# Energy & Sustainability Statement

**for**

**London Borough of Camden**

**at**

**Tybalds Estate**

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**20th January 2022**

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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

No be clean measure are to be implemented, as a site wide heat network was determined to be unfeasible. The heat pumps RE included in ‘Be Green’.

### BE GREEN

An Exhaust Air Heat Pump will be installed within each dwelling, this will provide heating and hot water. Heat Pumps will serve commercial areas.
A PV array will also be installed to provide additional energy from Low or Zero Carbon sources.

This means 72% of the development’s energy will derive from Low or Zero Carbon sources. Implementing Be Green measures of the development achieves a 41.2% 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 for residential and non-residential 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 (Community TRA Halls) due to their proposed use, will require active cooling to ensure comfort for use in infrequent occasions of full occupancy only. This in demonstrated in the Overheating Report.

### 3.6 Domestic Water

During the later stages of design, fixtures and fittings will be specified to achieve a maximum of 105 l/person/day internal consumption and 5 l/person/day externally. Calculations will be carried out at a later stage in the design.

### 3.7 Demolition Waste

On site, for the small areas of demolition, the target recycling rate will be in line with the London Plan of a minimum of 95% of demolition waste to be recycled, this exceeds the Local plan target of 85%.

### 3.8 Responsible sourcing

Materials sourcing can involve long and complex supply chains that result in a wide range of impacts locally and globally. These might include environmental, economic or social issues. These issues and can occur during the extraction, processing, manufacturing or supply chain. In order to minimise the developments contribution to these issue, materials will be forced more locally where possible.

Materials from credible certification schemes will be considered to exist to increase confidence to specifiers that risks are being minimised or avoided. Certified products will also enable the development to demonstrate the responsible nature of their selection decisions.

In line with the UK Government Timber Procurement Policy, 100% of timber and timber-based products will be classed as ‘Legal and Sustainable’.

### 3.9 Metering and sub-metering

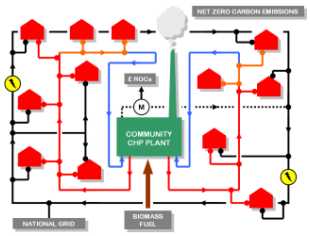
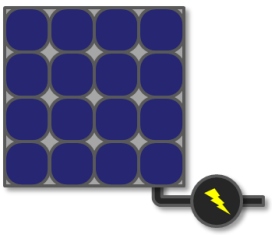
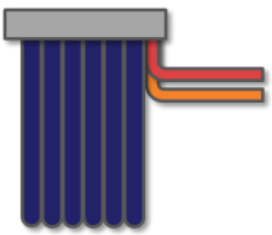
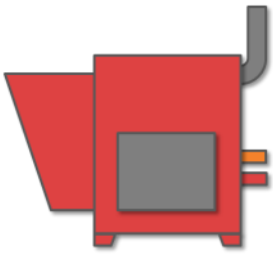
Units will be individually metered. Non-domestic areas will be metered as per CIBSE TM39 Guidance.

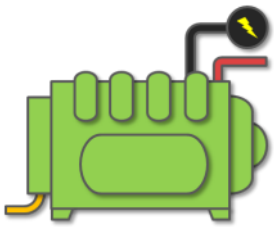
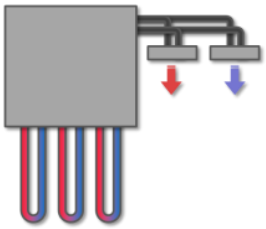
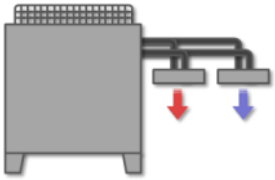
### 3.10 Water Harvesting and Recycling

Rainwater and Greywater recycling was discounted at the early stage of design due to space requirements and economic feasibility reasons.

## 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)<br>  | 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<br>  | Ground Source Heat Pumps (GSHP) use a ground loop to extract heat from the ground. The two main ground loop options are:<br>1. Slinkies – a horizontal ground loop located in shallow trenches.<br>2. Boreholes – a vertical loop located in vertical boreholes.<br>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<br>  | 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<br>  | 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.<br>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)<br>Glazing g-value | 1.40<br>g = 0.63 | 1.40 W/m²K<br>g = 0.40 | 0% |
| Building Air Permeability Target | 5.0 m³/m².h @ 50Pa | 2.0 m³/m².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) | 1.60 | 1.40 W/m²K | 13% |
| Glazing g-value | g = 0.60 | g = 0.40 | |
| 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 further 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 **Error! Reference source not found.**3.

### Table 3 Be Lean Efficient Services

| Element | Performance |
|---|---|
| Lighting | LED Light Fittings |

## 5.2 Be Clean

Greater London Energy Assessment Guidance advises that to be included in the 'Be Clean' section of the energy report is connection to local existing or planned heat networks where feasible. However, for reasons discussed in the File Note accompanying the planning application, this was not a viable option for this site. This was due to the age of the existing network resulting in high distribution losses, overheating and carbon and Part L Regulation compliance.

It was not plausible to create a new site wide heat network due to considerations such as ground conditions, space requirements, acoustics, visual appearance and daylight and sunlight issues.

In accordance with Greater London Planning Authority Guidance, Heat Pumps are to be assessed under the 'Be Green' analysis of the energy hierarchy.

### 5.3 Be Green

In place of gas fired boilers for space heating and hot water heating in new build residential areas, it is proposed that an Exhaust Air Heat Pump system is installed to deliver heating and hot water. These will be installed within a cupboard of each dwelling and require no large external plant.

**Table 4 Be Green Services**

| Development Area | Element | Performance |
|---|---|---|
| Block B, C, D and Mews | Heating and DHW Exhaust Air Heat Pump | Winter CoP 234% |
| MV | Extract | SFP 0.29-0.32 |
| Underbuilds | Gas District Heating | SCoP: 94.9% |
| Community Halls | ASHP VRF | SCoP: 250% |

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.

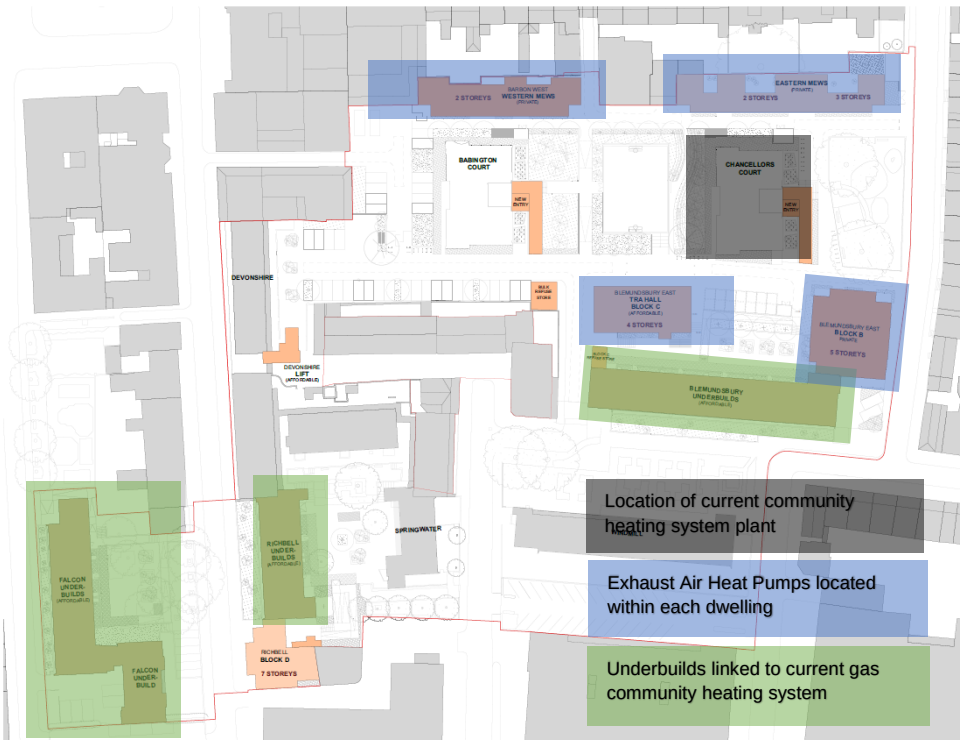



**Figure 2 Residential Site Strategy**

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.

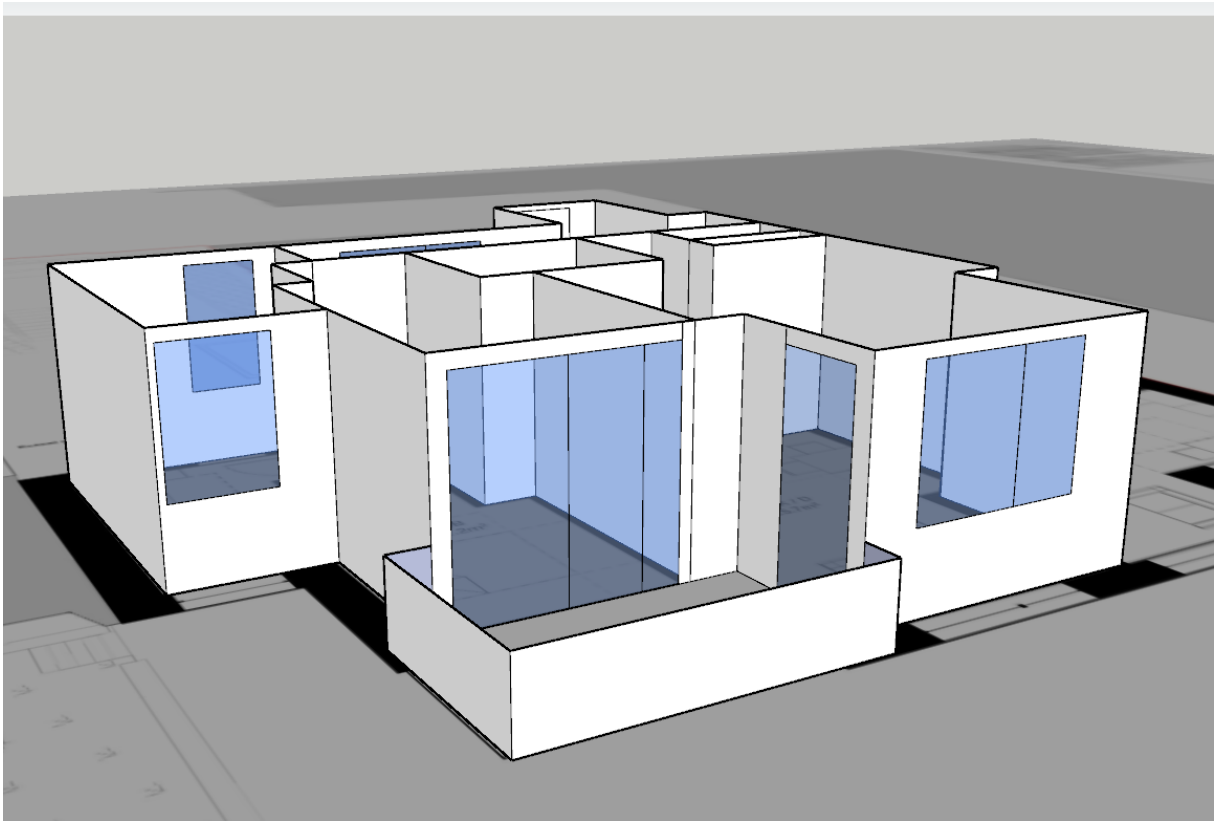


**Figure 3 Tybalds Estate Apartment Sketchup Model**

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.

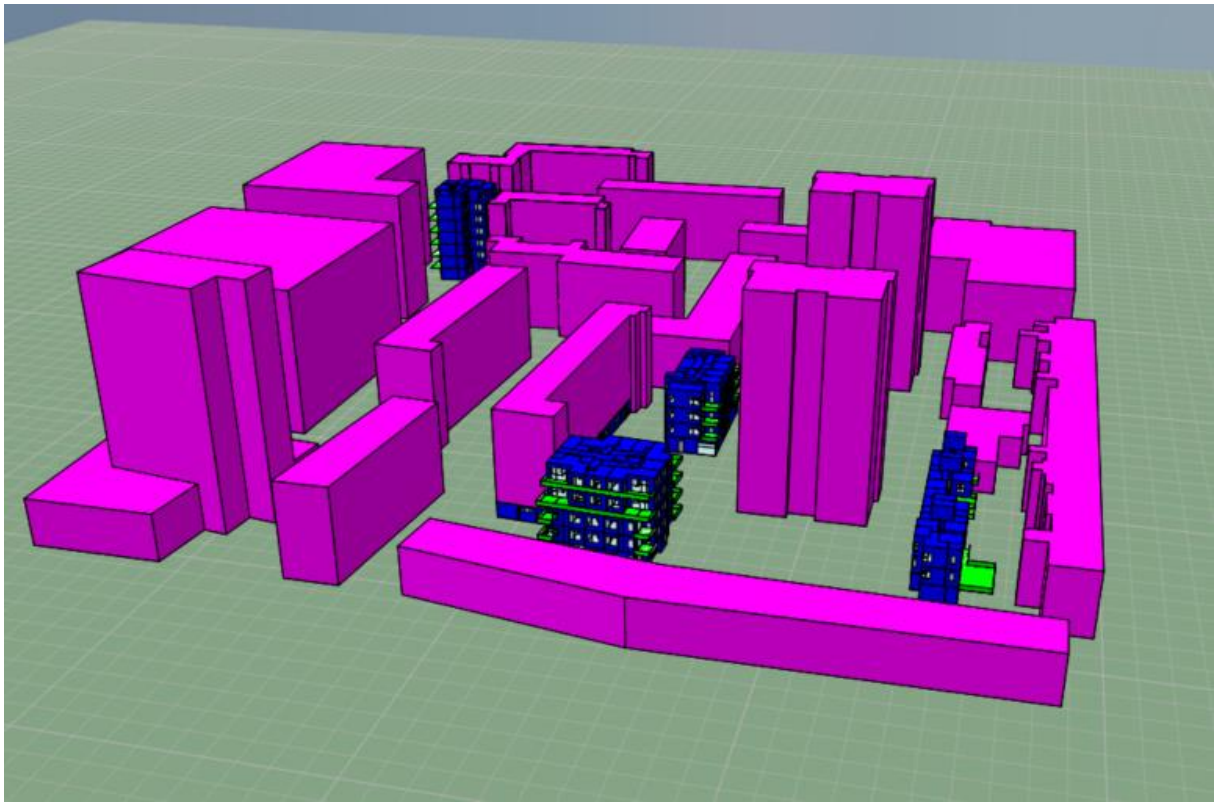


**Figure 4 Tybalds Estate IES Model**

## 7.0 RESULTS

### 7.1 Be Lean

The 'Be Lean' development achieves a Buildings Emission Rate (BER) of 63.23 tonnes.$CO_2$/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 (tonnes.$CO_2$) | BER (tonnes.$CO_2$) | % 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% |

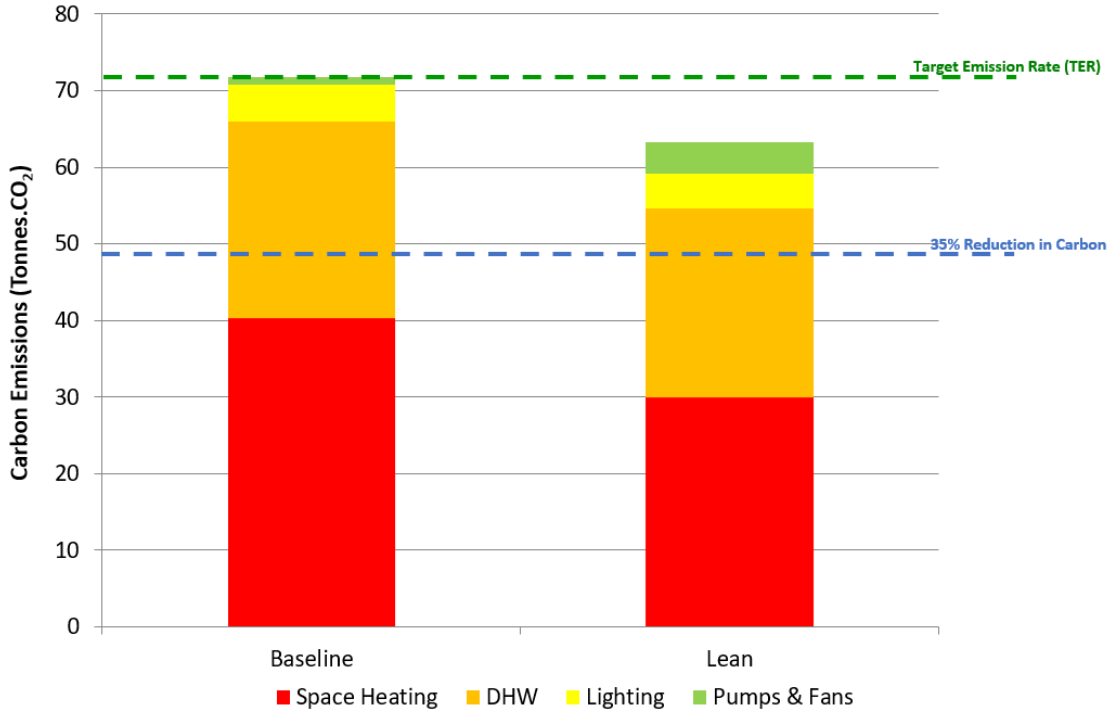



**Figure 5 Carbon Emissions of the Be Lean Building vs the Notional Building**

**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

See Section 5.2

### 7.3 Be Green

Be Green measures such as Introducing an Exhaust Air Heat Pump to deliver heating and DHW to dwellings and an ASHP to deliver DHW. There will also be 105 $m^2$ of photovoltaic panels would result in a site-wide Buildings Emission Rate (BER) of 42.52 tonnes.$CO_2$/annum. This is an improvement of 41.2% on the minimum carbon reduction targets in line with Part L of the Building Regulations (Table 10 and Figure 7).

The heat pumps and PV will generate 72% of the site's 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 (tonnes.CO2) | BER (tonnes.$CO_2$) | % 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 Green | 72.35 | 42.52 | 41.2% | 204,464 | 147,628 | 72% |

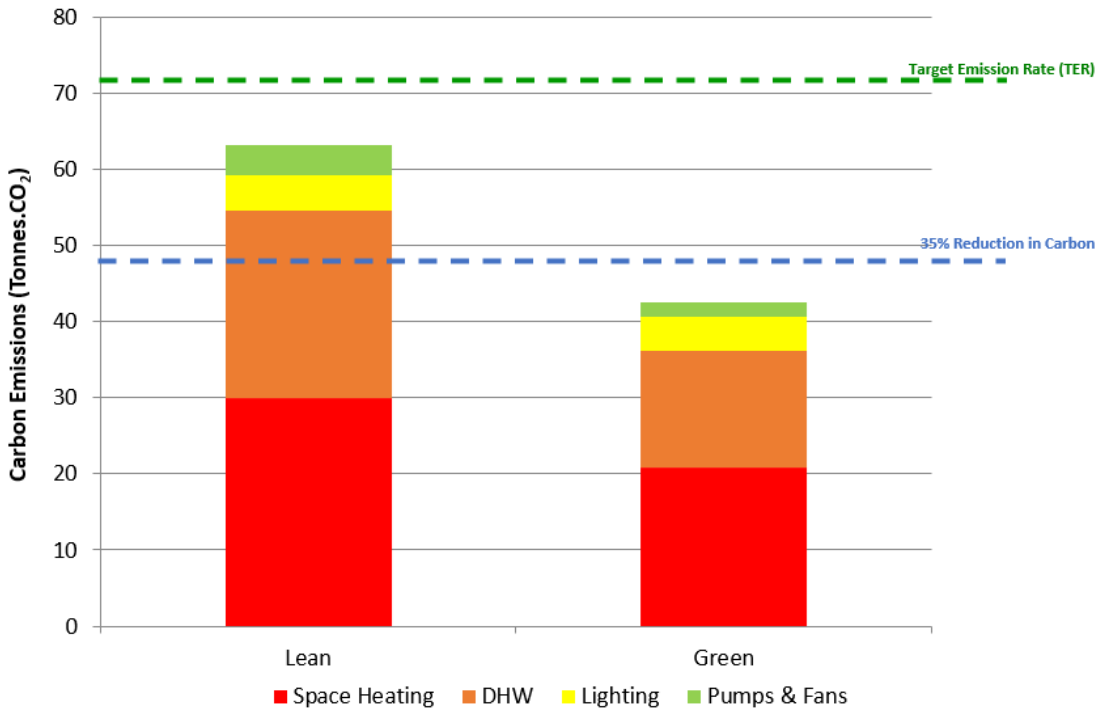



**Figure 7 Carbon Emissions of the Be Clean Building vs the Be Green**

**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).

The are no 'Be Clean' measures as per GLA Energy Assessment Guidance.

Introducing Be Green design principles provides a 41% reduction in carbon emissions over Part L Building Regulations requirements (2013) and provides 72% 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 £121,195 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 02 | **Issued on Date** | 19/01/2022 |
| **Assessment Reference** | Sample 2 BB 2B3P Lean | **Prop Type Ref** | BB 2B3P |
| **Property** | | | |

| | | | | | |
|---|---|---|---|---|---|
| **SAP Rating** | 84 B | **DER** | 17.64 | **TER** | 18.95 |
| **Environmental** | 87 B | **% DER<TER** | 6.90 | | |
| **$CO_2$ Emissions (t/year)** | 1.05 | **DFEE** | 49.34 | **TFEE** | 53.05 |
| **General Requirements Compliance** | Pass | **% DFEE<TFEE** | 7.00 | | |

| | | | |
|---|---|---|---|
| **Assessor Details** | Miss Charlotte Edwards, Charlotte Edwards, Tel: 01913 007 860, charlotte.edwards@tgace.co.uk | **Assessor ID** | T153-0001 |
| **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) | 18.95 | $kgCO_2/m^2$ | |
| Dwelling Carbon Dioxide Emission Rate (DER) | 17.64 | $kgCO_2/m^2$ | Pass |
| | -1.31 (-6.9%) | $kgCO_2/m^2$ | |

1b TFEE and DFEE

| | | | |
|---|---|---|---|
| Target Fabric Energy Efficiency (TFEE) | 53.05 | $kWh/m^2/yr$ | |
| Dwelling Fabric Energy Efficiency (DFEE) | 49.34 | $kWh/m^2/yr$ | |
| | -3.8 (-7.2%) | $kWh/m^2/yr$ | 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<br>Data from manufacturer<br>tbc tbc<br>Combi boiler<br>Efficiency: 90%<br>Minimum: 88% | Pass |
| Secondary heating system | None | |

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

Design SAP elmhurst energy

| | | | |
|---|---|---|---|
| **5 Cylinder insulation** | | | |
| Hot water storage | No cylinder | | |
| **6 Controls** | | | |
| Space heating controls | Time and temperature zone control | | Pass |
| Hot water controls | No cylinder | | |
| Boiler interlock | Yes | | Pass |
| **7 Low energy lights** | | | |
| Percentage of fixed lights with low-energy fittings | 100 | % | |
| Minimum | 75 | % | Pass |
| **8 Mechanical ventilation** | | | |
| Continuous supply and extract system | | | |
| Specific fan power | 0.66 | | |
| Maximum | 1.5 | | Pass |
| MVHR efficiency | 87 | % | |
| Minimum | 70 | % | Pass |
| **Criterion 3 – Limiting the effects of heat gains in summer** | | | |
| **9 Summertime temperature** | | | |
| Overheating risk (Thames Valley) | Slight | | Pass |
| Based on: | | | |
| Overshading | Average | | |
| Windows facing North East | 6.24 m², Overhang twice as wide as window, ratio 0.68 | | |
| Windows facing North West | 13.68 m², No overhang | | |
| Air change rate | 3.00 ach | | |
| Blinds/curtains | None | | |
| **Criterion 4 – Building performance consistent with DER and DFEE rate** | | | |
| **Party Walls** | | | |
| Type | U-value | | |
| Solid Wall | 0.00 | W/m²K | Pass |
| **Air permeability and pressure testing** | | | |
| **3 Air permeability** | | | |
| Air permeability at 50 pascals | 2.00 (design value) | | |
| Maximum | 10.0 | | Pass |
| **10 Key features** | | | |
| External wall U-value | 0.12 | W/m²K | |
| External wall U-value | 0.12 | W/m²K | |
| Party wall U-value | 0.00 | W/m²K | |
| Air permeability | 2.0 | m³/m²h | |

*This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.*

# 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, kg$CO_2$/m$^2$.annum | 17.7 |
| Target $CO_2$ emission rate (TER), kg$CO_2$/m$^2$.annum | 17.7 |
| Building $CO_2$ emission rate (BER), kg$CO_2$/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 | $U_{a\text{-}Limit}$ | $U_{a\text{-}Calc}$ | $U_{i\text{-}Calc}$ | 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 |

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m$^2$K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m$^2$K)]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m$^2$K)]

* 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 |
|---|---|---|
| m$^3$/(h.m$^2$) 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 GREEN SAP OUTPUT

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

Design SAP
elmhurst energy

| | | | |
|---|---|---|---|
| Property Reference | Sample 02 | Issued on Date | 19/01/2022 |
| Assessment Reference | Sample 2 BB 2B3P Green | Prop Type Ref | BB 2B3P |
| Property | | | |

| | | | | | |
|---|---|---|---|---|---|
| SAP Rating | 76 C | DER | 20.84 | TER | 27.23 |
| Environmental | 79 C | % DER<TER | 23.46 | | |
| $CO_2$ Emissions (t/year) | 1.73 | DFEE | 49.34 | TFEE | 53.05 |
| General Requirements Compliance | Pass | % DFEE<TFEE | 7.00 | | |

| | | | |
|---|---|---|---|
| Assessor Details | Miss Charlotte Edwards, Charlotte Edwards, Tel: 01913 007 860, charlotte.edwards@tgace.co.uk | Assessor ID | T153-0001 |
| 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) | 27.23 | $kgCO_2/m^2$ | |
| Dwelling Carbon Dioxide Emission Rate (DER) | 20.84 | $kgCO_2/m^2$ | Pass |
| | -6.39 (-23.5%) | $kgCO_2/m^2$ | |

1b TFEE and DFEE

| | | | |
|---|---|---|---|
| Target Fabric Energy Efficiency (TFEE) | 53.05 | $kWh/m^2/yr$ | |
| Dwelling Fabric Energy Efficiency (DFEE) | 49.34 | $kWh/m^2/yr$ | |
| | -3.8 (-7.2%) | $kWh/m^2/yr$ | 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 | Heat pump with radiators or underfloor - Electric JOULE Victorum HW 7784292 | |
| Secondary heating system | None | |

5 Cylinder insulation

| | | |
|---|---|---|
| Hot water storage | No cylinder | |

elmhurst energy

Page 1 of 2

Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.14r19

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

Design SAP elmhurst energy

| | | | |
|---|---|---|---|
| **6 Controls** | | | |
| Space heating controls | Time and temperature zone control | | Pass |
| Hot water controls | No cylinder | | |
| **7 Low energy lights** | | | |
| Percentage of fixed lights with low-energy fittings | 100 | % | |
| Minimum | 75 | % | Pass |
| **8 Mechanical ventilation** | | | |
| Continuous extract system | | | |
| Specific fan power | 0.29 | | |
| Maximum | 0.7 | | Pass |
| **Criterion 3 – Limiting the effects of heat gains in summer** | | | |
| **9 Summertime temperature** | | | |
| Overheating risk (Thames Valley) | Slight | | Pass |
| Based on: | | | |
| Overshading | Average | | |
| Windows facing North East | 6.24 m³, Overhang twice as wide as window, ratio 0.68 | | |
| Windows facing North West | 13.68 m³, No overhang | | |
| Air change rate | 3.00 ach | | |
| Blinds/curtains | None | | |
| **Criterion 4 – Building performance consistent with DER and DFEE rate** | | | |
| **Party Walls** | | | |
| **Type** | **U-value** | | |
| Solid Wall | 0.00 | W/m²K | Pass |
| **Air permeability and pressure testing** | | | |
| **3 Air permeability** | | | |
| Air permeability at 50 pascals | 2.00 (design value) | | |
| Maximum | 10.0 | | Pass |
| **10 Key features** | | | |
| External wall U-value | 0.12 | W/m²K | |
| External wall U-value | 0.12 | W/m²K | |
| Party wall U-value | 0.00 | W/m²K | |
| Air permeability | 2.0 | m³/m²h | |

*This report has not been submitted through the Elmhurst Energy members' portal, therefore results are subject to change when the dwelling is completed.*

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# APPENDIX E: BE GREEN 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 | $U_{a\text{-}Limit}$ | $U_{a\text{-}Calc}$ | $U_{i\text{-}Calc}$ | 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 |

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* 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 |
|---|---|---|
| $m^3/(h.m^2)$ 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 | 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/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] | 97.98 | 141.01 |
| Primary energy* [kWh/m²] | 107.6 | 108.75 |
| Total emissions [kg/m²] | 18.2 | 19.6 |

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