Phoenix Yard, 65 King’s Cross Road, London. WC1X 9LW

Energy and Sustainability Statement

Consulting Building Services Engineers

Issued 20th January 2020

75 South Western Road
Twickenham
Middlesex
TW1 1LG

Tel:- 020 8892 7947
Email:- info@ingine.co.uk
Web:- www.ingine.co.uk

CONTENTS

1. Preamble

This energy statement has been prepared in support of the planning application for Phoenix Yard, 65 King's Cross Road, London for the redevelopment of the site to provide refurbished and new commercial office space, and new residential accommodation. The development will retain the existing facades while introducing two new storeys and a glazed courtyard.

The purpose of this document is to report on the analysis of the proposed mixed-use development. The energy statement assesses compliance of the proposed development and demonstrates London Plan carbon reductions against the Part L 2013 baseline.

2. Executive Summary

This report describes how the proposed mixed-use development will respond to the objectives of reducing energy consumption and CO_2 emissions.

The approach seeks to take into account National, Regional and Local guidance and to exceed the minimum requirements of the Building Regulations.

The National policy requirement is that new developments should conserve energy by implementing energy efficient and renewable energy strategies using a defined energy hierarchy implemented in the following order;

- Use less energy
- Supply energy efficiently
- Use renewable energy

Our analysis has consisted of;

- Setting realistic targets for the thermal and environmental properties of the building to determine U-values, air permeability and glazing specifications.
- Using software modelling to calculate the energy demand and CO_2 emission reductions that can be achieved in the development by employing energy efficient techniques.
- Investigating the viability of low and/or zero carbon technologies and their contribution to achieving CO_2 emission reductions.

The design features adopted include;

- Enhanced U-values applied to all thermal elements; these are considerably better than the minimum standards by current Building Regulations.
- The inclusion of high specification, low g-value glazing and exposed thermal mass where possible to minimise summer overheating and mitigate the future effects of climate change.
- Extensive use of low energy lighting and controls.
- The limited use of solar photovoltaics (PV).

The adoption of these features found the design to exceed the requirements of the Building Regulations Part L and Camden Borough Council's 20% CO_2 emissions reduction target. The total CO_2 emissions were found to be 7.5 tonnes per annum.

3. Introduction

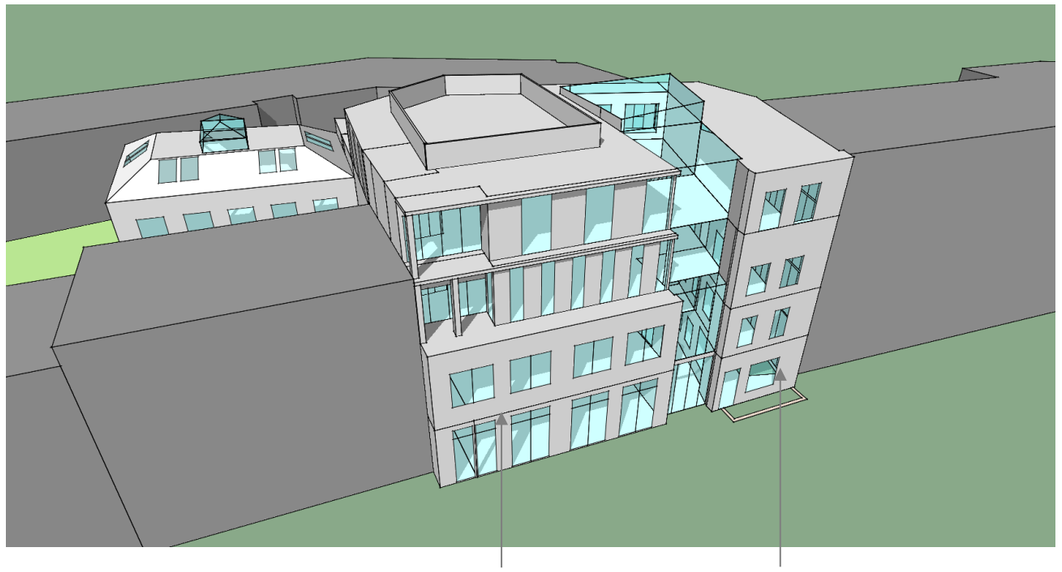
3.1. Location

The proposed development is located at Phoenix Yard, 65 King's Cross Road, London in the Borough of Camden, a busy North-South A-road.

3.2. Building Characteristics

The proposed development has the following characteristics;

- Refurbishment of 1,404.6m^2 of the existing ground, first and second floor.
- Provision of 338.3m^2 of new office and ancillary space across new second and third floors.
- Provision of four new residential dwellings totalling 351.3m^2.



4. Policy Context

4.1. General

Our approach is informed by national, regional and local planning policy. The London Plan encourages the conservation of energy in buildings by a defined energy hierarchy which should be implemented in the following order;

- Use less energy, in particular by adopting sustainable design and construction measures.
- Supply energy efficiently, in particular by prioritising decentralised energy generation.
- Using low and/or zero carbon energy generation technologies.

The hierarchy has been used in parallel with the requirements of current Building Regulations for the conservation of fuel and power Part L 2013, which sets out specific benchmarks for the performance of the basic building design.

The structure of this report follows the ordered approach of the hierarchy, illustrating compliance with Building Regulations and using less energy, supplying energy efficiently, and deploying an effective renewable energy solution to the building.

4.2. National Policy

The National Planning Policy Framework was amended and reissued in July 2018.

- **Achieving Sustainable Development** - to achieve sustainable development the economic, social and environmental objectives are to be pursued in mutually supportive ways.
- **Planning for climate change** – to provide a positive strategy through the use of appropriate renewable and low carbon energy and heat.

4.3. Regional Policy

The improvement in design on 2013 non-domestic buildings will meet or exceed current building regulations requirements.

Chapter 5 of The London Plan 2016 ‘London’s Response to Climate Change’ reiterates national Policy. A CO_2 emission reduction of 60% below 1990 levels by 2025 is sought by The Mayor in order to mitigate the impact of climate change. Where possible the CO_2 reduction targets should be met on site. Sustainable design and construction will minimise CO_2 emissions across the site, while avoiding overheating and contributing to the urban heat island effect. The use of renewable energy systems will minimise adverse impact on the surrounding context.

The design should;

- Demonstrate at least a 35% on-site reduction beyond Part L 2013 for non-residential development.
- Reduce regulated CO_2 emissions below those of a development compliant with Building Regulations Part L 2013 through energy efficiency measures alone.

The design will ‘reduce the impact of the urban heat island effect in London and encourage the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis’ (The London Plan 2016 Policy 5.9).

The London Plan ‘intend to publish’ (December 2019) is a material consideration that will deliver a more integrated and sustainable city that supports health and wellbeing. This London Plan will run from 2019 to 2041 to address the pressure placed on land, housing, infrastructure and the environment. Policies relevant to the proposed refurbishment include;

- **GG6 Increasing efficiency** to ensure buildings and infrastructure are designed to adapt to a changing climate, making efficient use of water, reducing impacts from natural hazards like flooding and heatwaves, while mitigating and avoiding contributing to the urban heat island effect.
- **G5 Urban greening** should contribute to the greening of London by including urban greening as a fundamental element of site and building design, and by incorporating measures such as green roofs, green walls and nature-based sustainable drainage.
- **G6 Biodiversity and access to nature** to secure a net biodiversity gain and seek opportunities to create other habitats.
- **SI 1 Improving air quality** by not leading to deterioration of existing poor air quality by being at least Air Quality Neutral.
- **SI 2 Minimising greenhouse gas emissions** by using less energy (**be lean**), supplying energy efficiently (**be clean**), use renewable energy (**be green**) and monitor, verify and report on energy performance (**be seen**).
- **SI 4 Managing heat risk** by minimising adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure and follow the cooling hierarchy below.
- **SI 5 Water infrastructure** shall minimise the use of mains water by achieving BREEAM ‘excellent’ for Wat 01.
- **SI 7 Reducing waste** whereby construction and demolition shall meet or exceed a 95% reuse/recycling/recovery rate. The design should promote circular economy outcomes and aim to be net zero-waste.
- **SI 13 Sustainable drainage** should aim to achieve greenfield run-off rates in line with the drainage hierarchy that treats rainwater in the following order; (1) a resource, (2) infiltration to ground at or close to source, (3) attenuation through green infrastructure or (4) controlled discharge to infrastructure.

The design should;

- Include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.
- Make a reduction of at least 35% beyond Building Regulations for major development. Residential development should achieve 10%, and non-residential development should achieve 15% through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, through a cash-in-lieu contribution to the boroughs carbon offset fund.

In order to meet this aim, the following cooling hierarchy should be observed;

- 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 systems (ensuring they are the lowest carbon options).

As part of a fabric-first approach, blue/green roofs aid cooling (adaptation), while acting as sustainable urban drainage, aiding energy efficiency (mitigation), and enhancing biodiversity.

Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should be designed to avoid the need for energy intensive air conditioning systems as much as possible.

4.4. Local Policy

Camden Borough Council has reviewed its Planning Guidance documents to support the delivery of the Camden Local Plan following its adoption in 2017. The updated guidance was issued in March 2019 and is summarised as follows;

- **CC1 Climate change mitigation** through implementation of the energy hierarchy.
- **CC2 Adapting to climate change** discourages active cooling unless thermal modelling demonstrates otherwise after all other cooling hierarchy measures are considered.
- **CC3 Water and flooding** to ensure that development does not increase flood risk and reduces the risk of flooding where possible.
- **CC4 Air quality** to ensure that the impact of development on air quality is mitigated.
- **CC5 Waste** to reduce the amount of waste produced in the borough.
- **CPG3 Renewable energy technologies -** developments are to target a 20% reduction in carbon dioxide emissions from on-site renewable energy technologies. Where space allows, solar thermal hot water panels are to meet 100% of the site's summer hot water needs, which equates to 50-60% of the annual demand. Photovoltaics will not impact on bats or birds and visual amenity. Air and ground source heat pumps need to have a COP of 4 or more to be considered renewable, with GSHP to be considered if the geology is suitable. Wind technology will be assessed for the impact on neighbouring properties, particularly flicker, noise and vibrations.
- **CPG Energy Efficiency and Adaptation**, in support of CC1 and CC2, supports national and regional policy through the ‘be lean, be clean, and be green’ energy hierarchy, and make the most of sunlight while observing the cooling hierarchy.
- **BREEAM ‘excellent’ for refurbishment** to be achieved for commercial accommodation.
- **BRE Home Quality** Mark to be used for residential accommodation.

5. Calculation Methodology

5.1. Non-domestic Methodology

The method employed for the non-domestic energy calculations to demonstrate compliance with the Building Regulations Part L of the proposed development is as detailed in the Simplified Building Energy Model (SBEM) BRUKL standard. These procedures calculate the predicted carbon emissions from the heating, fixed lighting, hot water and other building services systems and compliance achieved when the predicted annual carbon emissions in each unit is lower than a notional value as set out in the SBEM 2013 documentation. The thermal model was constructed in IES-VE in accordance with CIBSE AM11. The method was used to calculate the emissions for the commercial office space and residential common areas.

5.2. Domestic Methodology

The method employed for the domestic energy calculations to demonstrate compliance with the Building Regulations Part L of the proposed development is as detailed in the Standard Assessment Procedure (SAP) BRUKL standard. These procedures calculate the predicted carbon emissions from the heating, fixed lighting, hot water and other building services systems and compliance is achieved when the predicted annual carbon emissions in each unit is lower than a notional value as set out in the SAP 2012 documentation. The method was used to calculate the emissions for the residential accommodation.

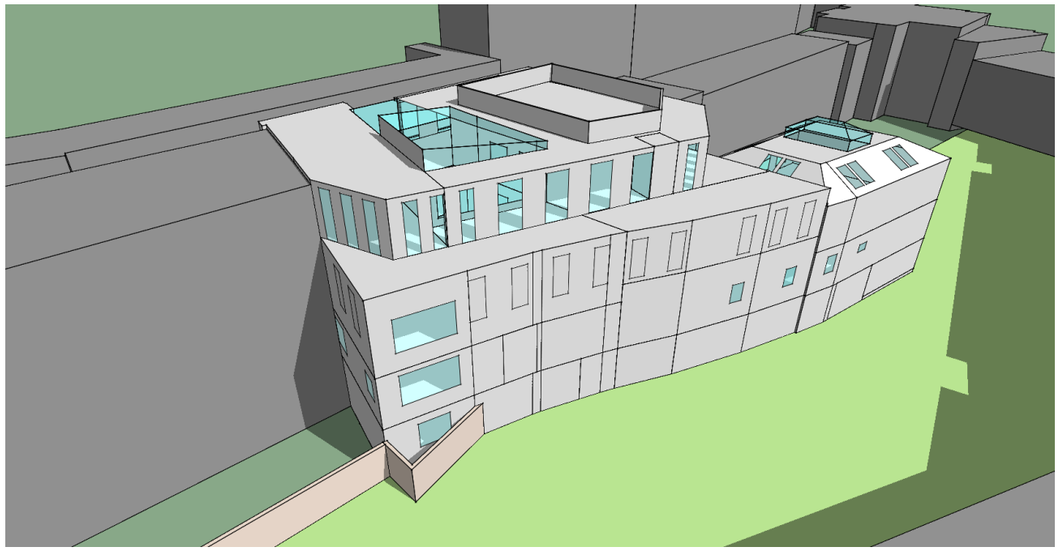
5.3. Results

The results of the calculation differentiate between the carbon emissions of regulated and unregulated loads of the proposed design.

Regulated energy is building energy consumption resulting from the specification of controlled, fixed building services and fittings, including space heating and cooling, hot water, ventilation, fans, pumps and lighting. Such energy uses are inherent in the design of a building.

Unregulated energy is building energy consumption resulting from a system or process that is not 'controlled'. This may include energy consumption from systems integral to the building and its operation, e.g. IT equipment, lifts, external lighting, servers, printers, photocopiers, laptops, cooking, audio-visual equipment and other appliances. Some buildings can have unregulated energy accounting for 50% of total energy use.

The Target Emissions Rate (TER), Building Emissions Rate (BER) and Dwelling Emissions Rate (DER) include both regulated and unregulated energy use. The carbon emission reduction is calculated for the regulated load.



6. Energy Analysis

6.1. Compliance with Building Regulations

The first stage of our energy analysis ensures compliance with the Building Regulations by following the energy hierarchy;

- Use less energy – be lean.
- Supply energy efficiently – be clean
- Use renewable energy – be green

Building Regulations Part L2A requires that the annual CO_2 building emission rate (BER), calculated using the approved SBEM methodology, should not exceed the target emission CO_2 emission rate (TER). The TER is based upon the performance of a newly defined Notional Building, which is the same size and shape as the proposed building but constructed according to reference values, e.g. U-values, heating system etc. which are more rigorous than 2013 Building Regulations. The units of the BER and TER are $kgCO_2/m^2/year$.

6.2. Be Lean

Complying with the first stage of the energy hierarchy may be achieved by incorporating 'passive' energy efficiency measures to reduce the demand for energy rather than meeting a larger demand from other sources. The following strategies will be included in the design to enhance the energy efficiency of the proposed building.

6.2.1. Design

- While the building orientation, form and mass is pre-determined by refurbishment and the existing context, the design will admit sufficient daylight while mitigating overheating through shading, albedo, fenestration, insulation and blue/green roofs.
- The improvement of existing elements will improve the efficiency of the building fabric.
- The introduction of new elements will improve the efficiency of the building fabric.
- Exposed thermal mass will be retained where possible, for example within the new atrium.

6.2.2. Building Elements

- The development consists in part of existing construction with pre-1900 U-values considered as follows;

Element	Existing U-values (W/m^2K)
Walls	2.12
Roof	2.63
Floor	3.37
Windows	5.60
Roof lights	2.30
Air permeability	15 m^3/hm^2 @50Pa

- With improved insulation, exceeding Part L requirements, the U-values of the proposed new and refurbished building elements are summarised as follows;

Element	Limiting U-values (W/m^2K)	Proposed U-values (W/m^2K)
Walls	0.35	0.18
Roof	0.25	0.15
Floor	0.25	0.15
Windows	2.20	1.50
Roof lights	2.20	2.20
Air permeability	10 m^3/hm^2 @50Pa	5 m^3/hm^2 @50Pa

- The use of blue/green roofs to mitigate the urban heat island effect, reduce rainwater run-off rates and increase biodiversity.
- Double glazed, argon filled windows with a U-value as low as 1.50 W/m^2K minimise heat losses through openings.
- Glazing total solar transmittance (G-value) – 0.32 (south, east and west façade glazing), (0.4 north façade glazing)
- Glazing Visible Light Transmission (VLT) – 0.60 (south, east and west façade glazing); VLT-0.70 (north façade glazing).
- Accredited construction details to new elements to reduce unwanted air infiltration, certified air-tight windows and post completion air-pressure testing to ensure compliance with design standards.

6.2.3. Non-domestic Building Services

- Renewal and extension of the existing heating and hot water building services for increased efficiency, with enhanced controls and metering using a low NO_x solution. In order to minimise NOx emissions arising from heating and hot water systems the replacement system will achieve NOx emissions of <40 mg/m^3 and an energy efficiency rating >90%.
- A cost-effective future connection to a heat network.
- Occupant-controlled natural ventilation.
- Sub-metered intelligent, zoned light controls and low-energy light fittings.
- External light fittings will not be used unless for security purposes.

- Low energy equipment and eco-labelled goods rated to a minimum rating of A+.
- Heating season only mechanical ventilation with heat recovery to office areas.
- Mechanical ventilation with heat recovery to sanitary zones.

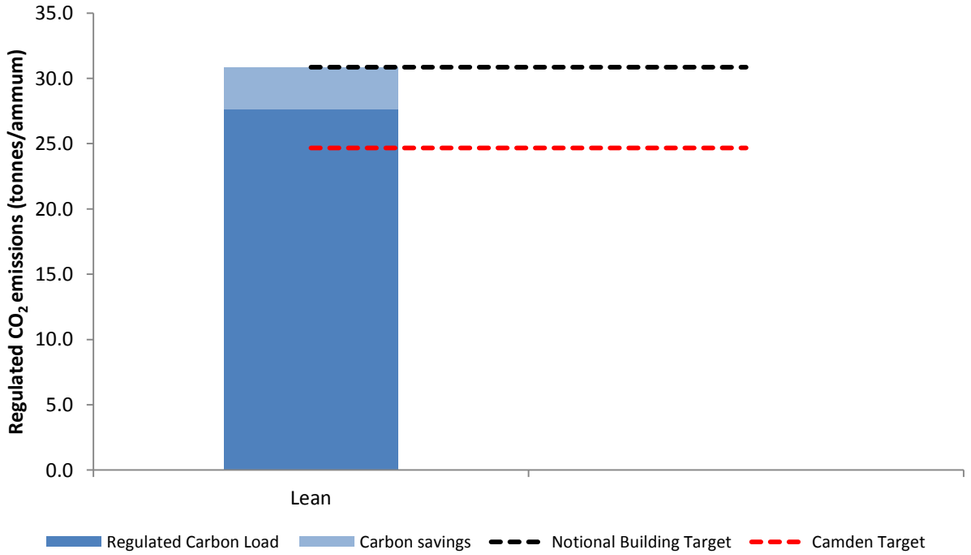
6.2.4. Domestic Building Services

- Electric panel heaters to common circulation areas with natural ventilation.
- Efficient gas condensing combi boilers feeding radiator heating and domestic hot water.
- Low-energy light fittings.
- Natural ventilation.
- Local intermittent mechanical ventilation to kitchen and sanitary zones.

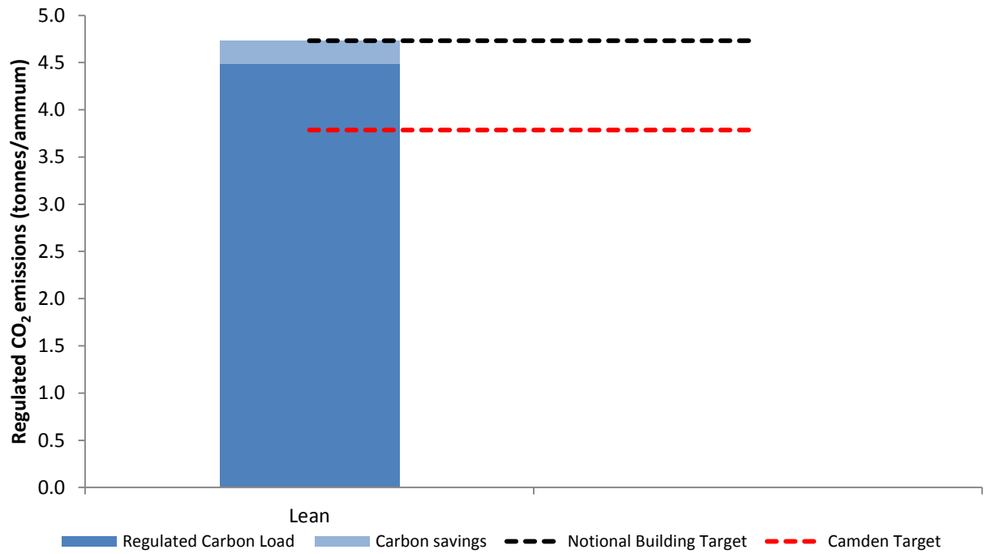
6.2.5. Be lean CO_2 emissions

Part L calculations were completed for the significant constituent zones as follows;

Non-domestic zone	TER ($kgCO_2/m^2/yr.$)	BER ($kgCO_2/m^2/yr.$)	Regulated CO_2 reduction
Existing commercial	15	13.7	11.1%
New commercial	16.8	15.4	9.8%
Domestic common area	12.4	12.2	17.3%
Whole area	15.4	14.1	10.3%



Domestic zone	TER ($kgCO_2/m^2/yr.$)	DER ($kgCO_2/m^2/yr.$)	Regulated CO_2 reduction
First floor flat	17.61	16.22	
Second floor studio	28.70	25.49	
Second floor flat	20.73	19.75	
Third floor flat	18.52	18.84	
Whole block (average)	20.34	19.29	5.2%

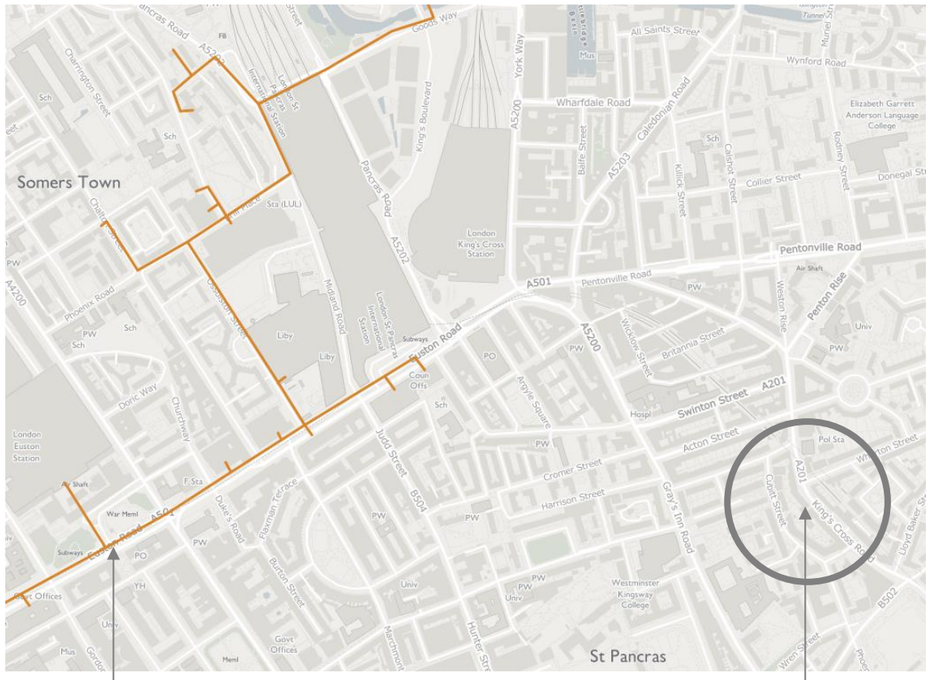


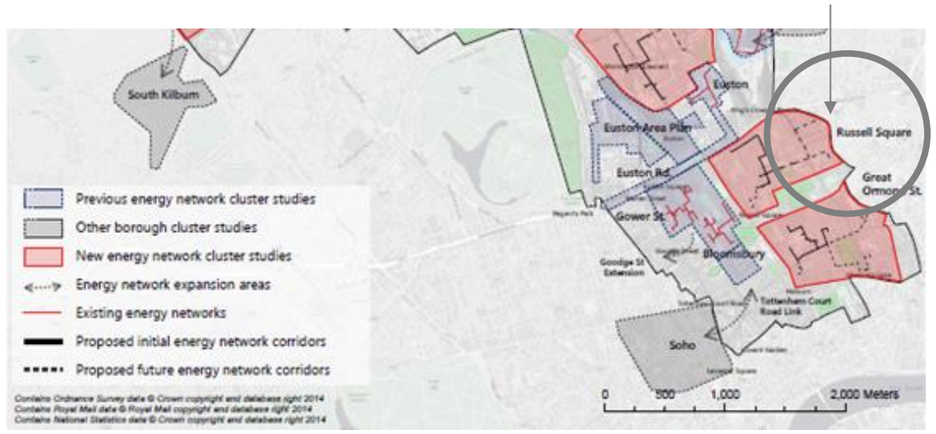
The ‘be lean’ measures considered result in an annual carbon emission's saving of approximately 3.4 tonnes of CO_2 per annum for all the commercial and residential spaces.

6.3. Be Clean

6.3.1. District Heating

The London Heat Map has been reviewed and no district heating sources are known to be available in close proximity to the proposed development, as illustrated in the image below. However, with heating networks potentially built in the area in the future, provision will be made for future connection to a system should it be installed at a later date.





6.1. Be Green

6.1.1. Low/Zero Carbon Technologies

Once energy efficiency measures have been applied, the next step is to consider the introduction of low and zero carbon technologies (LZCT) to reduce the CO_2 emissions produced by the energy consumed by the building.

LZCT harness non-fossil fuel energy (for example sun, wind and water power) to generate heat or electricity whilst not producing any CO_2 emissions and include;

- Photovoltaic panels
- Solar thermal panels
- Wind turbines
- Hydropower

Low carbon technologies use fossil fuels to generate heat or power more efficiently, or use fuels that have a low CO_2 footprint, such as biofuel. These technologies result in lower CO_2 emissions than traditional mains gas or electricity use, and include;

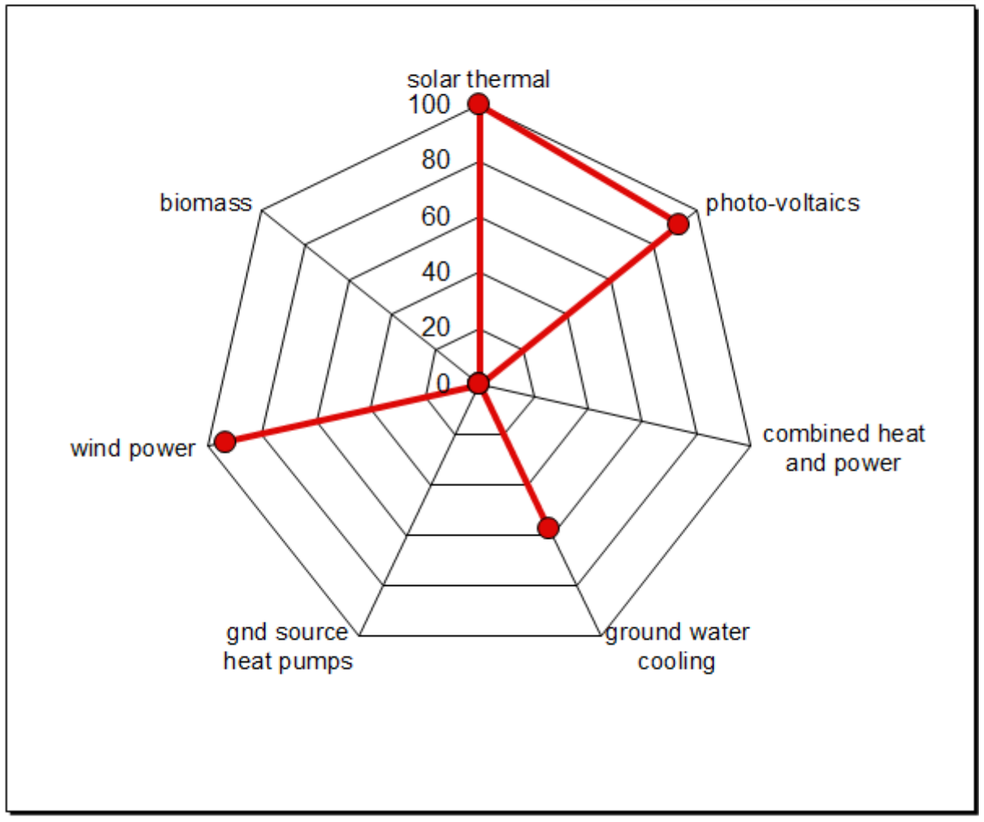
- Geothermal and ground source heat pumps
- Air source heat pumps (applicable when used for heating)
- Biomass heating and CHP

The initial renewables selection process has been formalised into a tool (TM38) by CIBSE. Using the information provided in the specifications and knowledge of the site, the output of this tool is as shown.

The spider diagram shows which technologies are worthy of further consideration; the closer to the outside of the 'web' the point is, the more viable it is likely to be. The tool is only an indication and technologies may be included or discounted due to other factors.

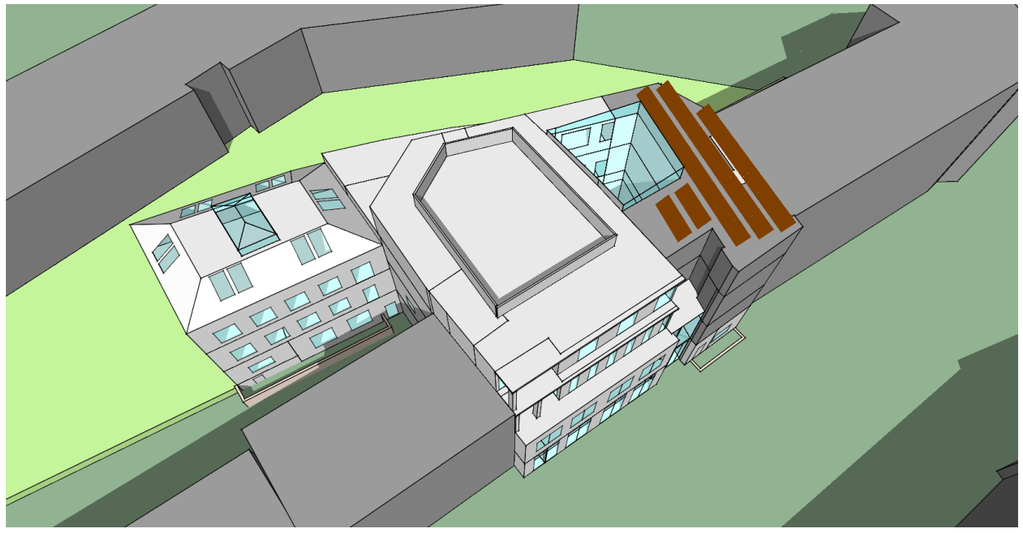
Building Information	
Type	**offices**
Location	**urban**
Exposure	**normal**

Ranking	
Cost Effectiveness:	4
Carbon Savings:	5
Marketing / Image:	3
Technology Risk:	5



6.1.2. Solar Photovoltaic Panels

Solar photovoltaic (PV) power takes advantage of the photovoltaic effect to generate electricity. It is anticipated that 40% of the third floor flat roof may be utilised by PV, with remainder for other services and safe access.



Proposed PV

Each accommodation zone is equipped with the following PV array;

Accommodation zone	PV Panels and area
First floor flat	1 (1.63m^2)
Second floor studio	1 (1.63m^2)
Second floor flat	1 (1.63m^2)
Third floor flat	2 (3.26m^2)
Non-domestic	24 (39.14m^2)

Assuming high performance modules with an efficiency of 22.7% are utilised this equates to a peak output of 370 W/panel. Thus, the peak output of the 47.3m^2 array would be 10.73 kW(p).

The generally accepted annual UK performance for a London PV array is for each kW(p), between 800 and 1000 kWh of electricity will be generated each year. Assuming mid-range, the system could generate 9,657 kWh per annum.

Capital cost of system @ £665/m^2	£31,454
Average cost per unit of electricity	£0.14/kWh
Electricity generated by system per annum	9,657 kWh
Saving on electricity from utility per annum	£1,352
Simple payback	23.3 yrs.

The annual carbon emission saving is estimated to be 4.1 tonnes per annum.

6.1.3. Discounted LZCT

The following low and zero carbon technologies have also been considered, but discounted for this project

Solar thermal panels use heat from the sun to heat domestic hot water. Solar thermal realises very little benefit when compared to the additional complexities of installation involved. It is expected that domestic hot water demand in the building will be served instantaneously. Therefore, the benefits from a solar thermal array are reduced and this technology is not deemed to be economically viable.

Wind turbines use the wind's lift forces to turn aerodynamic blades that turn a rotor thus generating electricity. Wind turbines have a significant visual impact and can create noise and vibration issues. Therefore a wind turbine installation would not be recommended.

Hydro-based technologies use power from water flow to generated energy. The development is located in an urban location without any waterways nearby, and therefore deemed unviable.

Biomass boilers use natural resources as fuel for combustion. Biomass heating is deemed to be a carbon neutral process, as the carbon emissions from burning biomass are balanced by those absorbed during its growth. Biomass boilers are considered renewable energy technologies, subject to the distance of the biomass source. At the logistically challenging central London location of the proposed development there is not sufficient space to house a biomass boiler, its fuel delivery system and fuel storage, and this is therefore deemed unviable.

Heat pumps extract heat from the ground or air and save carbon emissions with a renewable source of electricity is used to power them, and do not require fuel storage. Heat pumps are discounted in keeping with the cooling hierarchy and to reduce mass and form of the roof-top plant.

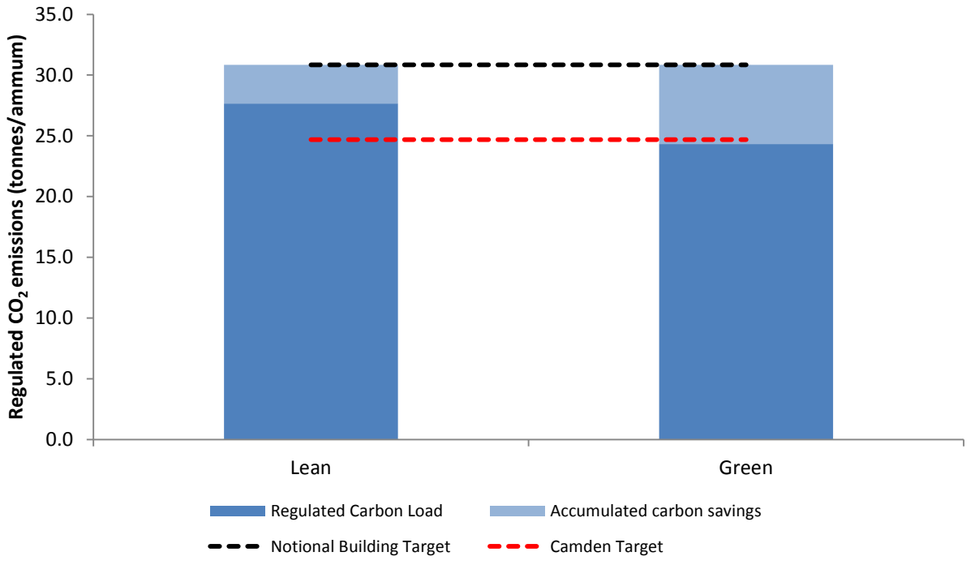
6.1.4. Be green CO_2 Emissions

The ‘be green’ measures considered result in an annual carbon emission's saving of approximately 4.1 tonnes of CO_2 per annum for all the commercial and residential spaces.

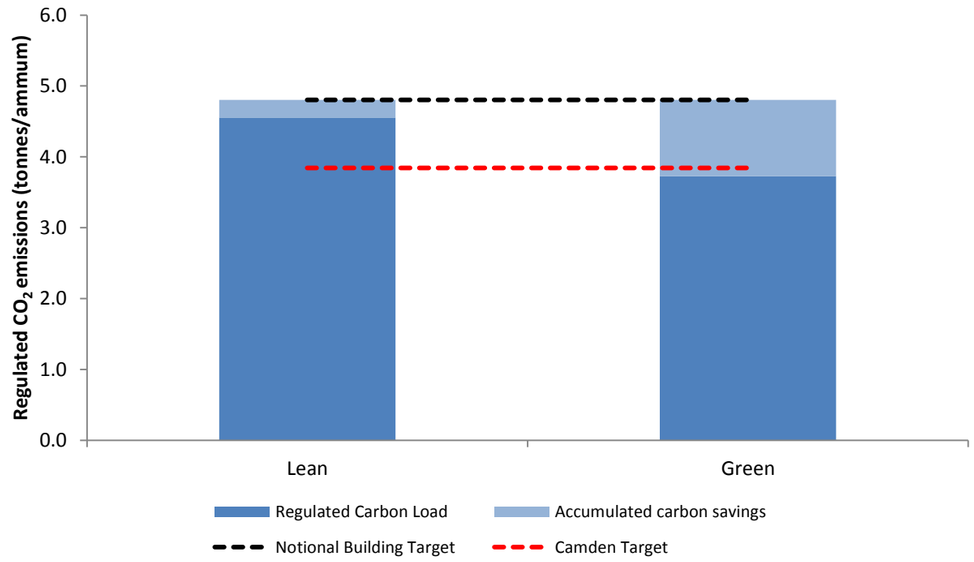
6.1.5. Building Services and LZCT CO_2 Emissions

Part L calculations for the inclusion of PV were completed for the significant constituent zones as follows;

Zone	TER ($kgCO2/m^2/yr.$)	BER / DER ($kgCO2/m^2/yr.$)	Regulated CO_2 reduction
Whole non-domestic	15.4	12.4	21.1%
Whole domestic	20.3	15.8	22.4%



Proposed non-domestic PV CO_2 emission reduction



Proposed domestic PV CO_2 emission reduction

7. Sustainability

The proposed development will meet the sustainability targets in accordance with BRE UK Refurbishment and Fit-out (2014) to achieve BREEAM 'excellent' and BRE Home Quality Mark One (2018).

7.1. Visual Comfort

Visual comfort in the commercial accommodation will be maintained through the use of internal mesh blinds that are 3% open in order to maintain views out while reducing glare and contributing to a reduction in overheating.

For the commercial accommodation vertical glazing area equates to 10% of the anticipated gross internal floor area, while roof lights equate to 4% of the anticipated gross internal floor area.

The main occupied office areas of the concept design were analysed for daylight factor using climate-based daylight modelling and found to be;

Room	Min	Max	Average	Floor area of interest >2%	Uniformity
Ground floor (existing)	0.3	17.1	3.1	39%	0.2
First floor (existing)	0.7	53.4	7.5	88%	0.1
Second floor (existing and new)	3.5	29.8	11.0	67%	0.2
Third floor (new)	0.6	40.7	3.3	55%	0.2

7.2. Thermal Comfort

The design intent is for the refurbished building to be naturally ventilated through occupant-openable windows that will be supplemented with mechanical ventilation and heat recovery during the heating season. In combination with occupant-openable acoustically attenuated vents to the rear elevation and the louvre openings to the glazed atrium roof-level upstand walls, the strategy will meet the requirements of CIBSE TM52 Adaptive Thermal Comfort Criterion 1 and 3 for the current design year in providing stack effect and cross-ventilation to maintain occupant adaptive thermal comfort.

In accordance with Greater London Authority guidance (April 2015), thermal modelling was carried out using weather data and guidance from CIBSE Design Summer Years for London (TM49: 2014). The current and future weather files account for both the Urban Heat Island effect and for future climate change;

- 2003, a year with a very intense single warm spell.
- 1976, a year with a prolonged period of sustained warmth.

These weather files are commonly identified as DSY2 and DSY3 respectively.

The proposed refurbishment was tested against the following current and future weather scenarios;

- London DSY 05 (current design year).
- DSY2 London Weather Centre 2020s high emissions scenario in the 50th percentile for the period 2011 to 2040.
- DSY3 London Weather Centre 2020s high emissions scenario in the 50th percentile for the period 2011 to 2040.
- DSY2 London Weather Centre 2050s medium emissions scenario in the 50th percentile for the period 2041 to 2070.
- DSY3 London Weather Centre 2050s medium emissions scenario in the 50th percentile for the period 2041 to 2070.

CIBSE TM52 defines adaptive thermal comfort as;

- Criterion 1 sets a limit of 3% on the number of occupied hours that the operative temperature can exceed the threshold comfort temperature by 1K or more during the occupied hours during May to September.
- Criterion 2 deals with the severity of overheating within any one day, which can be as important as its frequency. This criterion sets a daily limit for acceptability and this should not be more than six degree-hours.
- Criterion 3 sets an absolute maximum temperature 4°C for a room, beyond which the level of overheating is unacceptable during May to September.

The thermal model for the range of climate scenarios found the average TM52 Criterion for the occupied office spaces to be;

Criterion	Current	Future
1	2%	Up to 9%
2	18 deg. hrs.	Up to 45 deg. hrs.
3	4^{o}C	Up to 8^{o}C

The occupant 'predicted mean vote' of the commercial accommodation was found to be 'slightly cool' to 'cool' for the office spaces during occupied hours. Future results suggest that occupant 'predicted mean vote' would range from 'slightly cool' to 'slightly warm'.

The residential accommodation found to pass the SAP 2012 overheating assessment.

The thermal model for the range of climate scenarios found indoor and outdoor operative temperature ranges for the main occupied office spaces to be;

Value	Outdoor temperature range	Indoor temperature range
Minimum	-4.6 - 0.5°C	14.8 - 15.7°C
Maximum	31.8 - 40.0°C	32.1 - 40.6°C
Average	11.44 - 14.7°C	20.9 - 22.1°C

The minimum indoor operative temperatures were typically found to occur at 07:30am, while peak indoor operative temperatures were typically found to occur at 17:30pm

7.3. Energy

The use of blue/green roofs will be used to mitigate the urban heat island effect, reduce rainwater run-off rates and increase biodiversity. A green/blue roof will be laid on the third floor roof to surround the plant enclosure and sedum laid below the PV while maintaining safe maintenance access.

The mechanical ventilation and heat recovery will be accommodated in an acoustically attenuated roof-top plant enclosure. The design intent is to minimise the form and pass of the plant enclosure by discounting the use of ASHP for heating and cooling which would otherwise require larger plant.

7.4. Water

The building services design will reduce water consumption through the appropriate selection of efficient fixtures and fittings in meeting the BRE requirements.

7.5. Materials

The fabric-first approach to the refurbishment of the building will reduce the environmental impact of the design through the responsible and appropriate selection of durable materials put to efficient use in meeting the BRE requirements.

7.6. Pollution

The passive design of the proposed refurbishment does not require the use of refrigerants as part of the building services strategy. The renewal and extension of the existing heating and hot water building services will reduce the NO_x emissions in meeting the BRE requirements.

External light fittings shall not be employed unless required for security purposes. This will reduce unnecessary light pollution, energy consumption and nuisance to neighbouring properties in meeting the BRE requirements.

7.7. BREEAM

Of the twenty-two BREEAM Refurbishment sections accounting for up to 65 credits, approximately 48 credits may be targeted for the above in achieving an ‘excellent’ rating.

8. Conclusion

An energy assessment of the proposed Phoenix Yard development has been carried out against a non-domestic emission target of 24.7 tonnes of CO_2 per annum and a non-domestic emission target of 3.8 tonnes of CO_2 per annum.

Various energy reduction measures have been considered to reduce energy consumption;

- Taking a fabric-first approach.
- The installation of high performance glazing.
- Efficient space heating and hot water.
- The use of roof-top solar PV.

The outcomes at each stage are affected by the carbon factor of kg/kWh for gas and electricity.

Considering the combination of all measures, the CO_2 emissions per annum were found to exceed the minimum requirement of 20%.

Non-domestic	**Regulated** (tonnes CO_2 per annum)	**Savings** (tonnes CO_2 per annum)	**Savings** (%)
Part L 2013	30.8		
Be lean	27.7	3.2	10.3%
Be clean	-	-	-
Be green	24.3	3.3	12.0%
Overall		6.5	21.1%

Proposed non-domestic CO_2 emission reduction

Domestic	**Regulated** (tonnes CO_2 per annum)	**Savings** (tonnes CO_2 per annum)	**Savings** (%)
Part L 2013	4.8		
Be lean	4.6	0.2	5.2%
Be clean	-	-	-
Be green	3.7	0.8	18.2%
Overall		1.1	22.4%

Proposed domestic CO_2 emission reduction

9. Building Regulations Part L

9.1.1. Non-domestic be lean

BRUKL Output Document
HM Government
Compliance with England Building Regulations Part L 2013

Project name

Phoenix Yard — As designed

Date: Mon Dec 23 12:43:29 2019

Administrative information

Building Details
Address: 65 King's Cross Road, London, WC1X 9LW

Certification tool
Calculation engine: SBEM
Calculation engine version: v5.6.a.2
Interface to calculation engine: Virtual Environment
Interface to calculation engine version: v7.0.12
BRUKL compliance check version: v5.6.a.1

Owner Details
Name:
Telephone number:
Address: , ,

Certifier details
Name: Ingine
Telephone number: 020 8892 7947
Address: 75 South Western Road, Twickenham, TW1 1LG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	15.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	15.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.1
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	0.18	2.12	GR00000D_W7
Floor	0.25	0.15	0.15	CY000000_F
Roof	0.25	0.16	1.09	BS000001_C_A1
Windows***, roof windows, and rooflights	2.2	1.53	1.7	SC000000_C_O0
Personnel doors	2.2	2.2	2.2	CY000000_W5_O2
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = 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
$m^3/(h.m^2)$ at 50 Pa	10	8.5

9.1.2. Non-domestic be green

BRUKL Output Document
HM Government
Compliance with England Building Regulations Part L 2013

Project name

Phoenix Yard — As designed

Date: Mon Dec 23 13:36:23 2019

Administrative information

Building Details
Address: 65 King's Cross Road, London, WC1X 9LW

Certification tool
Calculation engine: SBEM
Calculation engine version: v5.6.a.2
Interface to calculation engine: Virtual Environment
Interface to calculation engine version: v7.0.12
BRUKL compliance check version: v5.6.a.1

Owner Details
Name:
Telephone number:
Address: , ,

Certifier details
Name: Ingine
Telephone number: 020 8892 7947
Address: 75 South Western Road, Twickenham, TW1 1LG

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	15.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	15.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	12.4
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	0.18	2.12	GR00000D_W7
Floor	0.25	0.15	0.15	CY000000_F
Roof	0.25	0.16	1.09	BS000001_C_A1
Windows***, roof windows, and rooflights	2.2	1.53	1.7	SC000000_C_O0
Personnel doors	2.2	2.2	2.2	CY000000_W5_O2
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = 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
$m^3/(h.m^2)$ at 50 Pa	10	8.5

9.1.3. Domestic be lean

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Block Reference	974	Issued on Date	03/01/2020
Block Name	Phoenix Yard		
Assessor Details	Mr. Nick Walker, Nick Walker, Tel: 02088927947, nick.walker@michaelpopper.com	Assessor ID	Admin
Client			

Block Compliance Report - DER

Block Reference: 974		Block Name: Phoenix Yard		
Property-Assessment Reference	Multiplier	Floor Area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)
First Flat-001 (gas)	1	72.15	16.22	17.61
Second Studio-001 (gas)	1	37.71	25.49	28.70
Second Flat-001 (gas)	1	50.12	19.75	20.73
Third Flat-001 (gas)	1	76.14	18.84	18.52
Totals:	4	236.12	80.30	85.56
Average DER = 19.29 $kgCO_2/m^2$			PASS	
Average TER = 20.34 $kgCO_2/m^2$				

Block Compliance Report - DFEE

Block Reference: 974		Block Name: Phoenix Yard		
Property-Assessment Reference	Multiplier	Floor Area (m^2)	DFEE ($kWh/m^2/yr$)	TFEE ($kWh/m^2/yr$)
First Flat-001 (gas)	1	72.15	37.32	46.17
Second Studio-001 (gas)	1	37.71	67.87	72.88
Second Flat-001 (gas)	1	50.12	44.40	50.77
Third Flat-001 (gas)	1	76.14	51.71	53.05
Totals:	4	236.12	201.30	222.87
Average DFEE = 48.34 $kWh/m^2/yr$			PASS	
Average TFEE = 53.63 $kWh/m^2/yr$				

elmhurst energy Page 1 of 1 Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.10r08

9.1.4. Domestic be green

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Design SAP elmhurst energy

Block Reference	974	Issued on Date	03/01/2020
Block Name	Phoenix Yard		
Assessor Details	Mr. Nick Walker, Nick Walker, Tel: 02088927947, nick.walker@michaelpopper.com	Assessor ID	Admin
Client			

Block Compliance Report - DER

Block Reference: 974		Block Name: Phoenix Yard		
Property-Assessment Reference	Multiplier	Floor Area (m^2)	DER ($kgCO_2/m^2$)	TER ($kgCO_2/m^2$)
First Flat-002 (with PV)	1	72.15	13.93	17.61
Second Flat-002 (with PV)	1	50.12	16.44	20.73
Second Studio-002 (with PV)	1	37.71	21.09	28.70
Third Flat-002 (with PV)	1	76.14	14.48	18.52
Totals:	4	236.12	65.94	85.56
Average DER = 15.78 $kgCO_2/m^2$			PASS	
Average TER = 20.34 $kgCO_2/m^2$				

Block Compliance Report - DFEE

Block Reference: 974		Block Name: Phoenix Yard		
Property-Assessment Reference	Multiplier	Floor Area (m^2)	DFEE ($kWh/m^2/yr$)	TFEE ($kWh/m^2/yr$)
First Flat-002 (with PV)	1	72.15	37.32	46.17
Second Flat-002 (with PV)	1	50.12	44.40	50.77
Second Studio-002 (with PV)	1	37.71	67.87	72.88
Third Flat-002 (with PV)	1	76.14	51.71	53.05
Totals:	4	236.12	201.30	222.87
Average DFEE = 48.34 $kWh/m^2/yr$			PASS	
Average TFEE = 53.63 $kWh/m^2/yr$				

elmhurst energy Page 1 of 1 Regs Region: England
Elmhurst Energy Systems SAP2012 Calculator (Design System) version 4.10r08