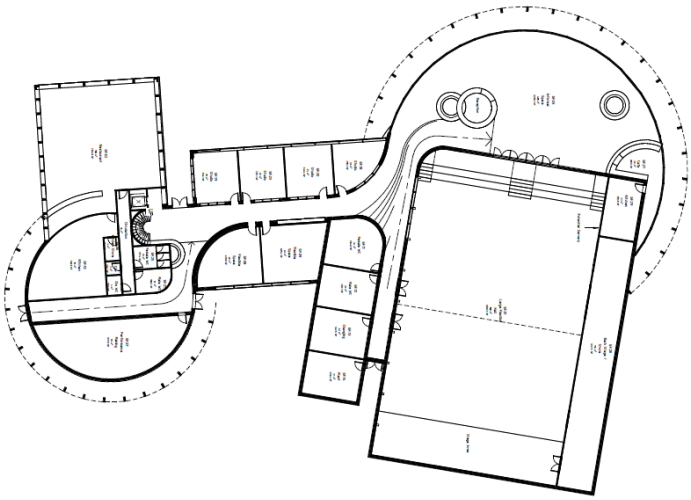
1.0 Introduction

1.1 Scheme Description

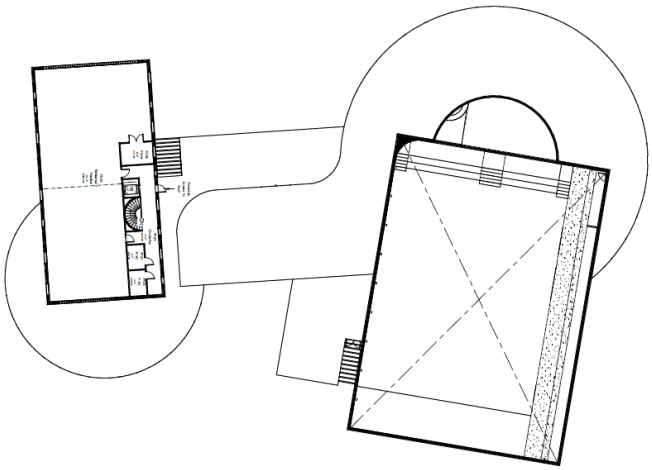
ALH Design (ALH) have been instructed to undertake a detailed energy analysis for the proposed development of the new Battery Green performance centre off Battery Green Road in Lowestoft (facing the Waveney Dock).

As part of the Governments Levelling Up Fund, East Suffolk Council were awarded £24.9m to regenerate Lowestoft with five key projects being allocated funding in an effort to increase visitors to the area and improve the local resident's quality of life. One of the five projects is improvements to the Cultural Quarter which includes the redevelopment of the former Battery Green car park to provide a new leisure/cultural offering.

The proposed new Battery Green performance centre consists of a new two-storey building with a ground floor café/restaurant, large performance hall, studios, green rooms, toilets and dressing/changing facilities.



Ground Floor – General Arrangement



First Floor – General Arrangement

1.2 Scope of Work

The scope of this Energy Statement is to address the adopted planning policy documents in terms of energy use and sustainability, and in particular to provide an estimate of the energy and carbon performance of the new Battery Green performance centre.

1.3 Methodology

The scheme has been appraised using MHCLG approved software (IES Virtual Environment 2023) as the regulatory instrument used for assessing energy demands and carbon emissions in buildings which involves creating a three-dimensional thermal model representative of the proposed planning drawings and specifications inclusive:

- General arrangements
- Elevations
- Building fabric specification
- Building services layouts
- MEP performance specifications

Followed by a comparison of the proposed buildings performance in regards primary energy and carbon emissions against the notional building. Copies of the Building Regulation UK Part L report and Energy Performance Certificate are included within the Appendices of this document.

2.0 Planning Policy

2.1 National Level Policies

2.1.1 National Planning Policy Framework (2021)

The National Planning Policy Framework (NPPF) was revised on July 2021 and replaced the first NPPF published in March 2012 and the updated version from February 2019. The NPPF set out the Government's planning policies for England and how these are expected to be applied. The NPPF is designed to make the planning system less complex and more accessible; to protect the environment and promote sustainable growth. It provides a framework within which local people and their respective councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

At the heart of the NPPF is a presumption in favour of sustainable development (paragraph 11). The three dimensions of sustainable development can be defined as the economic, social, and environmental.

Plans should provide a framework for addressing housing needs and other economic, social, and environmental priorities; and a platform for local people to shape their surroundings. Strategic policies should set out an overall strategy for the pattern, scale, and quality of development.

The NPPF (paragraph 154) states that new development should be planned for in ways that avoid increased vulnerability to the range of impacts arising from climate change; and help to reduce greenhouse gas emissions. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

The NPPF aims to strengthen local decision making, with the use of decision-taking in a positive way, as a means of fostering the delivery of sustainable development.

Finally, the NPPF (paragraph 16) also highlights that plans should be prepared with the objective of contributing to the achievement of sustainable development and in a way that is aspirational but deliverable.

2.1.2 Building Regulations Part L

Building Regulations are statutory instruments that seek to ensure that the policies set out within any relevant UK legislation are carried out. Building regulations approval is required for the majority of building work carried out in the United Kingdom.

Part L of these regulations covers the requirements with respect to the conservation of fuel and power in all building types. It controls the insulation values of building fabric elements and openings, the air permeability of the structure, the heating efficiency of heating, ventilation and air conditioning systems together with hot water storage and lighting efficiency. It also sets out the requirements for

calculating the primary energy use and carbon dioxide emissions and the associates targets for each building type.

Part L 2021 is split into two sections:

- Volume 1: Dwellings.
- Volume 2: Buildings other than Dwellings.

This development needs to comply with all schedules of Part L.

2.2 Local Level Policies

2.2.1 East Suffolk Council - Waveney Local Plan 2019

Policy WLP8.28 - Sustainable Construction

Proposals for major residential development of 10 or more houses and commercial development schemes of 1,000sqm or more of floorspace should demonstrate through the submission of a sustainability statement that, where practical, they have incorporated:

- Improved efficiency of heating, cooling, and lighting of buildings by maximising daylight and passive solar gain through the orientation and design of buildings.
- Sustainable water management measures such as the use of sustainable drainage systems, green roofs and/or rainwater harvesting systems.
- Locally sourced and recycled materials.
- Renewable and low carbon energy generation into the design of new developments.
- Larger schemes should explore the scope for District heating.
- Minimising construction waste, including designing out waste during the design stage, selecting sustainable and efficient building materials and reusing materials where possible.
- Accessible and unobtrusive sustainable waste management facilities such as adequate provision of refuse/recycling/composting bin storage.
- A show home demonstrating environmentally sustainable options which can be purchased and installed in homes bought off-plan.

All new residential development in the District should achieve the optional technical standard in terms of water efficiency of 110 litres/person/day unless it can be demonstrated that it is not viable or feasible to do so.

All new office and school developments in Waveney of equal or greater than 1,000sqm gross floorspace are required to achieve the British Research Establishment Environmental Assessment Method 'Very Good' standard or equivalent unless it can be demonstrated that it is not viable or feasible to do so.

2.3 Overview of Efficiency Statement Requirements and Deliverables

The new Battery Green performance centre is to comply with the Approved Document L: 2021 of the Building Regulations. Furthermore, given that the new proposed building is above the 1000m^2 threshold, it shall meet the requirements of Policy WLP8.28 – 'Sustainable Construction'. However, on the basis that the building is neither an office or school, the requirement for a BREEAM rating of 'Very Good' is precluded.

ALH design principles are focussed on energy efficiency in an effort to deliver sustainable buildings. This has been carried forward within our design philosophy for the new Battery Green performance centre:

Requirement	ALH Design
Improved efficiency of heating, cooling, and lighting of buildings by maximising daylight and passive solar gain through the orientation and design of buildings.	Industry leading low carbon technologies are proposed for the provision of space heating, cooling and domestic hot water (air source heat pumps). The building includes large expanses of glazing complete with solar shading (brise soleil and roof overhangs) to meet the daylight needs of the occupant. Furthermore, a highly efficient LED lighting system is proposed to work in tandem (through the use of daylight linked controls to façade facing rooms) with the architectural shape, form and orientation to minimise energy consumed.
Sustainable water management measures such as the use of sustainable drainage systems, green roofs and/or rainwater harvesting systems.	A green roof is proposed as part of the architectural package. Furthermore, water efficient fittings have been proposed to reduce unnecessary water use and waste.
Locally sourced and recycled materials.	Where possible, materials to be locally sourced to reduce associated carbon emissions in the form of production and delivery.
Renewable and low carbon energy generation into the design of new developments.	Space heating and hot water is delivered by way of low carbon technologies (roof mounted air source heat pumps). Furthermore, a large solar photovoltaic system is proposed to offset the proposed buildings CO_2 emissions.
Larger schemes should explore the scope for District heating.	To our knowledge there are no local district heating networks available for connection onto. For this reason there is no provision included within the design at the time of writing.

Minimising construction waste, including designing out waste during the design stage, selecting sustainable and efficient building materials and reusing materials where possible.	The Development involves the reuse of previously-developed land. Furthermore, waste of materials has been precluded through the development of a detailed BIM model whereby the required materials are scheduled to ensure only the necessary materials are procured and used. Energy waste is designed out of our proposals via a building management system which will monitor, control and switch building services systems to ensure they are active when necessary.
Accessible and unobtrusive sustainable waste management facilities such as adequate provision of refuse/recycling/composting bin storage.	A refuse store has been provided on the Ground Floor on the building (adjacent to the plantroom) complete with louvred double doors.

3.0 Sustainable Design & Construction

3.1 Energy Efficient Design

ALH Design's design philosophy have employed passive design techniques whereby a fabric-first approach has been followed. This generally involves includes whereby the construction budget is invested into the building envelope before anything else e.g. low or zero carbon technologies.

3.1.1 Building Envelope Specification

The development benefits from a thermally improved building envelope in exceedance of the Building Regulations Part L requirements:

Construction Element	Part L 2021 (Limit)	Proposed Constructions	% Improvement
External Wall	0.26 W/m^{2}K	0.18 W/m^{2}K	30.8 %
Windows	1.6 W/m^{2}K	1.2 W/m^{2}K	25.0 %
Roof	0.18 W/m^{2}K	0.15 W/m^{2}K	16.7 %
Floor	0.18 W/m^{2}K	0.15 W/m^{2}K	16.7 %
Air-tightness	8 m^3/m^2/hr @ 50 Pa	3 m^3/m^2/hr @ 50 Pa	62.5 %

Building Fabric Performance

There is a significant expanse of glazing to the Waveney Dock elevation which offers uninterrupted views for occupant enjoyment. Curtain wall glazing offers natural daylight which reduces the dependency on artificial lighting use however it can present a separate problem in regards glare and excessive solar gain. To mitigate against glare fixed solar shading has been integrated into the architectural design in the form of brise soleil and a curved roof overhang. To mitigate against solar gain creating overheating issues, solar control glazed units are proposed with a G-value of 0.35 (or 35%).

3.1.2 Passive Design Services Specification

To compliment the building fabric improvements, other passive design solutions are proposed inclusive:

- Water efficient sanitaryware fittings to reduce water consumption
- Variable speed pumps on all secondary circuits to reduce energy consumptions and ensuring pump operation matches demand
- Optimisation on heating and cooling plant to ensure systems turn on/off at appropriate times based on the buildings thermal response

- Building services zoning strategy to ensure energy is not wasted by servicing vacant areas of the building
- On demand ventilation control linked to CO_2 sensors in large auditorium hall to ensure energy efficiency is maximised by only delivering the necessary amount of air.
- Highly efficient ventilation systems inclusive of highly efficient centralised air handling units alongside low energy local mechanical heat recovery units serving the Studio's and changing facilities (specific fan power - 1.6 W/L/s)
- Highly efficient, low energy LED lighting throughout inclusive of comprehensive controls and the provision of daylight dimming in spaces with direct access to natural daylight (large expanse of glazing to Waveney Dock elevation)
- Metering installation to allow monitoring of major energy uses

3.1.3 Low and/or Zero Carbon Technologies

Given that the building is located on the Coast with a relatively large south west facing roof, renewable technologies have been considered.

The considered technologies included:

i) Wind Turbines

The use of any wind turbine at this development will require the siting of the turbines on suitable mast on the site.

The Government wind speed database indicates average wind speeds of 5.5m/s at 10m above ground level, 5.98m/s at 25m and 6.28m/s at 45m at Lowestoft. The BWEA (British Wind Energy Association) recommend an average wind speed in the region of 4 to 15 m/s for a worthwhile installation. Turbines generally begin generating electricity at wind speeds of 4 m/s, with maximum rated power at 15 m/s. With the expected wind speeds on site wind generation would achieve the lower end of this threshold.

A suitable turbine would generally be in the region of a 1.5kW model which would produce on average 3,900 kWh / yr in a stable wind environment. A turbine could be seen as unsightly and noisy by nearby residents. Summer flicker from the wind turbines shadow could cause serious issues and would need a thorough survey to assess.

In view of the above, use of wind turbines has not been considered further.

ii) Air Source Heat Pumps

Air source heat pumps extract the heat from the air surrounding the units and convert this energy into usable heat, generally for space heating and in some cases hot water. Air source heat pumps operate most efficiently when providing space heating at a low temperature as in the case of air-to-air heating, underfloor heating or suitably oversized radiators.

Air source heat pumps must be installed outside, so external space is required with not only enough space for the units themselves but suitable space surrounding the units to allow maintenance access and adequate passage of air for intake and discharge. Incorrect installation of air source heat pumps

whereby not enough space is provided generally means that the efficiency of the units will be sacrificed.

Based on the site layout, available space and the overarching intent to eliminate fossil fuels alongside the mechanical services strategy (largely underfloor heating and air-to-air systems) air source heat pumps are a suitable technology to use for the provision of heating and the hot water demand for the site.

iii) Solar Thermal & Photovoltaics

Solar energy involves capturing and harnessing directly the free and clean energy of the sun to either heat water passing through solar panels or evacuated tubes, or generate electricity via photovoltaic panels.

Solar hot water panels use the solar energy to directly heat water circulating through panels or pipes. A typical $3m^2$ solar panel will provide an energy saving of approximately 2,750 kWh / yr.

Flat panels are traditionally roof-mounted and, for highest efficiencies, should be positioned to face south/southwest, at an incline of approximately 30°, depending on site location. The use of evacuated solar tubes are preferable to the flat plates as they have a greater efficiency, work better in low-light or cloudy conditions and are able to be mounted flat on the roof with the individual tubes tilted towards the sun for optimum performance, resulting in a more stable and less visible installation.

The preferred use for the panels / tubes is to supply domestic hot water with seasonal top-up from the main heating system as required. The hot water demand is generally small with only a handful of hot water outlets. Therefore, the benefit of solar thermal panels/tubes is considered to be low and will not be investigated further for this particular development.

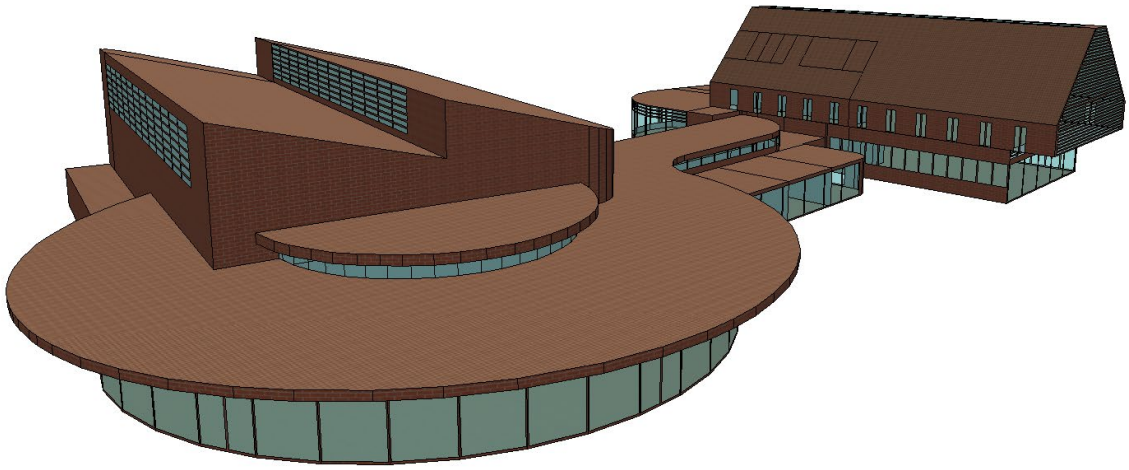
Photovoltaic (PV) panels are able to generate electricity in most daylight conditions; however, as with the solar panels they are at the most efficient when orientated at approximately 30° facing South / Southwest.

PV's have the advantage that they are straightforward to install as a standalone installation. To generate 1kW of electricity with a standalone system would require approximately $7m^2$ of photovoltaic panelling.

The use of photovoltaic panels is recommended as a renewable energy source on the grounds of site orientation (south-west facing), available space for installation, cost, net zero carbon ambitions, simplified installation and availability of the technology.

4.0 Building Regulations Part L Compliance

ALH Design have undertaken a preliminary Part L 2021 compliance assessment using MHCLG approved software – IES Virtual Environment 2023. The assessment involved creating a three-dimensional model that is identical to the Architects information in regards location, size, orientation, form and construction details



IES Model

As part of this analysis, the IES Virtual Environment software automatically generates a Notional Building (which is identical to the Actual Building) to calculate the Notional Buildings Target Emission Rate and Target Primary Energy Rate.

The Target Emission Rate (TER) and Target Primary Energy Rate (TPER) is subsequently compared with the Actual Building Emission Rate (BER) and Building Primary Energy Rate (BPER).

The results our analysis can be reviewed overleaf:

Carbon Emissions			
Result	**Emissions by Area *(kgCO2/m2.annum)***	**Total Emissions *(kgCO2/annum)***	**% Improvement**
Target Emissions Rate (TER)	6.76	19,250.45	
Building Emissions Rate (BER)	5.86	16,687.52	13.3
Primary Energy Use			
Result	**Primary Energy *(kgCO2/m2.annum)***	**Primary Energy *(kgCO2/annum)***	**% Improvement**
Building Primary Energy Rate (TPER)	72.97	207,796.67	-
Building emission Rate (BPER)	62.29	177,383.23	14.6

Part L 2021 Compliance Results

Refer to Appendices at the rear of this document for copies of the design stage BRUKL and Energy Performance Certificate.

5.0 Energy Predictions and Conclusion

The energy predictions for the new Battery Green performance centre has been based upon the current Building Regulations, Part L 2021 "Conversation of fuel & power, Volume 2: Buildings other than dwellings" and the adopted policy documents.

The energy figures have been evaluated from our dynamic simulation modelling calculations based upon the following criteria:

- U-Values based upon improved figures targeted by the design team
- Air permeability at 3 m^3 / $h.m^2$
- High SCOP Air Source Heat Pumps providing heating and cooling
- High SCOP Air Source Heat Pumps providing hot water generation
- Optimised operation of heating and cooling plant
- Ventilation to all areas of the building with exception to unconditioned spaces, circulation spaces including staircores
- Demand control ventilation high density spaces such as the large auditorium hall
- Ventilation to Building Regulations, Part F and air change rates in compliance with CIBSE
- LED lighting with absence/presence detection/daylight automatic control to areas with direct access to daylight;
- Metering strategy to monitor major energy uses
- Water efficient sanitaryware fittings to reduce water consumption
- Variable speed pumps on all secondary circuits to reduce energy consumptions and ensuring pump operation matches demand
- Large roof mounted solar photovoltaic array to offset proposed building carbon emissions

Based on the aforementioned, the total baseline energy prediction for the development is as listed in the following table.

Energy Loads	Total kWh		
	kWh/yr	%	kWh/m^2
Heating	31,751.86	22	11.15
Cooling	9,539.79	7	3.35
Auxiliary	45,420.82	31	15.95
Lighting	19,933.9	14	7
Hot Water	37,732.03	26	13.25

6.0 Appendices

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Battery Green As designed

Date: Thu Oct 26 19:31:05 2023

Administrative information

Building Details

Address: Lowestoft, Suffolk, NR

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: SBEM

Calculation engine version: v6.1.e.0

Interface to calculation engine: Virtual Environment

Interface to calculation engine version: v7.0.22

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

Foundation area [m²]: 1396.7

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

Target CO_2 emission rate (TER), $kgCO_2/m^2annum$	6.76	
Building CO_2 emission rate (BER), $kgCO_2/m^2annum$	5.86	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	72.97	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	62.29	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

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

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.24	1.8	GF000023_W5_A0
Floors	0.18	0.15	0.15	GF000015_F
Pitched roofs	0.16	0.15	0.15	SP00001B_C
Flat roofs	0.18	0.15	0.15	GF000015_C
Windows** and roof windows	1.6	1.2	1.2	GF000015_W1_O0
Rooflights***	2.2	1.8	1.8	SP00001B_C_O0
Personnel doors^	1.6	1.6	1.6	GF000009_W1_O0
Vehicle access & similar large doors	1.3	-	-	No external vehicle access doors
High usage entrance doors	3	-	-	No external high usage entrance doors

$U_{a\text{-}Limit}$ = 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- SYS0001 - FCU & AHU (MAIN)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.4	6.4	-	1.6	0.8
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

2- SYS0003 - UFH & AHU (KITCHEN)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.78	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

3- SYS0005 - UFH

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.78	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

4- SYS0007 - T/EXT

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

5- SYS0002 - FCU & AHU (HALL)

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	4.4	6.4	-	1.6	0.8
Standard value	2.5*	5	N/A	2^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

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

^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.

6- SYS0004 - UFH & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.78	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

7- SYS0009 - DX

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.3	7.2	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

8- SYS0008 - EPH (PLANT)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

9- SYS0006 - FCU & MVHR

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.9	7.6	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

1- SYST0007-DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.57	0.015
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

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
GF.10 KITCHEN	-	-	-	-	-	-	-	-	0.8	-	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
GF.06 KITCHEN STORE	-	-	-	-	-	-	-	-	1	-	N/A
GF.25 FEMALE WC	-	-	0.5	-	-	-	-	-	-	-	N/A
GF.21 MALE WC 1	-	-	0.5	-	-	-	-	-	-	-	N/A
GF.31 CLNR	-	-	0.5	-	-	-	-	-	-	-	N/A
GF.30 DIS WC	-	-	0.5	-	-	-	-	-	-	-	N/A
FF 02 DIS WC	-	-	0.5	-	-	-	-	-	-	-	N/A
FF 07 WC 1	-	-	0.5	-	-	-	-	-	-	-	N/A
FF 06 WC 2	-	-	0.5	-	-	-	-	-	-	-	N/A
FF 01 CLNR	-	-	0.5	-	-	-	-	-	-	-	N/A
GF HALLWAY 2	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF 11 FOYER	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF 12 FOYER	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.14 GREEN ROOM 2	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.13 GREEN ROOM 1	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.11 DRESSING 1	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.12 DRESSING 2	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.10 WC 2	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.09 WC 1	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.14 SHOWER	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.13 DIS WC	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.11 FEMALE WC	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.12 MALE WC 2	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.09 PLANT	-	-	-	-	1.6	-	-	-	-	-	N/A
GF.23 STUDIO 3	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF.19 STUDIO 4	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF 18 STUDIO 1	-	-	-	-	1.6	-	-	-	-	0.8	N/A
GF 20 STUDIO 2	-	-	-	-	1.6	-	-	-	-	0.8	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
GF.08 PERFORMANCE MAKING 2	99	-	-
GF.07 PERFORMANCE MAKING 1	99	-	-
GF.02 RESTAURANT	99	-	-
GF.34 STORE 3	99	-	-
GF.35 STORE 2	99	-	-
FF 03 REHEARSAL / FLEXIBLE	99	-	-
GF.10 KITCHEN	99	-	-
GF.06 KITCHEN STORE	99	-	-
GF.04 CIRCULATION	99	-	-
GF LIFT	99	-	-
FF 05 CIRCULATION	99	-	-
FF STAIRWELL	99	-	-

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
FF 04 LIFT	99	-	-
GF HALLWAY 1	99	-	-
GF HALLWAY 3	99	-	-
GF.25 FEMALE WC	99	-	-
GF.21 MALE WC 1	99	-	-
GF.31 CLNR	99	-	-
GF.30 DIS WC	99	-	-
FF 02 DIS WC	99	-	-
FF 07 WC 1	99	-	-
FF 06 WC 2	99	-	-
FF 01 CLNR	99	-	-
GF SCENERY	99	-	-
GF.01 LARGE	99	-	-
GF.28 FURNITURE STORE	99	-	-
GF.27 CAFE	99	-	-
GF.27 CAFE	99	-	-
GF HALLWAY 2	99	-	-
GF 11 FOYER	99	-	-
GF 12 FOYER	99	-	-
GF.14 GREEN ROOM 2	99	-	-
GF.13 GREEN ROOM 1	99	-	-
GF.11 DRESSING 1	99	-	-
GF.12 DRESSING 2	99	-	-
GF.10 WC 2	99	-	-
GF.09 WC 1	99	-	-
GF.14 SHOWER	99	-	-
GF.13 DIS WC	99	-	-
GF.11 FEMALE WC	99	-	-
GF.12 MALE WC 2	99	-	-
GF.08 AV CONTROL	99	-	-
GF.09 PLANT	99	-	-
GF.32 STORE 1	99	-	-
GF.23 STUDIO 3	99	-	-
GF.19 STUDIO 4	99	-	-
GF 18 STUDIO 1	99	-	-
GF 20 STUDIO 2	99	-	-

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?
GF.08 PERFORMANCE MAKING 2	YES (+23.2%)	NO
GF.07 PERFORMANCE MAKING 1	YES (+7.7%)	NO
GF.02 RESTAURANT	YES (+11.6%)	NO
GF.34 STORE 3	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
GF.35 STORE 2	YES (+27.1%)	NO
FF 03 REHEARSAL / FLEXIBLE	YES (+45.7%)	NO
GF SCENERY	N/A	N/A
GF.01 LARGE	NO (-75.1%)	NO
GF.28 FURNITURE STORE	N/A	N/A
GF.27 CAFE	NO (-68.2%)	NO
GF.27 CAFE	NO (-16.5%)	NO
GF.08 AV CONTROL	N/A	N/A
GF.32 STORE 1	N/A	N/A
GF.23 STUDIO 3	YES (+11%)	NO
GF.19 STUDIO 4	NO (-30.7%)	NO
GF 18 STUDIO 1	YES (+7.3%)	NO
GF 20 STUDIO 2	YES (+10.7%)	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]	2847.7	2847.7
External area [m^2]	7454.3	7454.3
Weather	NOR	NOR
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	2076.95	1634.4
Average U-value [W/m^2K]	0.28	0.22
Alpha value* [%]	46.1	15.51

* 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
	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
100	**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	11.15	8.94
Cooling	3.35	2.8
Auxiliary	15.95	12.49
Lighting	7	8.24
Hot water	13.25	17.28
Equipment*	32.76	32.76
TOTAL**	**50.7**	**49.75**

* 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	10.12	0.55
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*10.12*	*0.55*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	231.08	166.57
Primary energy [kWh_{PE}/m^2]	62.29	72.97
Total emissions [kg/m^2]	5.86	6.76

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	193.6	68.3	13.1	4.7	15	4.1	4.06	4.4	6.4
	Notional	66.9	50.4	7	3.2	12.7	2.64	4.4	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	22	290.8	1.4	0	48.4	4.26	0	4.78	0
	Notional	24.9	291.4	2.6	0	35.9	2.64	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	164.9	42	10.7	0	1.8	4.26	0	4.78	0
	Notional	178.9	59.7	18.8	0	1.7	2.64	0	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	115.8	92.4	10.3	0	27.6	3.12	0	3.5	0
	Notional	178.4	104.9	18.8	0	32.6	2.64	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	136	58.3	9.2	4	17.5	4.1	4.06	4.4	6.4
	Notional	83.9	58.4	8.8	3.7	12.9	2.64	4.4	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	55.4	50	3.6	0	15.1	4.26	0	4.78	0
	Notional	56.4	85.5	5.9	0	8	2.64	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	269.5	11.2	18.7	0.6	0	4.01	5.11	4.3	7.2
	Notional	167.1	27	17.6	1.7	0	2.64	4.4	----	----
[ST] No Heating or Cooling										
	Actual	0	1295.2	0	0	3.6	0	0	0	0
	Notional	0	1299.8	0	0	0.8	0	0	----	----
[ST] Other local room heater - unfanned, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	383.8	7.9	133.3	0	0	0.8	0	1	0
	Notional	212.9	22.8	44.1	0	0	1.34	0	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	103.9	0	6.3	0	4.3	4.57	0	4.9	0
	Notional	79.8	0	8.4	0	2	2.64	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

Energy Performance Certificate

HM Government

Non-Domestic Building

Battery Green
Lowestoft
Suffolk
NR

Certificate Reference Number:
7316-1642-6265-1266-9777

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

Energy Performance Asset Rating

More energy efficient

A+

Net zero CO_2 emissions

A 0-25

B 26-50

C 51-75

D 76-100

E 101-125

F 126-150

G Over 150

7 This is how energy efficient the building is.

Less energy efficient

Technical information

Main heating fuel:	Grid Supplied Electricity
Building environment:	Air Conditioning
Total useful floor area (m^2):	2847.7
Building complexity:	Level 4
Building emission rate ($kgCO_2/m^2$ per year):	5.86
Primary energy use (kWh_{PE}/m^2 per year):	62.29

Benchmarks

Buildings similar to this one could have ratings as follows:

9 If newly built

34 If typical of the existing stock