Energy & Sustainability Statement

for

London Borough of Camden

at

Tybalds Estate

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A sustainable future... engineered.

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EXECUTIVE SUMMARY

SCOPE OF DOCUMENT

This Energy and Sustainability Statement has been prepared to assess sustainability issues and the proposed energy strategy for Tybalds Estate.

APPROACH

The energy strategy for the development has been based upon the application of an energy hierarchy. This method deals with reducing the requirement for energy, the efficient use of energy and then the integration of low or zero carbon technologies in sequential order. This approach inherently offers best value for money against carbon savings.

TARGETS

Two key energy planning targets have been identified for the development:

- Achieve a 35% reduction in carbon over Part L Building Regulation requirements (2013)
- Provide energy for the development from Low or Zero Carbon Technologies

The SAP calculation tool along with a dynamic simulation tool has been used to determine the performance of the proposed buildings, together with the performance of a series of low zero carbon technologies against these two key energy targets.

BE LEAN

The energy demand of the building has been reduced passively by maximising daylight whilst reducing solar gains, improving the building fabric, and reducing unwanted infiltration. Actively, the energy required to service the building has then been further reduced through the use of efficient lighting, heat recovery, efficient fans.

BE CLEAN

A highly efficient DHW system using air source heat pumps in each dwelling are installed to provide space DHW in residential spaces. Heating is server by electric underfloor and electric panel heaters.

The TRA Halls in the commercial areas is to be served by an efficient VRF air source heat pump to provide conditioning. The kitchen and communal WC is to be served by electric panel heaters to provide space heating and electric water heater to provide DHW.

BE GREEN

A PV array will provide a further 8% of the development's energy from Low or Zero Carbon sources, a total of 92%. Implementing Be Green measures of the development achieves a 38.1% improvement against Part L of the Building Regulations.

In addition to meeting the two key energy planning targets, the proposals also meet the requirements of local and national policy.

1.0 INTRODUCTION

The Tybalds estate is part of an estate regeneration programme providing new homes for existing and new residents. The proposed development comprises of 3 new residential blocks of flats, 2 blocks of mews houses and underbuild flats beneath 3 existing residential blocks. The site is located in the London Borough of Camden's Holborn and Covent Garden ward. Old Gloucester Street runs along the western boundary of the development, Great Ormand Street and Great Ormond Street Hospital to the north of the site, Orde Hall Street and Harpur Street to the east.

The site being approximately indicated as follows:

Figure 1 Site Boundary

The proposed residential development will include 1-bed 2- bed, 3-bed and 4-bed units. Along with communal areas including bike stores, communal WC's, and 2 TRA Halls.

This report analyses the anticipated carbon performance of the revised energy strategy for the Tybalds estate, both communal and residential areas, and the energy contribution low carbon technologies can provide.

2.0 PLANNING POLICY

2.1 National Planning Policy

The National Planning Policy Framework (NPPF), released in March 2012 and updated in February 2019, replaced all national planning policy statements and guidance. The document formalised a presumption in favour of sustainable development and sets out the requirement to provide for much needed new homes.

2.2 Local Planning Policy

The relevant extracts from the Greater London Authority (GLA) London Plan (March 2021), the GLA Energy Assessment Guidance (April 2020) and Camden Local Plan (2017) are presented below.

2.2.1 *Extract from GLA London Plan (March 2021), Chapter 9, Policy SI 2 Minimising Greenhouse Gas Emissions*

Policy SI 2- Minimising Greenhouse Gas Emissions

Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation

2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

4) be seen: monitor, verify and report on energy performance

Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

2.2.2 *Extract from Greater London Authority Guidance on Preparing Energy Assessments as Part of Planning Applications (April 2020)*

Energy assessments must:

- demonstrate how the zero-carbon target for major domestic and non-domestic developments will be met, with at least a 35% on-site reduction beyond Part L 2013 and proposals for making up the shortfall to achieve zero carbon, where required.
- include information demonstrating that the risk of overheating has been mitigated through the incorporation of passive design measures.

2.2.3 *Extract from Camden Local Plan, Chapter 8, Policy CC2 Adapting to climate change (2017)*

Policy CC2 Adapting to climate change

The Council will require development to be resilient to climate change.

All development should adopt appropriate climate change adaptation measures such as:

a. the protection of existing green spaces and promoting new appropriate green infrastructure;

b. not increasing, and wherever possible reducing, surface water runoff through increasing permeable surfaces and use of Sustainable Drainage Systems;

c. incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and

d. measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy

Any development involving 5 or more residential units or 500 sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement.

2.3 Summary of the Carbon / Energy Reduction Targets

The key energy targets for the development were:

- Achieve a 35% reduction in carbon over Part L Building Regulation requirements (2013)
- Provide energy for the development from Low Carbon Energy

The risk of overheating will be presented in a supplementary Thermal Comfort Report.

3.0 SUSTAINABILITY

Key sustainability issues have been addressed throughout the design process.

3.1 Green Spaces

Significant landscape enhancements are proposed as part of the development. The application is accompanied by a Landscape Statement that has been prepared by LUSH and Matthew Lloyd Architects. The site currently provides large areas of hardstanding and an area of mown grass in the centre of the Estate. The landscaping strategy for the scheme proposes:

- Planting of 51 additional trees
- Introduction of additional soft landscaping including planters, green walls, shrubs and grasses to provide urban greening and visual interest.
- Native planting will be used appropriate and species to attract wildlife and enhance habitats will be introduced.
- Places to sit and enjoy the landscaped areas
- Tybalds Square will provide a multi-use community space for residents to meet and for children to play.
- Improved legibility through the Estate with clearly defined routes.

3.2 Sustainable Drainage

A Flood Risk Assessment and Surface Drainage Water Strategy has been prepared by MNP and has been submitted as part of the planning application which provides a full assessment of flood risk and drainage.

Overall the development results in an 289m^2 decrease in hardstanding which equates to a decrease of 2.00% in hard paved areas.

It is proposed to provide betterment on the surface water run off where possible across the site. As part of the re-development, it is proposed to incorporate green/blue roofs to all new buildings which will discharge at a restricted rate. Also, where possible permeable paving will be proposed to new parking areas within the site. This will again provide a controlled discharge to the surface water as the run off routes through the permeable sub-base. The combination of the proposed green/blue roofs and the lined permeable pavement amounts to 83.00m3 of on-site surface water attenuation.

The quantity of SuDS features has where possible been maximised in the development to adhere to local policy, and minimise surface water runoff rates as far as reasonably practicable.

In accordance with the SuDS requirements of Camden Council, the proposed new drainage infrastructure will be designed to accommodate all storm events up to and including the 1 in 100 year storm event plus the allowance for climate change.

3.3 Biodiversity

A Preliminary Ecological Appraisal and Preliminary Bat Roost Assessment prepared by Middlemarch Environmental has been submitted as part of the planning application.

The Preliminary Ecological Appraisal identified no European statutory sites within 5 km of the survey area, one UK statutory site within 2 km and 13 non-statutory sites within 1 km. The site is not located within 10 km of a statutory site designated for bats. The study also provided records of protected/notable species within 1 km, including: bats, badger, amphibians, birds, invertebrates, and plants.

Measures will be incorporated into the design to support ecology enhancements and protect habitats. The Preliminary Ecological Appraisal advises the following:

- The development proposals are designed to, where feasible, allow for the retention of existing notable habitats including the hedgerows, semi-mature and mature trees.
- Incorporating biodiversity enhancement measures into the landscaping scheme to work towards delivering net gains for biodiversity. This will be achieved through introducing planting of habitats which will be of value to wildlife, inclusion of hedgehog passes and provision of nesting/ roosting habitats.
- Ensuring that any excavations that need to be left overnight are covered or fitted with mammal ramps to ensure that any animals that enter can safely escape. Any open pipework with an outside diameter of greater than 120 mm must also be covered at the end of each work day to prevent animals entering/becoming trapped.
- Ensuring that vegetation and building clearance are undertaken, where possible, outside the nesting bird season.

3.4 Urban Heat Island

The use of air conditioning and excessive mechanical plant has been minimised in this development to help limit the Urban Heat Island effect.

Mitigation measures have been put in place to minimise the heat expelled into the local environment from plant that is required to prevent overheating of densely populated areas and to provide fresh air into the apartments.

Following guidance from the Mayor of London Sustainable Design and Construction Supplementary Planning Guidance, green cover and planting as outlined in section 3.1 have been a crucial part of the design.

3.5 Cooling

The need for cooling within the development has been reduced by implementing to principles of the cooling hierarchy:

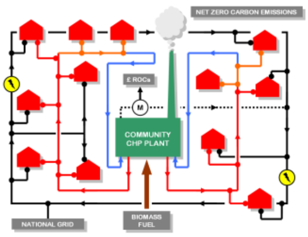
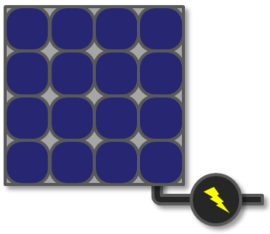
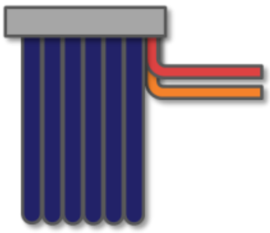
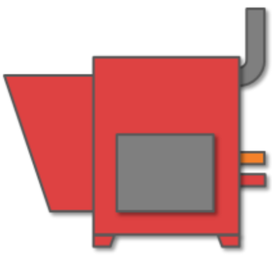
- Minimise internal heat generation through energy efficient design;
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
- Manage the heat within the building through exposed internal thermal mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation;
- Active cooling.

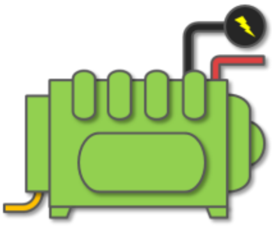
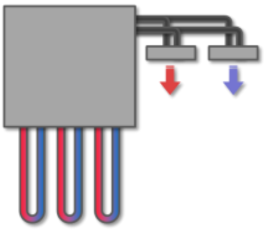
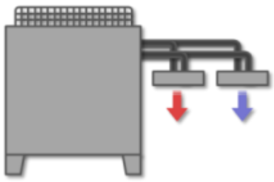
Following the outline of the cooling hierarchy, measures have been applied such as considered orientation, shading, passive and mechanical ventilation and glazing with a low g-value.

Thermal Modelling has demonstrated that despite following the principles of the cooling hierarchy, areas with dense occupancy due to their proposed use, will require active cooling to ensure comfort.

4.0 FEASABILITY STUDY

A feasibility study has been carried out to review how appropriate various technologies are for this development.

Technology	Description	Feasibility
Community Heating 	Community heating schemes lend themselves to large-scale, centralised plant, which allows heat and electricity to be generated simultaneously and at high efficiency.	 Community heating is an option for underbuilds only and will be linked to the existing gas community heating system. The loads associated with the new builds are too large and an all-electric approach was favourable based on future grid carbon factor.
Photovoltaics 	Photovoltaic generate electricity from solar radiation. This is fed into the building's electrical system.	 PV panels could be mounted on Blemunsbury, Falcon and Richbell buildings to offset the electrical demand for lighting and small power associated with the underbuilds.
Solar Hot Water 	Solar thermal panels capture solar radiation. This is transferred to circulating hot water than can then be used to provide space heating and/or domestic hot water.	 The underbuilds, roof area is better designated to PV panels as opposed to solar hot water. Other buildings have issues with overshadowing, storage and the solar hot water panels being too far away from when DHW is required which effects their feasibility.
Biomass 	Biomass boilers burn plant waste (usually wood chip or wood pellets) to provide heat for space heating and/or domestic hot water.	 Frequent delivery of fuel will cause noise pollution. Furthermore, biomass can have a negative impact on air quality. Plant space and maintenance is also an issue.

Technology	Description	Feasibility
Combined Heat & Power (CHP) 	Combined Heat & Power (CHP) burns gas to simultaneous generate heat and electricity. The heat is used to provide space heating and/or domestic hot water and the electricity is fed into the building's electrical system.	 With the greening of the electric grid, they no longer achieve the benefits previously achieved. The burning of gas can also result in issues with local air quality.
Ground Source Heat Pumps 	Ground Source Heat Pumps (GSHP) use a ground loop to extract heat from the ground. The two main ground loop options are: 1. Slinkies – a horizontal ground loop located in shallow trenches. 2. Boreholes – a vertical loop located in vertical boreholes. The pumps can be run in reverse to provide cooling.	 GSHPs generate heat efficiently at low grade, and land would need to be available for the bore holes or slinkies required. Due to the built-up area in which the development is located, this land is not available.
Air Source Heat Pumps 	Air Source Heat Pumps (ASHPs) use a heat pump to generate heating and cooling. The heat generated is typically low grade and is used to provide space heating. Higher grade heat can be generated, but efficiencies are much lower.	 ASHPs generate heat efficiently at low grade. They will be explored further for the development to generate DHW. ASHP's will also provide heating and cooling to community halls.
Wind 	Wind turbines use natural wind currents to turn their blades, which in turn produces electricity from a generator. This is fed into the building's electrical system. Output is dependent on the average wind flow rate, therefore high-speed undisturbed currents are the best.	 Planning for a wind turbine would be extremely difficult. Wind turbines would also create potential issues with noise, shadow flicker and tv/radio signal interference. Furthermore, noise from wind turbines may be considered unacceptable, particularly for local residential areas.

5.0 ENERGY STRATEGY

Our approach to the development of the energy strategy is based upon the application of an energy hierarchy (see Figure 2).

This method deals with reducing the requirement for energy, the efficient use of energy and then the integration of low or zero carbon technologies in sequential order. This approach inherently offers best value for money against carbon savings.

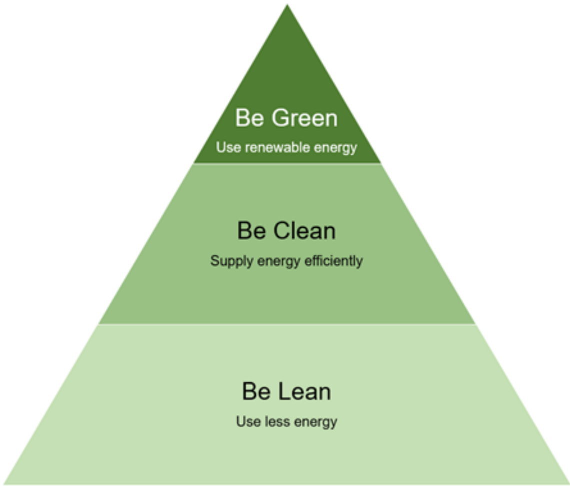


Figure 2 Energy Strategy Approach

5.1 Be Lean

The energy demand is reduced through adopting sustainable design principles and optimum design of the building fabric and form. The following are developed to achieve this:

- Optimise passive design
- Maximise daylighting
- Solar control to reduce overheating
- Improved building fabric

A selection of Be Lean design requirements for the development are presented in Table 1 and Table 2.

Table 1 Residential Building Fabric Properties

Fabric Detail	Part L 2013 Notional Building Value	Proposed Building Value	Improvement
Ground Floor U-value	0.13	0.12 W/m²K	8%
External wall U-value	0.18	0.12 W/m²K	33%
Roof U-value	0.13	0.10 W/m²K	23%
Glazing U-value (including frame)	1.40	1.40 W/m²K	0%
Glazing g-value	g = 0.63	g = 0.40	
Building Air Permeability Target	5.0 $m^3/m^2.h$ @ 50Pa	2.0 $m^3/m^2.h$ @ 50Pa	60%

Table 2 Communal Non-Residential Building Fabric Properties

Fabric Detail	Part L 2013 Notional Building Value	Proposed Building Value	Improvement
Ground Floor U-value	0.22	0.12 W/m²K	45%
External wall U-value	0.26	0.12 W/m²K	54%
Roof U-value	0.18	0.10 W/m²K	44%
Glazing U-value (including frame) Glazing g-value	1.60 g = 0.60	1.40 W/m²K g = 0.40	13%
Building Air Permeability Target	3.0 m³/m².h @ 50Pa	2.0 m³/m².h @ 50Pa	33%

The energy required to service the building is reduced through the use of energy efficient systems. This includes the implementation of:

- Efficient lighting
- High efficiency heat generation
- Heat recovery
- Low specific fan power
- Optimised zoning and controls

A selection of efficient services for the development are presented in Table 3.

Table 3 Be Lean Efficient Services

Element	Performance
Lighting	LED Light Fittings
Fans – Mechanical S&E Ventilation	Specific Fan Power ~ 0.85 W/l/s
Heat Recovery	~ 87%

5.2 Be Clean

In place of gas fired boilers for space heating and hot water heating in new build residential areas, it is proposed electric heating and highly efficient air source heat pumps (ASHP) DHW systems are installed within a cupboard of each dwelling.

ASHP VRF systems will provide heating and cooling to community halls.

A district heating scheme with an efficient gas boiler will be utilised to serve space heating and hot water to the renovated Underbuilds.

Table 4 Be Clean Efficient Services

Development Area	Element	Performance
Block B, C, D and Mews	Electric Heating	SCoP 100%
	ASHP DHW	SCoP: 367.5% Loss 1.61 kWh\day
Underbuilds	Gas District Heating	SCoP: 94.9%
Community Halls	ASHP VRF	SCoP: 250%

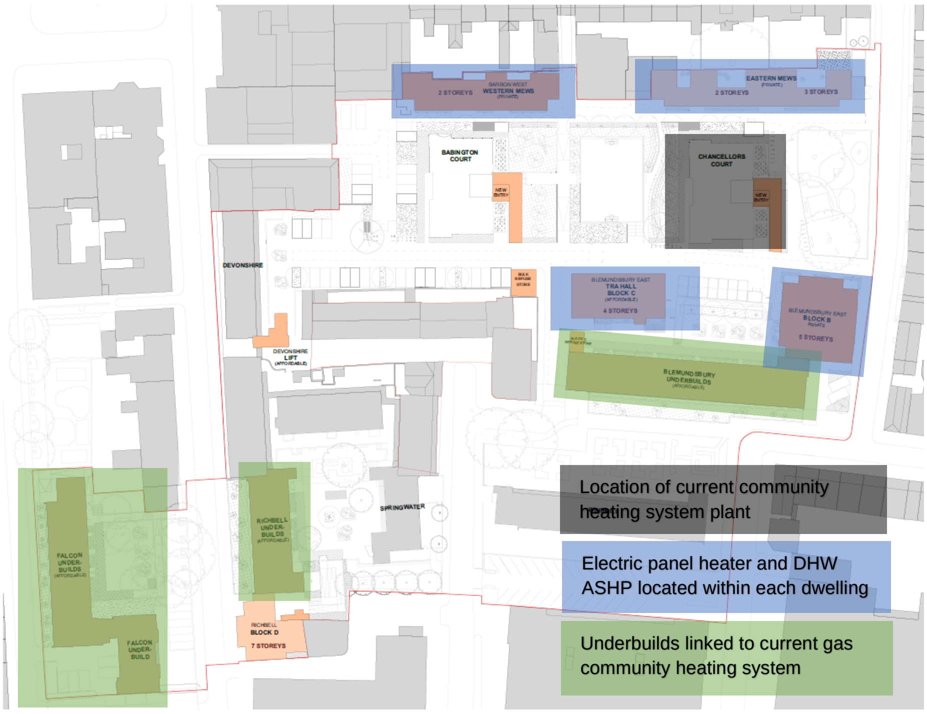


Figure 2 Residential Site Strategy

5.3 Be Green

A 105m^2 array of monocrystalline photovoltaic panels will generate electricity for the development underbuilds and would be located on the roof of the Blemunsbury, Falcon and Richbell buildings.

6.0 METHODOLOGY

6.1 Residential Areas

Calculations have been undertaken based on the methodology from Part L1A of the Building Regulations in order to establish the baseline carbon emissions (i.e., the regulated carbon emissions*) and the carbon emissions reductions achieved through the provision of energy efficiency measures.

*Regulated carbon emissions are related to fixed building services systems including: space heating, cooling, fans and pumps, lighting and domestic hot water. It excludes non fixed items such as equipment and catering appliances.

In carrying out the residential assessment, TGA utilised Design SAP 2012 software package from Elmhurst Energy Systems. This is a fully validated commercially available software package that is available for the purpose of demonstrating compliance with the Building Regulations requirements of Approved Document Part L1A (2013 ADPL1A).

The data acquired from Design SAP 2012 software package was applied to the GLA carbon emission reporting spreadsheet with the SAP 10 carbon emission factors in order to estimate CO_2 emission performance against London Plan policies.

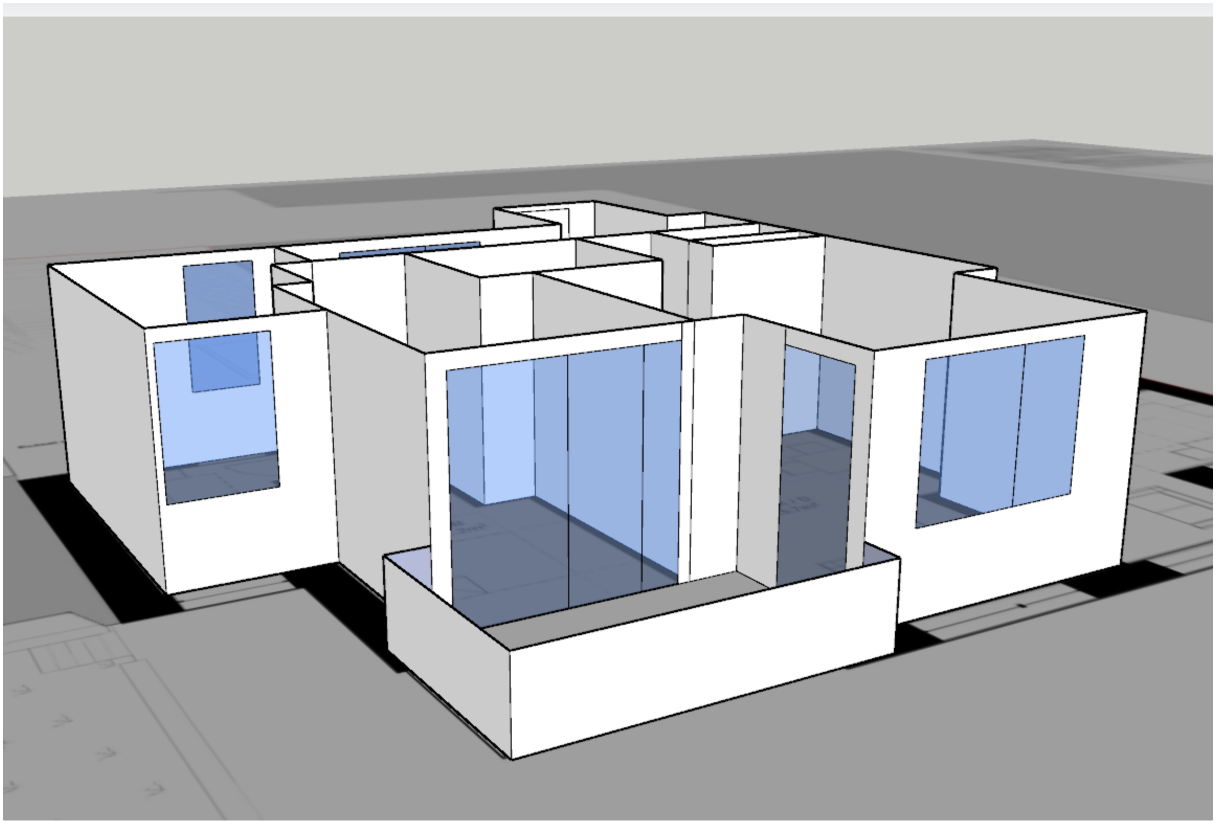


Figure 3 Tybalds Estate Apartment Sketchup Model

At this stage, 11 properties have been calculated to represent the Tyablds Estate (see Table 5).

Table 5 Sample Apartments

Unit Reference	Total Area Represented (m^2)
Sample 1 B 1B2P	209
Sample 2 B 2B3P	275
Sample 3 B 1B2P	532
Sample 4 C 3B5P	160
Sample 5 C 2B4P	320
Sample 6 D 1B2P	260
Sample 7 D 2B3P	342
Sample 8 D 1B2P	113
Sample 9 EM 4B7P	476
Sample 10 EM 3B5P	624
Sample 11 UB 2B4P	768

6.2 Communal Non-Residential

Detailed energy modelling has been undertaken based on the methodology from Part L2A of the Building Regulations in order to establish the baseline carbon emissions (i.e. the regulated carbon emissions*) and the carbon emissions reductions achieved through the provision of energy efficiency measures.

*Regulated carbon emissions are related to fixed building services systems including: space heating, cooling, fans and pumps, lighting and domestic hot water. It excludes non fixed items such as equipment and catering appliances.

In carrying out the assessment, TGA utilised a dynamic simulation software package, Virtual Environment (VE) version 2021 software suite from Integrated Environmental Solutions (IES). This is a fully validated commercially available software package that is available for the purpose of demonstrating compliance with the Building Regulations requirements of Approved Document Part L2A (2013 ADPL2A).

The CIBSE 'Test Reference Year' (TRY) weather file for London Heathrow is used to assess Criterion 1 and Criterion 3 of ADL2A 2013 as determined using the DCLG SBEM Weather Locations map. The TRY consists of hourly data for twelve typical months, selected from approximately 20-year data sets, and smoothed to provide a composite, but continuous, 1 year sequence of data. They enable the likely energy consumption of buildings to be assessed by simulation under typical weather conditions.

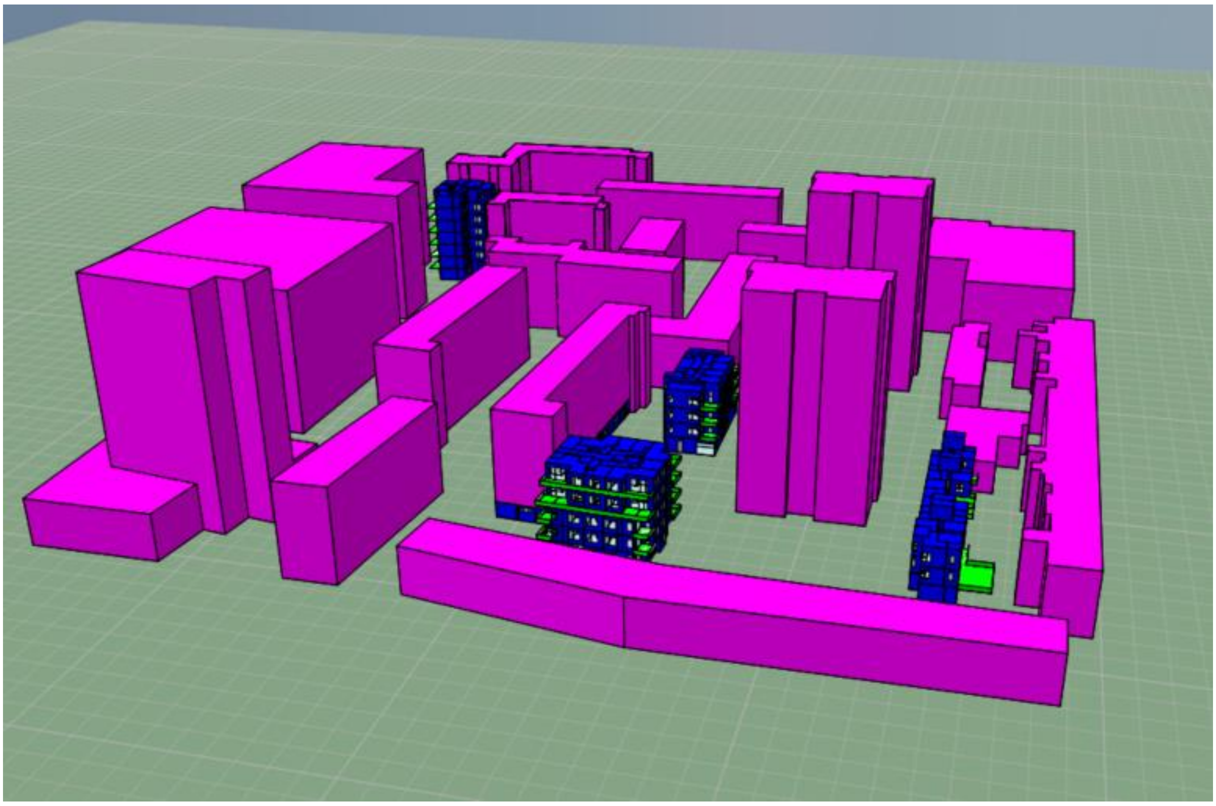


Figure 4 Tybalds Estate IES Model

7.0 RESULTS

7.1 Be Lean

The ‘Be Lean’ development achieves a Buildings Emission Rate (BER) of 63.23 kg.CO_2/annum. This is an improvement of 12.6% in the minimum carbon reduction targets in line with Part L of the Building Regulations (Table 6 and Figure 5).

There are no Low or Zero Carbon Technologies.

The ‘Be Lean’ design therefore achieves neither of the energy targets (Table 7).

Table 6 Be Lean Results

	Baseline Emission Rate (kg.CO_2)	BER (kg.CO_2)	% Reduction in CO_2 Emissions	Total Energy (kWh/ Annum)	LZC Energy (kWh/ Annum)	% LZC Energy
Be Lean	72.35	63.23	12.6%	297,023	0	0%

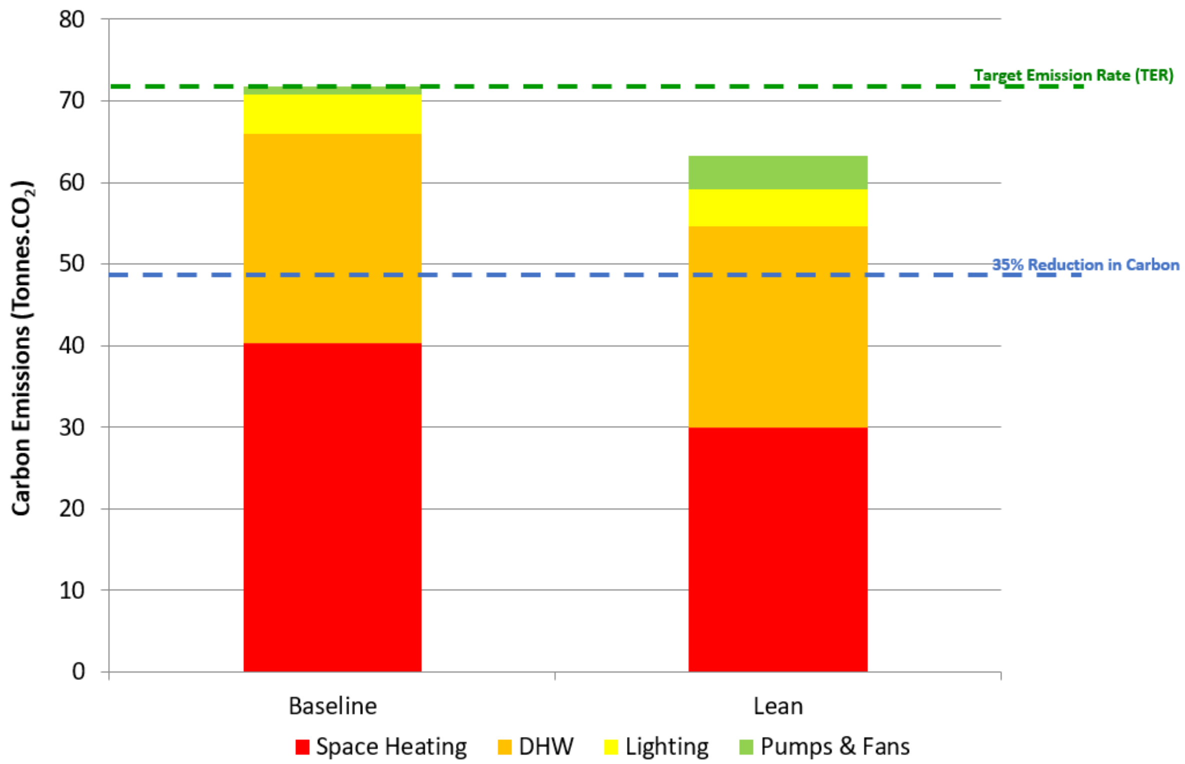


Figure 5 Carbon Emissions of the Be Lean Building vs the Notional Building

Table 7 Summary of Targets for Be Lean Energy Efficient Design

Target	Achieved
Achieve a 35% reduction in carbon over Part L Building Regulation requirements (2013)	✗
Provide energy for the development from Low Carbon or Renewable Energy	✗

7.2 Be Clean

The ‘Be Clean’ development achieves a Buildings Emission Rate (BER) of 48.82 kg.CO_2/annum. This is an improvement of 32.5% in the minimum carbon reduction targets in line with Part L of the Building Regulations (Table 8 and Figure 6).

The ‘Be Clean’ development has 84% of energy provided by Low or Zero Carbon Technologies.

This demonstrates the ‘Be Clean’ approach achieves one of the energy targets (Table 9).

Table 8 Be Clean Results

	Baseline Emission Rate (kg.CO_2)	BER (kg.CO_2)	% Reduction in CO_2 Emissions	Total Energy (kWh/ Annum)	LZC Energy (kWh/ Annum)	% LZC Energy
Be Lean	72.35	63.23	12.6%	297,023	0	0%
Be Clean	72.35	48.82	32.5%	214,156	181,104	84%

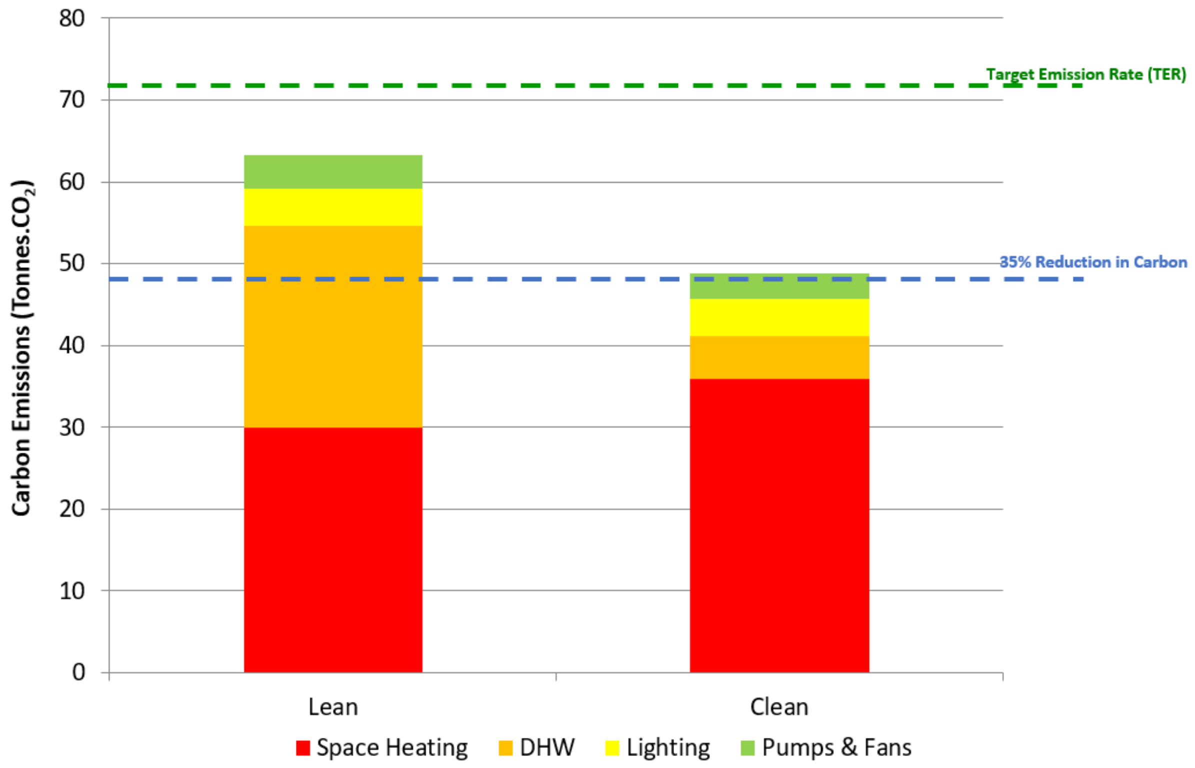


Figure 6 Carbon Emissions of the Be Lean Building vs the Clean Building

Table 9 Summary of Targets for Be Clean Energy Efficient Design

Target	Achieved
Achieve a 35% reduction in carbon over Part L Building Regulation requirements (2013)	✗
Provide energy for the development from Low Carbon or Renewable Energy	✓

7.3 Be Green

Introducing 105 m[2] of photovoltaic panels would result in a Buildings Emission Rate (BER) of 44.77 kg.CO_2/annum. This is an improvement of 38.1% in the minimum carbon reduction targets in line with Part L of the Building Regulations (Table 10 and Figure 7).

The PV will generate an additional 8% of the annual energy demand from Low or Zero Carbon Technologies.

The Be Green development therefore achieves both of energy targets (Table 11).

Table 10 Be Green Results

	Baseline Emission Rate (kg.CO2)	BER (kg.CO_2)	% Reduction in CO_2 Emissions	Total Energy (kWh/ Annum)	LZC Energy (kWh/ Annum)	% LZC Energy
Be Clean	72.35	48.82	32.5%	214,156	181,104	84%
Be Green	72.35	44.77	38.1%	214,156	198,468	92%

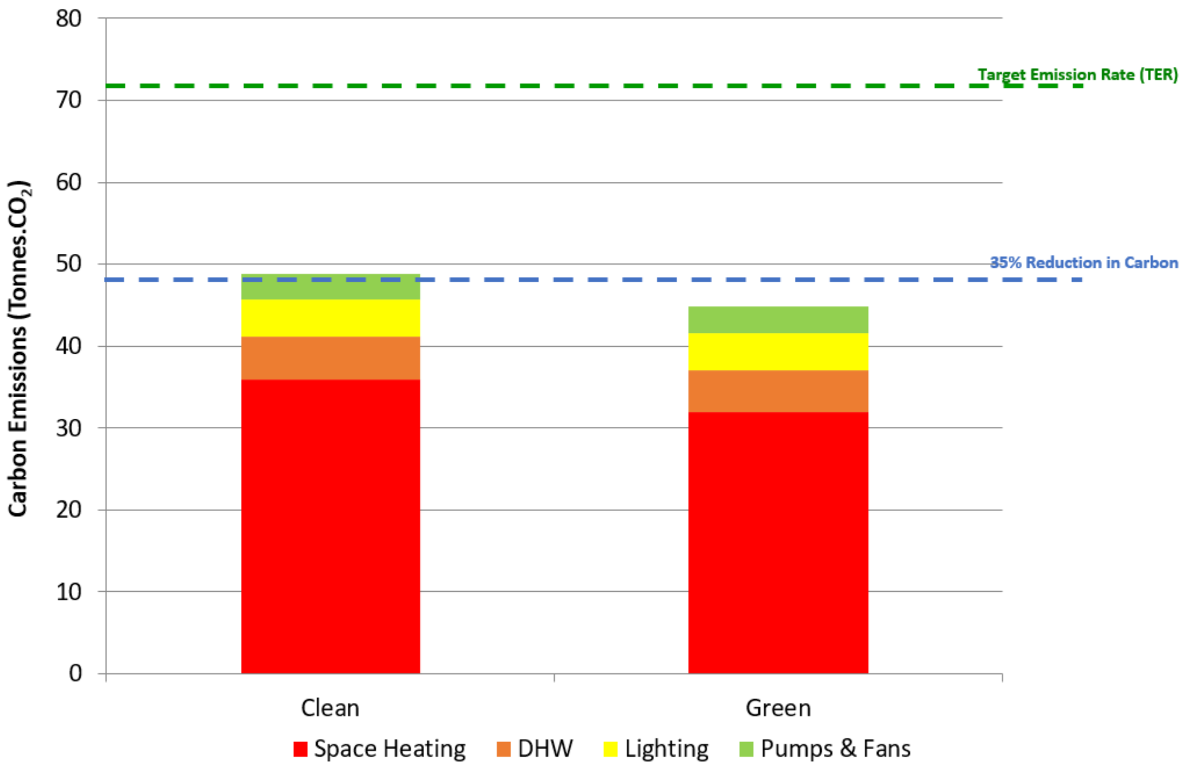


Figure 7 Carbon Emissions of the Be Clean Building vs the Be Green

Table 11 Summary of Targets for Be Clean Energy Efficient Design

Target	Achieved
Achieve a 35% reduction in carbon over Part L Building Regulation requirements (2013)	✓
Provide energy for the development from Low Carbon or Renewable Energy	✓

8.0 DISCUSSION & CONCLUSION

There are two key energy targets for the energy strategy for the development:

- Achieve a 35% reduction in carbon over Part L Building Regulation requirements (2013)
- Provide energy for the development from Low Carbon Energy or Renewable Energy

Applying Be Lean design measures provides a 12.6% saving in carbon emissions for over Part L Building Regulations requirements (2013).

Incorporating Be Clean design measures provides a 32.5% saving in carbon emissions over Part L Building Regulations requirements (2013) and provides 84% of the development's energy provided by Low or Zero Carbon Sources.

Introducing Be Green design principles provides a 38.1% reduction in carbon emissions over Part L Building Regulations requirements (2013) and provides 92% of the development's energy from Low or Zero Carbon Sources.

To offset the shortfall in carbon emissions, as per the GLA Carbon Emission Reporting Spreadsheet, a cash in-lieu contribution of £139,133 would need to be made.

APPENDIX A: BE LEAN SAP OUTPUT

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Property Reference	Sample 03	**Issued on Date**	07/05/2021
Assessment Reference	Sample 3 BB 1B2P Lean	**Prop Type Ref**	BB 1B2P
Property			

SAP Rating	83 B	**DER**	19.58	**TER**	20.77
Environmental	87 B	**% DER<TER**	5.71		
CO_2 Emissions (t/year)	0.89	**DFEE**	53.65	**TFEE**	55.54
General Requirements Compliance	Pass	**% DFEE<TFEE**	3.40		

Assessor Details	[redacted]	[redacted]
Client		

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Mains gas		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	20.77	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	19.58	$kgCO_2/m^2$	Pass
	-1.19 (-5.7%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.54	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	53.65	$kWh/m^2/yr$	
	-1.8 (-3.2%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system	Boiler system with radiators or underfloor - Mains gas Data from manufacturer tbc tbc Combi boiler Efficiency: 90% Minimum: 88%	Pass
Secondary heating system	None	

elmhurst energy

Page 1 of 2

Regs Region: England
Elmhurst Energy Systems
SAP2012 Calculator (Design System) version 4.14r16

APPENDIX B: BE LEAN BRUKL OUTPUT

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Gas Block C - Commercial Floor

As designed

Date: Thu May 06 15:04:16 2021

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	17.7
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	17.7
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	13.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.12	0.12	RM000000:Surf[0]
Floor	0.25	0.12	0.12	RM000000:Surf[2]
Roof	0.25	0.1	0.1	RM000008:Surf[11]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	RM000004:Surf[1]
Personnel doors	2.2	1.4	1.4	RM000002:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	2

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	210.4	210.4
External area [m²]	483.3	483.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	2	5
Average conductance [W/K]	130.46	230.75
Average U-value [W/m²K]	0.27	0.48
Alpha value* [%]	10.16	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
100	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.49	25.09
Cooling	0	0
Auxiliary	12.51	7.84
Lighting	7.78	14.31
Hot water	4.5	4.8
Equipment*	43.26	43.26
TOTAL**	35.28	52.04

* 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/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	32.69	77.87
Primary energy* [kWh/m²]	80.58	102.76
Total emissions [kg/m²]	13.8	17.7

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

APPENDIX C: BE CLEAN SAP OUTPUT

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP
elmhurst energy

Property Reference	Sample 03	**Issued on Date**	07/05/2021
Assessment Reference	Sample 3 BB 1B2P Clean	**Prop Type Ref**	BB 1B2P
Property			

SAP Rating	83 B	**DER**	25.40	**TER**	30.16
Environmental	85 B	**% DER<TER**	15.77		
CO_2 Emissions (t/year)	0.99	**DFEE**	53.65	**TFEE**	55.54
General Requirements Compliance	Pass	**% DFEE<TFEE**	3.40		

Assessor Details	[redacted]	[redacted]	[redacted]
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

1a TER and DER

Fuel for main heating	Electricity		
Fuel factor	1.55 (electricity)		
Target Carbon Dioxide Emission Rate (TER)	30.16	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	25.40	$kgCO_2/m^2$	Pass
	-4.76 (-15.8%)	$kgCO_2/m^2$	

1b TFEE and DFEE

Target Fabric Energy Efficiency (TFEE)	55.54	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	53.65	$kWh/m^2/yr$	
	-1.8 (-3.2%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

2 Fabric U-values

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

2a Thermal bridging

Thermal bridging calculated from linear thermal transmittances for each junction

3 Air permeability

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

4 Heating efficiency

Main heating system 1	Room heaters - Electric Panel, convector or radiant heaters	
Main heating system 2	Heat pump with warm air distribution - Electric Dimplex EDL200UK-630	
Secondary heating system	None	

APPENDIX D: BE CLEAN BRUKL OUTPUT

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Block C - Commercial Floor

As designed

Date: Thu May 06 15:10:26 2021

Administrative information

Building Details

Address: Address 1, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	19.6
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	19.6
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	18.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.12	0.12	RM000000:Surf[0]
Floor	0.25	0.12	0.12	RM000000:Surf[2]
Roof	0.25	0.1	0.1	RM000008:Surf[11]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	RM000004:Surf[1]
Personnel doors	2.2	1.4	1.4	RM000002:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

* There might be more than one surface where the maximum U-value occurs.
** 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.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	2

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	210.4	210.4
External area [m^2]	483.3	483.3
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	2	5
Average conductance [W/K]	130.46	230.75
Average U-value [W/m^{2}K]	0.27	0.48
Alpha value* [%]	10.16	10

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
	C2 Residential Institutions: Hospitals and Care Homes
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
100	**D2 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	5.22	11.17
Cooling	6.37	4.58
Auxiliary	11.06	7.03
Lighting	7.78	14.31
Hot water	4.61	4.8
Equipment*	43.26	43.26
TOTAL**	**35.05**	**41.89**

* 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	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	97.98	141.01
Primary energy* [kWh/m^2]	107.6	108.75
Total emissions [kg/m^2]	18.2	19.6

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

APPENDIX E: BE GREEN SAP OUTPUT

BASIC COMPLIANCE REPORT
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Property Reference	Sample 11	**Issued on Date**	07/05/2021
Assessment Reference	Sample 11 UB 2B4P Green	**Prop Type Ref**	UB B 2B4P
Property			

SAP Rating	94 A	**DER**	5.31	**TER**	18.78
Environmental	97 A	**% DER<TER**	71.73		
CO_2 Emissions (t/year)	0.09	**DFEE**	50.30	**TFEE**	54.44
General Requirements Compliance	Pass	**% DFEE<TFEE**	7.61		

Assessor Details	[redacted]	[redacted]	[redacted]
Client			

SUMARY FOR INPUT DATA FOR New Build (As Designed)

Criterion 1 – Achieving the TER and TFEE rate

__1a TER and DER__

Fuel for main heating	Mains gas (c)		
Fuel factor	1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	18.78	$kgCO_2/m^2$	
Dwelling Carbon Dioxide Emission Rate (DER)	5.31	$kgCO_2/m^2$	Pass
	-13.47 (-71.7%)	$kgCO_2/m^2$	

__1b TFEE and DFEE__

Target Fabric Energy Efficiency (TFEE)	54.44	$kWh/m^2/yr$	
Dwelling Fabric Energy Efficiency (DFEE)	50.30	$kWh/m^2/yr$	
	-4.1 (-7.5%)	$kWh/m^2/yr$	Pass

Criterion 2 – Limits on design flexibility

Limiting Fabric Standards

__2 Fabric U-values__

Element	Average	Highest	
External wall	0.12 (max. 0.30)	0.12 (max. 0.70)	Pass
Party wall	0.00 (max. 0.20)	-	Pass
Floor	0.12 (max. 0.25)	0.12 (max. 0.70)	Pass
Openings	1.40 (max. 2.00)	1.40 (max. 3.30)	Pass

__2a Thermal bridging__

Thermal bridging calculated from linear thermal transmittances for each junction

__3 Air permeability__

Air permeability at 50 pascals	2.00 (design value)	
Maximum	10.0	Pass

Limiting System Efficiencies

__4 Heating efficiency__

Main heating system	Community heating scheme	-
Secondary heating system	None	

__5 Cylinder insulation__

Hot water storage	Measured cylinder loss: 0.94 kWh/day Permitted by DBSCG 1.66	Pass