The Hop Exchange Development

Energy Assessment

Issue 3

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1.0 EXECUTIVE SUMMARY

A detailed Energy Assessment has been undertaken for the proposed redevelopment of the Hop Exchange, on Southwark Street in the London Borough of Southwark.

The proposals comprise the rear infill extension of 6 storeys connecting to a 2-storey roof extension on the western section of the building; a new atrium roof on the eastern section; roof terrace, landscaping and public realm works and general works of enhancement to the listed building in connection with the continued use of the building within Class E. The proposals are 'shell and core' and will result in three restaurant units, with a total area of 905m^2, and 2000m^2 of office space across 5 storeys.

The energy assessment has been conducted in line with the GLA Energy Assessment Guidance, April 2020 update; to demonstrate compliance with the policies of the 'The London Plan, March 2021', and the 'New Southwark Plan'.

The GLA 'Energy Hierarchy' has been followed as the path to achieving net zero carbon emissions. At each stage of the hierarchy regulated and unregulated CO2 emissions have been established using the Building Regulations Part L 2013 National Calculation Methodology in IESVE 2019 approved dynamic thermal simulation software. The results of the calculations have been presented separately for the new and refurbished areas, and an overall total has also been provided.

In accordance with the planning requirements, the outputs of these calculations have been converted to SAP10 emissions factors using the GLA Carbon Emissions Reporting Spreadsheet.

Baseline Emissions
Baseline emissions were calculated for the new-build and refurbished elements.

For the new-build elements, this corresponded to a building that meets building regulations emissions targets, using a gas boiler for heating and hot water, and electrically powered cooling equipment. This is effectively the 'be lean' notional building, and the calculated baseline regulated emissions were 29.9 tonnes CO_2/annum.

For the refurbished elements, in line with GLA guidance, baseline emissions were calculated using the 'notional specification for existing buildings' from the energy assessment guidance, and resulted in calculated regulated emissions of 33.0 tonnes CO_2/annum

Be lean
Demand reduction measures undertaken at the 'be lean' phase of the hierarchy include:

- High performance building fabric
- Mechanical ventilation with heat recovery
- High efficiency LED lighting

However, it should be noted that due to the building being Grade the possibilities for fabric improvements to the street facing south façade are limited in the refurbished areas.

Following the implementation of 'be lean' measures, the new-build elements achieved regulated emissions of 24.2 tonnes CO_2/annum, a 5.8 tonne, or 19% reduction from the baseline. This meets the GLA target for 15% emissions reduction at this stage of the hierarchy.

The refurbished areas achieved a 'be lean' phase regulated emissions of 37.6 tonnes CO_2/annum, which represents an increase over the baseline of 4.7 tonnes, or 14%. While this does not meet the GLA target, it should be noted that this is due to limitations on fabric improvements resulting from the historic façade – the notional specification for existing buildings has significantly better fabric performance than was estimated for the actual retained fabric.

Overall regulated carbon emissions following the 'be lean' phase of the hierarchy were calculated to be 61.8 tonnes CO_2/annum, which represents a 2% improvement over the overall baseline.

Overheating and Cooling
The GLA 'Cooling Hierarchy' was followed and discussed. The possibilities for passive strategies were limited due to the historic façade. The potential to provide overheating control via mechanical ventilation only (with no active cooling) was investigated, and an overheating risk assessment undertaken on this basis.

The overheating risk assessment used CIBSE TM52 methodology, and demonstrated that even at the highest practical airflow rates, comfort could not be achieved with outside air alone. This is primarily due to the constraints of the existing building and listed façade. The cooling demand was shown to be below that of the notional building, illustrating the efficacy of the overheating prevention measures that could be implemented.

As such, an active cooling system is proposed, it is to be of a high efficiency type and combined with the heating system to enable heat recovery and improved system efficiencies.

Be Clean
At the 'be clean' phase of the hierarchy, options for supplying energy cleanly and efficiently were investigated, in line with the GLA 'Heating Hierarchy'.

With no existing or proposed district heat networks in the vicinity of the project, connecting to an external network will not be possible.

There are also no suitable secondary sources of heat adjacent to the building, and the scale and heat demand of the project did not provide a case for low-emission CHP.

Given the low heat demand of the individually tenanted units, and the efficiencies and practical advantages associated with individual systems, it is proposed that units will be provided with their own high efficiency reversible air source heat pump with heat recovery. In this way extremely high efficiencies can be achieved; and maintenance, replacement and billing facilitated.

As an air source heat pump, the impact of this heat source was assessed under the 'be green' phase of the energy hierarchy, and so the 'be clean' emissions remain unchanged from the 'be lean' phase.

Be Green
A feasibility study of appropriate low or zero carbon technologies was undertaken to establish those most suited to the project. From this, an air source heat pump was identified as the most suitable.

It is proposed high efficiency reversible air source heat pumps with heat recovery will be provided to meet 100% of the building's heating and cooling demand. Units have been selected and manufacturer declarations indicate they will achieve an SCOP of at least 4 and an SEER of at least 6.

Following the implementation of 'be green' measures, the new-build elements achieved regulated emissions of 16.8 tonnes CO_2/annum, a 7.4 tonne or 25% reduction over the 'be clean' emissions, and a 13.1 tonne or 44% reduction over the baseline.

Following the implementation of 'be green' measures, the refurbished elements achieved regulated emissions of 17.7 tonnes CO_2/annum, a 19.9 tonne or 60% reduction over the 'be clean' emissions, and a 15.2 tonne or 46% reduction over the baseline.

Overall carbon emissions following the 'be green' phase of the hierarchy were calculated to be 34.5 tonnes CO_2/annum, which represents a 43% improvement over the 'be clean' emissions and a 45% improvement over the overall baseline.

This 45% improvement exceeds the 40% on-site emissions reduction required by the New Southwark Plan.

Carbon Offsetting
It is proposed that the remaining 34.5 tonnes CO_2/annum be offset by payment into the Southwark carbon offset fund, at £95/tonne over the assumed 30 year lifetime of the services, resulting in a total offset payment of £98,395.

The graphs and tables below summarise the emissions reductions and offset payment for the new-build, refurbished and overall areas respectively.

New-Build Areas

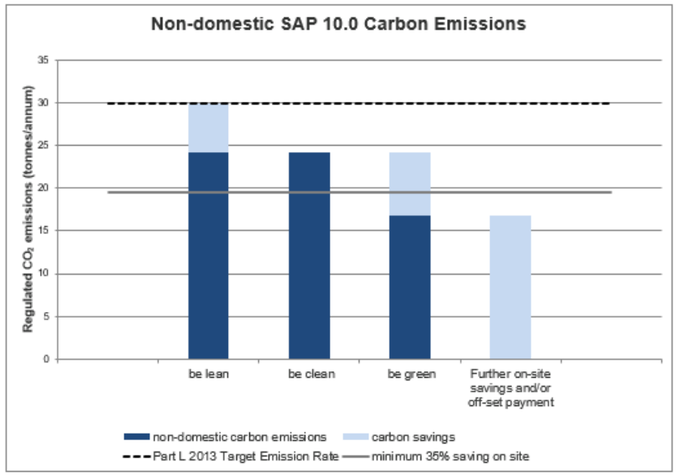

Figure 1: Emissions for the New-Build Elements

Table 1: Calculated Regulated and Unregulated Carbon Emissions – New-Build Area

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	29.9	25.1
After energy demand reduction (be lean)	24.2	25.1
After heat network connection (be clean)	24.2	25.1
After renewable energy (be green)	16.8	25.1

Table 2: Carbon Emissions Savings – New Build Areas

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	5.8	19%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	7.4	25%
Total Cumulative Savings	13.1	44%
Annual savings from off-set payment	16.8	-
Cumulative savings for off-set payment (Tonnes CO_2)	504	-
Cash in-lieu contribution (£)*	47,870	

Refurbished Areas

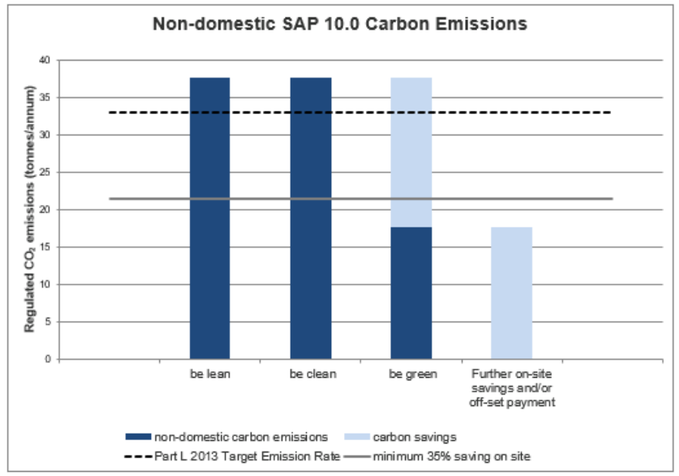

Figure 2: Emissions for the Refurbished Elements

Table 3:Calculated Regulated and Unregulated Carbon Emissions – Refurbished Areas

	Carbon Dioxide Emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Baseline: Notional Specification for Existing Buildings	33.0	24.3
After energy demand reduction (be lean)	37.6	24.3
After heat network connection (be clean)	37.6	24.3
After renewable energy (be green)	17.7	24.3

Table 4: Carbon Emissions Savings – Refurbished Areas

	Regulated non-domestic carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	-4.7	-14%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	19.9	60%
Total Cumulative Savings	15.2	46%
Annual savings from off-set payment	17.7	-
Cumulative savings for off-set payment (Tonnes CO_2)	532	-
Cash in-lieu contribution (£)*	50,525	

Site-Wide

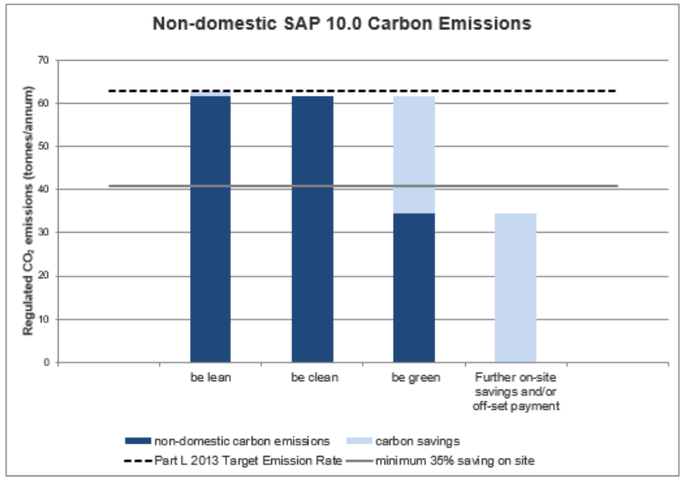

Figure 3: Emissions for the Overall Development

Table 5: Site-Wide Emissions and Savings

	Total regulated emissions (Tonnes CO_2 / year)	CO_2 savings (Tonnes CO_2 / year)	Percentage savings (%)
Baseline	62.9		
Be lean	61.8	1.1	2%
Be clean	61.8	0.0	0%
Be green	34.5	27.3	43%
Total Savings	-	28.4	45%
	CO_2 savings off-set(Tonnes CO_2)		-
Off-set	**1,035.7**		-

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2.0 INTRODUCTION

This Energy Assessment has been prepared in support of the planning application for the redevelopment of part of the Hop Exchange building, in Southwark, Central London.

The proposals comprise the rear infill extension of 6 storeys connecting to a 2-storey roof extension on the western section of the building; a new atrium roof on the eastern section; roof terrace, landscaping and public realm works and general works of enhancement to the listed building in connection with the continued use of the building within Class E.

2.1 Site Context

The Hop Exchange development is located on Southwark Street – a busy A road connecting London Bridge and Blackfriars Bridge – in the London Borough of Southwark.

The building is grade II listed, which limits options for fabric improvements and natural ventilation to the retained Southwark Street façade.

The proposals are a similar height to surrounding buildings so it will not be significantly overshadowed by adjacent developments.

Southwark Street and the railway viaduct running behind the building will be significant sources of noise pollution.

The proposed site sits within the Southwark Air Quality Management Area (AQMA) which will limit the feasibility of combustion-based technology.

Figure 4: Wider site context with the major transport hub to the east and significant nearby local services and visitor attractions

Figure 5: Local site context, with adjacent railway lines, and busy pedestrian and traffic thoroughfares

2.2 Aims and Objectives

The aim of this energy assessment is to demonstrate that the proposed redevelopment of the Hop Exchange incorporates climate change mitigation measures to comply with applicable energy policies.

Objectives in achieving this would include

- Establishing requirements of applicable policies
- Carrying out a detailed energy assessment for the proposals
- Applying the “Be Lean, Be Clean, Be Green” energy hierarchy to the development to achieve zero Carbon emissions

3.0 PLANNING POLICY

The Hop Exchange sits within the London Borough of Southwark, in the Central Activity Zone (CAZ) of London. As such, the policies of the GLA London Plan, and Southwark Planning Policy are applicable.

This energy assessment has been prepared in line with the requirements of the ''The London Plan, March 2021', and the January 2020 'New Southwark Plan'.

3.1 The GLA London Plan

The 'The London Plan, March 2021'was issued in Mar 2021 superseding the 'Intend to Publish London Plan' published in 2019 and the 'Publication London Plan, December 2020'.The Policy sections relating to the measures include the following;

Policy SI1 'Improving Air Quality'

- All major developments need to demonstrate that they will be at least air quality neutral.
- All energy proposals should have emissions lower than those generated by ultra-low NOx emission gas boilers.
- Developments in Air Quality Focus Areas (AQFA) will be under particular scrutiny. (The Hop Exchange falls within the AQFA covering Borough High Street just south of London Bridge)
- For major developments an Air Quality Assessment (AQA) must be submitted with the planning application.

Policy SI2 'Minimising Greenhouse Gas Emissions'

The existing requirements have been strengthened, and some aspirations of the previous plan have been clarified:

- Major developments to be net-zero carbon overall, although this can be achieved through off-site or offsetting payments.
- As with current London Plan at least a 35% reduction on building regulations must be achieved on site.
- For residential developments 10% of the reductions must be achieved through energy efficiency.
- For non-domestic 15% of reductions must be achieved through energy efficiency.
- Major development proposals should calculate and minimise carbon emissions of unregulated emissions.
- Development proposals referable to the Mayor should calculate whole lifecycle carbon emissions through a nationally recognised whole life-cycle carbon assessment and demonstrate actions taken to reduce life-cycle carbon emissions.
- Proposals to future proof the development to achieve net-zero carbon on-site by 2050.
- All major developments to monitor and report on their energy use for 5 years after completion by displaying a DEC and reporting via an online portal.
- The Mayor recognises that Building Regulations use outdated carbon emission factors and that this will continue to cause uncertainty until they are updated by Government. The Mayor's Energy Planning Guidance provides interim guidance on appropriate emissions factors to use.
- Demand-side response, specifically through installation of smart meters, minimising peak energy demand and promoting short-term energy storage, as well as consideration of smart grids and local micro grids where feasible, required.

Policy SI3 "Energy infrastructure"

Major development proposals within Heat Network Priority Areas should have a communal low-temperature heating system.

Requirement for an energy masterplan for large-scale developments (town centres and areas of multiple development) which should consider:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
2) heat loads from existing buildings that can be connected to future phases of a heat network
3) major heat supply plant including possible opportunities to utilise heat from energy from waste plants
4) secondary heat sources, e.g. environmental and waste heat
5) opportunities for low and ambient temperature heat networks
6) possible land for energy centres and/or energy storage
7) possible heating and cooling network routes
8) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works
9) infrastructure and land requirements for electricity and gas supplies
10) implementation options for delivering projects, considering issues of procurement, funding and risk, and the role of the public sector.
11) opportunities to maximise renewable electricity generation and incorporate demand-side response measures

The heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks
b) use available zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) use low-emission combined heat and power (CHP) (only where there is a case for CHP to enable the delivery of an area-wide heat network).
d) use ultra-low NOx gas boilers.

CHP and ultra-low NOx gas boiler heating systems to meet the requirements of policy SI1 (Air Quality).

Developments should be designed to allow for cost-effective future connection to planned heat networks, where none currently exist.

While heat networks are still considered to be an effective and low-carbon means of supplying heat, the carbon savings from gas-engine CHP, around which many of these networks have grown, are now declining due to grid decarbonisation. Low-emission CHP will still be considered on a case-by-case basis, but it is not expected that gas-engine CHP will fall into this category.

3.2 New Southwark Plan

Having already been through several stages of consultation, with the final public consultation on proposed changes set to close on 26 October 2020, the Examination in Public is expected to take place in early 2021, and it is anticipated that it will be adopted by the time the planning application for The Hop Exchange is determined. The New Southwark Plan (NSP) sets out the Council's vision, objectives and key policies for the development of Southwark.

This document largely reinforces and mirrors the policies of the London Plan. Key policies are:

P64 Improving Air Quality

As The London Plan. March 2021 Policy SI1 – all developments to achieve at least 'air quality neutral' standards and be designed to minimise occupant exposure to poor air quality. Any shortfall in air quality standards to be mitigated by offsite measures or by a financial contribution.

P65 Reducing Noise Pollution and Enhancing Soundscapes

Developments must be designed to avoid, mitigate and manage any significant adverse impacts on health and quality of life cause by noise.

Major developments should be designed to enhance and protect positive aspects of acoustic environment through a public soundscape assessment. They will be required to demonstrate how noise pollution impacts during the construction phase will be reduced, mitigated and managed.

P68 Sustainability Standards

BREEAM Excellent ratings must be achieved for all non-domestic developments or refurbishments >500m^2.

Risk of overheating must be reduced, taking into account climate change predictions over the lifetime of the building, in accordance with the following 'cooling hierarchy':

1) Minimise internal heat generation through energy efficient design; then
2) Reduce the amount of heat entering a building through the orientation, shading, albedo, fenestration, insulation and green roofs and walls; then
3) Manage the heat within the building through exposed internal thermal mass and high ceilings; then
4) Passive ventilation; then
5) Mechanical ventilation; then
6) Active cooling systems (ensuring they are the lowest carbon options).

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P69 Energy
Largely mirrors elements of The London Plan, March 2021 policies SI2 and SI3, except requires 40% on-site reduction of carbon emissions for major non-residential developments.

3.3 GLA Energy Assessment Guidance

The GLA have produced a guidance document to facilitate the production of energy assessments, and this has been referred to in the production of this document.

An updated draft version was published in April 2020, to bring the guidance in line with the Intend to Publish London Plan of Dec 2019, and it is this version that has been used here.

4.0 METHODOLOGY

The energy assessment follows the methodology set out in GLA Energy Assessment Guidance (April 2020 update). Accordingly, the retained and new areas are treated separately, according to the guidance for refurbishments and extensions respectively.

Baseline CO_2 emissions have been established, using the relevant methodology from the GLA Guidance. The three-step energy hierarchy consisting of 'Be Lean', 'Be Clean' and 'Be Green' measures is then applied to the baseline to achieve CO_2 reductions.

4.1 Refurbished Areas

Regulated and unregulated emissions were calculated using the Part L2A 2013 methodology based on the National Calculation Methodology (NCM). Approved dynamic thermal simulation software IES VE 2019.3.2 has been used to undertake these calculations.

The baseline was generated using the GLA notional specification for existing buildings (Appendix 4 of GLA Energy Assessment Guidance).

All the areas for which the fabric was retained were considered as 'refurbished'; with the new extension and surrounding existing buildings modelled as 'adjacent buildings'.

4.2 New Extension/Infill

Regulated and unregulated emissions were calculated using the Part L2A 2013 methodology based on the National Calculation Methodology (NCM). Approved dynamic thermal simulation software IES VE 2019.3.2 has been used to undertake these calculations.

The entire new-build area was considered, with the surrounding extension and existing buildings modelled as 'adjacent buildings'.

4.3 Carbon Emissions Factors

The results generated from the BRUKL calculations are based on current building regulations carbon emission factors. These factors do not account for the recent reduction in the carbon-intensity of the national electricity grid.

However, new factors have been introduced but not yet adopted by the building regulations, that more closely represent the current grid carbon intensity. Known as SAP10 factors, these are due to be incorporated into the future building regulations.

The GLA has produced a spreadsheet to convert results to the new emissions factors, and in line with GLA expectation, this has been used to convert the results generated for this project.

A comparison of the carbon emission factors extracted from the spreadsheet is shown in Table 6.

Table 6: SAP 2012 and SAP10 Emissions Factor Comparison

Fuel Type	Carbon Emissions Factor ($kgCO_2/kWh$)	
	SAP 2012	SAP10
Natural Gas	0.216	0.210
Grid Electricity	0.519	0.233

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5.0 BASELINE EMISSIONS

5.1 New Extension/Infill

Regulated CO_2 emissions for a Part L 2013 of the Building Regulations complaint development was calculated to establish the baseline CO_2 emissions for the commercial spaces.

This is equivalent to the Target Emission Rate (TER) for the 'Be Lean' stage of the energy hierarchy – i.e. in which the notional buildings heating and hot water requirements are served by a gas boiler, and any active cooling requirement by electrically powered equipment.

This resulted in baseline emissions for the new-build extension of 29.9 tonnes CO_2/annum using SAP10 emissions factors.

5.2 Refurbished Areas

Baseline emissions for the areas to be refurbished were calculated using the Part L2 2013 methodology in IES 2019. However, instead of using the calculated Target Emissions Rate (TER) for a building with gas central heating and electrically powered cooling as was done for the new-build areas; the 'Notional Specification for Existing Buildings' from the GLA Energy Assessment Guidance was used to generate a 'Building Emissions Rate' (BER) that will serve as the baseline for the refurbishment.

This is done, in line with GLA guidance, so that on the one hand existing buildings in which energy efficiency measures are inherently more difficult to implement are not unfairly penalised by being compared with an equivalent new build. While on the other, with the notional specification being broadly in line with the minimum requirements of Part L2B, means credit is not given for simply achieving the 'bare minimum' level of improvements.

This resulted in baseline emissions for the refurbished areas of 33.0 tonnes CO_2/annum.

The resultant TER, cumulative floor area and the regulated CO2 emissions for the new and refurbished spaces, and the overall building are shown in Table 7.

Table 7: Baseline Emissions for the Development

Area	Baseline Emissions ($kgCO_2/m^2$. Annum)	Floor Area (m^2)	Regulated CO2 Emissions (Tonnes CO_2/annum)
Refurbished	17.7	1864.7	33.0
New Extension	12.8	2336.8	29.9
Overall	15.0	4201.5	62.9

5.3 Unregulated Emissions

Unregulated energy usage accounts for a significant portion of a building's operational energy usage and resultant CO_2 emissions. Estimation of unregulated energy and total operational energy of a building pose significant challenges and could vary significantly from predictions, due to the assumptions and simplifications in energy models; as well as the unpredictable variations in small power usage, operating hours, occupant density and management of the building.

Estimated unregulated CO_2 emissions for the development are shown in Table 8.

Table 8: Unregulated Emissions for the Development

Area	Floor Area (m^2)	Unregulated CO2 Emissions (Tonnes CO_2/annum)
Refurbished	1864.7	24.3
New Extension	2336.8	25.1
Overall	4201.5	49.4

The development will endeavour to minimise unregulated emissions by incorporating the following measures:

- Installation of energy efficient white goods
- Installation of energy efficient lifts
- Provision of building user guides and tenant fit-out guides

6.0 BE LEAN

This section outlines the demand reduction measures incorporated in order to exceed the requirements of Building regulation Part L 2013.

These energy efficiency measures include passive and active design features included to meet the target for a 15% improvement on Building Regulations minimum, achieved through energy efficiency measures alone, as set out in the London Plan.

Passive design measures contribute to reducing the energy demand of the building without any energy input, whilst active design measures further reduce the energy demand by application of energy efficient building services systems.

6.1 Passive Design Measures

On an existing city-centre site, the range of possible passive design measures are somewhat restricted – for example, there is little that can be done about the orientation of the building; and local noise sources make a natural ventilation strategy infeasible.

The building massing has been improved to some extent, with the addition of the new infill and extension reducing the surface area to volume ratio, and thus reducing heat loss.

Refurbished Areas
In the existing areas there is little scope for fabric improvements due to the building being Grade II listed though repairs and making-good will be undertaken to improve the air-tightness of the envelope and reduce infiltration.

The estimated fabric performance of existing elements pre and post refurbishment is shown in Table 9.

Table 9: Estimated Existing Fabric Performance

Element	Existing Estimated Performance	Proposed Refurbished Performance
Wall	2.00 W/m^2.K	2.00 W/m^2.K
Glazing	5.55 W/m^2.K	5.55 W/m^2.K
Roof	1.70 W/m^2.K	1.70 W/m^2.K
Floor	1.70 W/m^2.K	1.70 W/m^2.K
Air-Tightness	25 m^3/hr.m^2 @50Pa	15 m^3/hr.m^2 @50Pa
Thermal Bridging	y value = 0.1	y value = 0.1

As a result, the 'be lean' improvements here will focus on active systems.

New Extension/Infill
There is more freedom in the new-build elements, and as such, high-performance fabric is proposed. The target fabric performance is presented in Table 10 below.

Table 10: Proposed Fabric Performance for New-Build Elements

Element	Building Regulations Notional Performance	Proposed Performance
Wall	0.26 W/m^2.K	0.18 W/m^2.K
Glazing	1.6 W/m^2.K 0.4 g value	1.10 W/m^2.K 0.4 g value
Roof	0.18 W/m^2.K	0.12 W/m^2.K
Floor	0.22 W/m^2.K	0.15 W/m^2.K
Air-Tightness	3 m^3/hr.m^2 @50Pa	3 m^3/hr.m^2 @50Pa
Thermal Bridging	y value = 0.1	y value = 0.04

6.2 Active Design Measures

Following the application of passive design measures, active design features can further reduce the energy demand and CO2 emissions. The site and existing fabric place fewer limitations on the potential active design measures, and so the same apply in the new and refurbished areas. The following energy efficiency features have been incorporated:

- Heat recovery incorporated into mechanical ventilation systems (MVHR)
- High-efficiency LED light fittings, with daylight and occupancy sensing controls where appropriate
- Smart meters for heat and electricity networks
- Programmable thermostatic controls with individual zone control for heating and hot water
- Provision of Building Management System (BMS) for central plant metering and controls
- High efficiency VRF cooling systems
- Variable speed pumps and fans for heating/cooling

Since the final heating proposal consists of renewable/low carbon energy, centralised gas boilers have been assumed as the heat source during the 'be lean' phase.

6.3 Be Lean Results

Refurbished Areas
As discussed in the previous sections, due to the heritage significance of the building it is not possible to improve fabric performance significantly in the refurbished areas. When compared to the GLA 'notional specification for existing buildings' the estimated refurbished fabric performance is much poorer, so these areas start from a distinct disadvantage.

After the implementation of the active energy efficiency measures a 'be lean' phase regulated carbon dioxide emissions of 37.7 tonnes CO2/annum was calculated, representing a 14% increase on the baseline emissions.

While this doesn't meet the 15% target set out in the London Plan, this represents a significant improvement over the likely performance of the building in its current condition.

New Extension/Infill
Following the 'be lean' phase application of passive and active energy efficiency measures, the CO2 emissions for the new build elements are 24.2 tonnes CO2/annum.

This represents a 19% improvement over the baseline emissions.

This meets the 15% target set out in the London Plan.

Overall
Overall, the total development emissions after the implementation of the 'be lean' phase design measures are 61.8 tonnes CO2/annum.

This represents an improvement of 2% over the overall baseline emissions.

While this does not meet the 15% target of the London plan, it is felt that given the constraints faced due to the historic nature of the refurbished elements, all possible energy efficiency measures have been implemented.

Table 11: Be Lean Regulated Emissions for the Development

Area	Be Lean Emissions (kgCO_2/m^2.Annum)	Floor Area (m^2)	Regulated CO_2 Emissions (Tonnes CO^2/annum)
Refurbished	20.2	1864.7	37.7
New Extension	10.3	2336.8	24.1
Overall	15.8	4201.5	61.8

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7.0 COOLING AND OVERHEATING

7.1 The Cooling Hierarchy

Measures to reduce the cooling demand have been considered under the following categories set out in the London Plan cooling hierarchy:

1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
2. Minimise internal heat generation through energy efficient design
3. Manage the heat within the building through exposed internal thermal mass and high ceilings
4. Passive ventilation
5. Mechanical ventilation
6. Active cooling systems

Reduce the amount of heat entering the building
In the new build areas, the glazing design has been developed to incorporate measures to reduce the amount of heat entering the building. The highly insulated building fabric will reduce the heat transfer from outside during summer months. The g-value and glazing ratio of windows has been selected to optimise the amount of solar heat gains and natural daylight levels throughout the year. The new glazing scheme incorporates deep recesses and areas of shading.

Possibilities to reduce heat entry are more limited in the refurbished areas – the building being grade II listed limiting external shading or solar control glazing interventions on the south-facing façade.

Minimise internal heat generation
The heat distribution infrastructure and building services within the building have been designed to minimise heat losses to spaces and improve system efficiencies. All necessary pipe work and ductwork are to be insulated to exceed the requirements of Building Regulations.

High efficiency LED lighting is used to reduce the heat gains from lighting when in use, and optimised lighting control provided to minimise unnecessary lighting use.

However, as a shell and core development, opportunities to influence aspects of the final fit out are limited, so the building must be prepared for a range of potential end-users and their electrical equipment.

Manage the heat within the building through exposed internal thermal mass and high ceilings
Much of the existing heavyweight fabric in the refurbished areas is to be retained and could be exposed as a feature, alongside it helping to buffer heat in the building.

However, once again, as a shell and core development it is not possible to dictate the final fit out, and so reliance on thermal mass at this stage is risky.

Generous floor to floor heights have been allowed for throughout the development, so even with the addition of suspended ceilings and distribution zones it should result in a good floor to ceiling height.

Passive ventilation
Due to the location and nature of the site, it has not been possible to introduce a passive ventilation strategy.

This is primarily due to the two significant noise sources adjacent to the development – Southwark Street immediately to the south and the rail line to the north. Given the proximity to these sources it is not possible to achieve indoor acoustic requirements while also providing enough air to passively cool the spaces. Refer to the Noise Impact Assessment for further details.

In addition, the considerations pertaining to the south façade arising from the building being listed would make the introduction of openings here unfeasible.

Mechanical Ventilation
It is proposed to provide background ventilation via MVHR, with a summer bypass to avoid the recovery of unwanted heat.

However, the volumes of air required to moderate the temperatures will be far greater than those for background ventilation. In the overheating risk analysis below, the volume of air required is investigated, and the feasibility of this assessed.

7.2 Overheating Risk Analysis

In line with GLA requirements, dynamic overheating modelling based on the CIBSE TM52 methodology and using the CIBSE TM49 datasets has been undertaken in IES VE 2019.3.2.0

Assumptions and Inputs
Two sample spaces have been selected, representative of the intended uses of the finished development: One of the ground-floor restaurant units; and the first-floor office unit. Both comprise the retained façade to the south, as in this area overheating prevention measures are more difficult to implement and so they represent highest overheating risk. Floorplans of the modelled units, alongside the 3D dynamic model of the same unit are shown in Figure 6 and Figure 7 below.

As a shell and core development, we have no firm details of the eventual occupants. As such, typical conservative values for internal gains, taken from CIBSE Guide A, have been used. These values are shown in Table 12 below.

Table 12: Gains Used in the Overheating Risk Assessment

Area	Occupant Density (m^2/person)	Internal Gains (W/m^2)		Schedule
		Lighting	Small Power	
Restaurant	3	8	5	12-15:00 and 18:00-22:00
Office	10	8	20	09:00-17:00

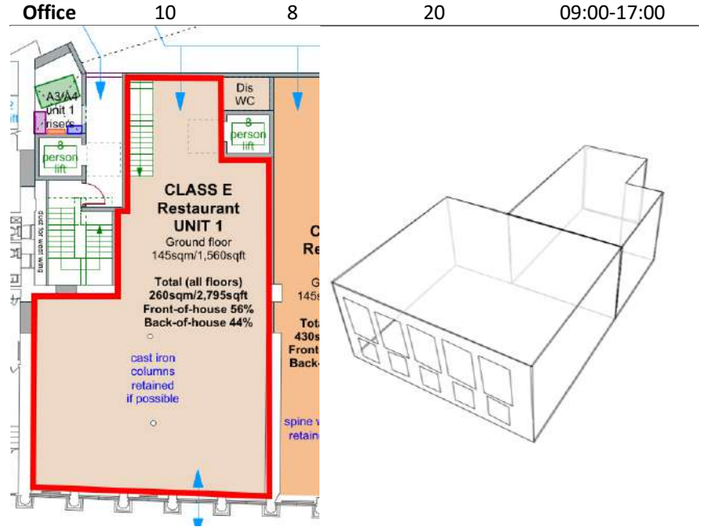

Figure 6: Floor plan and 3D Thermal Model of the Ground Floor Restaurant Space

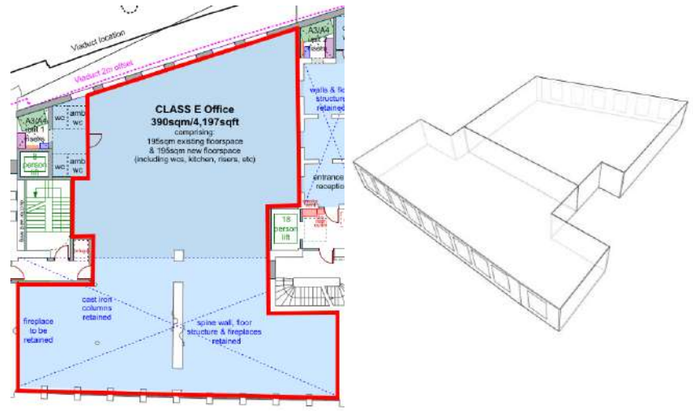

Figure 7: Floor Plan and 3D Thermal Model of the First Floor Office Space

A background ventilation rate of 10l/s.person was assumed via the MVHR system – using summer bypass. In addition, auxiliary mechanical ventilation for temperature control was added, with proportional control on room temperature, starting when the internal air temperature exceeds 22°C, up to a peak ventilation rate at 26°C. The peak air volume was varied, from background only ventilation, up to 15ACH. Above, and even at this volume, the fan, duct and intake sizes required begin to become unmanageable – particularly where the floor to floor heights are constrained by the existing building.

The TM49 weather datasets were used, taking those for London Weather Centre (LWC), as the Hop Exchange lies within the CAZ, and this weather data

best represents the urban heat island effect experienced in central London. The initial modelling was undertaken using the LWC 2020s weather file, for the high emissions scenario, at the 50th percentile.

Overheating Standard
While there is currently no specific standard for mechanically ventilated buildings without active cooling, as is being tested here, the CIBSE TM52 standard for 'free running' buildings is felt the most appropriate.

This standard is typically used to evaluate passively cooled buildings, relying on external air for temperature control. As, in this case, we too are assessing the possibility of using external air only for temperature control, it is thought the comfort conditions dictated by this model are also appropriate here.

CIBSE TM52 uses an adaptive comfort model – that is, there are no fixed or absolute temperature criteria, but rather these depend on the prevailing weather conditions.

Two out of three criteria must be met to demonstrate an acceptable overheating risk; with the criteria all defined in relation to ΔT, which is the difference between the internal operative temperature and the 'maximum adaptive temperature', T_{max} – which itself is calculated based on the running mean of the external temperature.

The three criteria are:

- **Criterion 1 - Hours of Exceedance:**
  The percentage of occupied hours for which ΔT > 1 must be less than 3%.
  I.e. the operative temperature can only exceed the maximum adaptive temperature by more than 1°C for a maximum of 3% of occupied hours.

- **Criterion 2 - Weighted Exceedance:**
  The sum of ΔT for each hour the building exceeds T_{max} must not exceed 6 in any one day.

  So, for example, a building which exceeds T_{max} by 1°C for two hours and by 2°C for one hour in a day would meet the criterion (weighted exceedance = 4); while a building exceeding T_{max} by 1°C for three hours and by 2°C for two hours would not meet the criterion (weighted exceedance = 7).

- **Criterion 3 - Threshold/Upper Limit Temperature:**
  ΔT must never exceed 4°C.

  That is, the operative temperature can never exceed the maximum adaptive temperature by 4.5°C or more.

Results
The TM52 results for the sample office and restaurant spaces are shown in Table 13 and Table 14 below, according to the mechanical ventilation air volume (this does not include the background 10l/s.p).

Table 13: TM52 Results for the Sample Office Space

Mechanical Ventilation Rate	TM52 Results			
	Criterion 1 (%, max. 3)	Criterion 2 (max. 6)	Criterion 3 (K, max. 4)	Overall
0ACH (background only)	98.2	110	16	Fail
2ACH	71.6	72	11	Fail
5ACH	37.4	51	9	Fail
10ACH	19.1	36	7	Fail
15ACH	12.3	30	6	Fail
15ACH + Enhanced control & night ventilation	7.4	24	5	Fail

Table 14: TM52 Results for the Sample Restaurant Space

Mechanical Ventilation Rate	TM52 Results			
	Criterion 1 (%, max. 3)	Criterion 2 (max. 6)	Criterion 3 (K, max. 4)	Overall
0ACH (background only)	80.4	80	14	Fail
2ACH	54.4	61	11	Fail
5ACH	34.4	48	9	Fail
10ACH	19.8	39	7	Fail
15ACH	13.3	35	7	Fail
15ACH + Enhanced control & night ventilation	5.7	27	6	Fail

As can be seen neither space sampled meets the CIBSE TM52 comfort criteria for any of the air volumes modelled up to and including 15ACH.

The final scenario '15ACH + Enhanced control & night ventilation' was introduced as the improvements from increased airflow were diminishing. In this, advantage was taken of the 'controllability' of mechanical ventilation – with air only been supplied when external temperature was below that inside, and a night purging regime implemented. While this scenario shows considerable improvement compared to the previous, it still falls some way short of meeting the comfort criteria.

Closer interrogation of the results indicates that solar gain is a significant contributor – reaching peaks of 30 - 50W/m^2. Within the constraints of the grade II listed south façade it is difficult to reduce this significantly.

Following the overheating risk analysis, it can be concluded that active cooling is the only practical way to control summertime temperatures.

7.3 Active Cooling Systems

As can be seen from the cooling hierarchy and overheating risk analysis, it is not feasible to control internal temperatures through passive means or mechanical ventilation alone.

As such, it is proposed to provide active cooling to the development. To minimise the energy use for cooling a reversible heat pump with heat recovery system is proposed.

This system allows simultaneous heating and cooling, with the rejected heat utilised to improve the efficiency of the heating and vice versa. This will prove beneficial in the mid-season in a mixed-use development such as this – where spaces with high internal gains may require cooling at the same time as those with low internal gains need heating.

In addition, as the proposal can incorporate provision of the domestic hot water for the restaurant kitchens, even during summer there will be a heat demand, thus ensuring optimum performance of the system.

The cooling demand for the actual and notional buildings (comprising the new and refurbished elements) is shown in the table below. As can be seen, the actual building has a lower cooling demand, showing the success of the passive overheating mitigation measures taken.

Table 15: Cooling Demand for Notional and Actual (new and refurbished) Buildings

Building	Area-Weighted Cooling Demand (MJ/m^2)	Total Area Weighted Cooling Demand (MJ/year)
Actual	33.3	140078
Notional	112.6	473216

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8.0 BE CLEAN

Once demand for energy has been minimised in the 'be lean' stage, the London Plan requires developments to demonstrate how their energy systems will supply energy efficiently and cleanly to reduce CO_2 emissions in the 'be clean' stage of the energy hierarchy.

8.1 Heating Hierarchy

The Hop Exchange lies within a Heat Network Priority Area (HNPA) – that is, where the heat demand density is sufficient for heat networks to provide a competitive solution.

In these areas, the GLA expects a communal low temperature heating system to be used, with the heat source selected in accordance with the heating hierarchy:

a) Connect to local existing or planned heat networks
b) Use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) Use low-emission combined heat and power (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d) Use ultra-low NOx gas boilers

Potential to connect to a new or planned heat network has been investigated through reference to the London Heat Map. As can be seen from Figure 8 below, showing existing and planned networks in the vicinity of the Hop Exchange, no heat networks exist, and the nearest planned network is around 1km away. This makes connection to a local heat network infeasible.

Figure 8: Extract from London Heat Map, showing new and planned heat networks in relation to the project site

No suitable local secondary heat sources were identified close to the site. However, low carbon heat generation using the air as heat source is considered feasible – refer to the 'be green' section of this report for further details of this option.

The scale and nature of the project was not deemed to provide a case for CHP – the annual heat demand would be too variable, and the project too small to generate the efficiencies necessary when compared to a low or zero carbon heat source in conjunction with the increasingly decarbonised grid. Alongside this, the project sits within an air quality management area. As a result CHP was not considered a suitable technology for this development.

With the new SAP10 carbon emissions factors, the case for installing gas-burning equipment is further weakened – particularly when coupled with concerns over air quality, and the potential of much improved efficiencies through the use of electric heat pumps. As such, the use of gas boilers was rejected in favour of much cleaner and more efficient heat pump technology.

8.2 Proposed Heating Strategy

Following the assessment of the potential heat sources in line with the heating hierarchy and in the context of the Hop Exchange site; it was found that in the absence of any local existing or planned heat networks, or secondary heat sources, the emissions of the development would be best minimised through the use of a low or zero carbon heat source such as a heat pump. Refer to the following section for the broader LZCT feasibility assessment.

In general, the implementation of a centralised strategy for this development is problematic: with individual tenants any fit-out modifications have the potential to cause disruption throughout the building. The heat demand for these individual units is also small, and thus any benefit in connecting to a communal heat network minimal.

Local VRF heat pump systems are therefore proposed to serve each separately tenanted area. This will help to minimise disruption due to modification, and allows heat supply, and thus plant operation, to be closely tailored to the demand – reducing energy consumption associated with standing losses from centralised plant and distribution pipework.

Heat recovery will be incorporated into the system to further reduce energy consumption – taking advantage of the propensity of the development to require heating and cooling simultaneously, and the hot water demand of the restaurant kitchens all year round.

Furthermore, in the absence of combustion technology, there will be no local emissions associated with the heating and cooling plant, thus helping to ensure the development remains air quality neutral.

The connection to a heat network in the future should one become available can be achieved by bringing in connections and locating the system's heat exchange in the existing Hop Exchange boiler room (replacing the existing boilers in the process). This would provide connections to the whole of the Hop Exchange's existing heating systems.

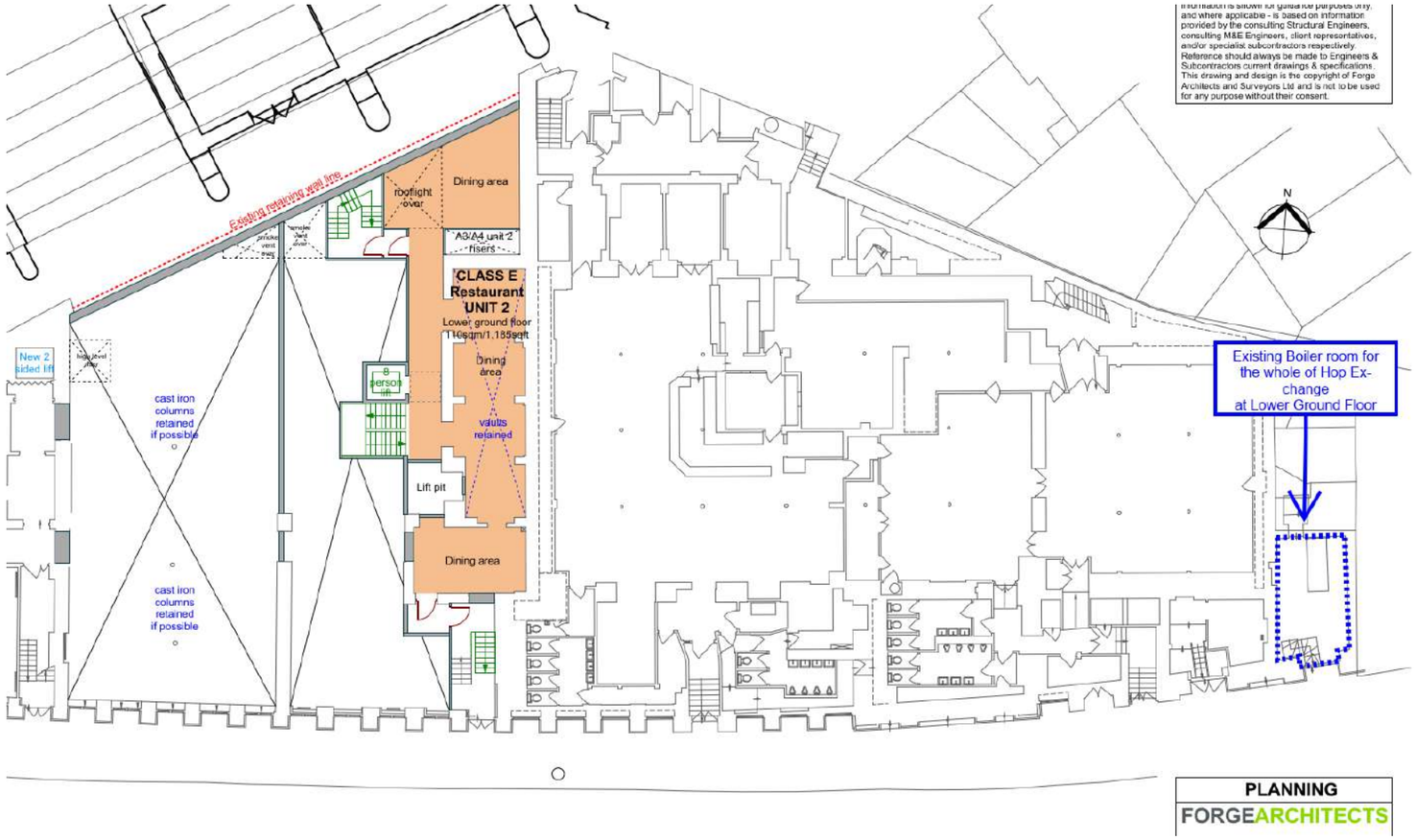

Figure 9 - Location of connection to Future Heat Network

8.3 Be Clean Results

Refurbished Areas
Following the implementation of the 'be clean' phase measures, carbon emissions for the refurbished areas remain unchanged at 37.6 tonnes CO_2/annum.

New Extension/Infill
Following the implementation of the 'be clean' phase measures, carbon emissions for the new extension remain unchanged at 24.2 tonnes CO_2/annum.

Overall
Following the implementation of the 'be clean' phase measures, carbon emissions for the overall site remain unchanged at 61.8 tonnes CO_2/annum.

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9.0 BE GREEN

Following the demand-reduction strategies of 'be lean', and the efficient energy supply in 'be clean'; the opportunities to incorporate low and zero carbon technologies into the scheme will now be assessed under the 'be green' phase of the energy hierarchy.

9.1 Feasibility Analysis

A large range of low or zero carbon technologies (LZCT) are available and can be used to reduce the net carbon emissions of a site. However not all will be suitable for the Hop Exchange development – either because of site constraints or features of the building's energy demand.

After an initial review, the following LZCT considered suitable for the site, and as such worthy of a more detailed review:

- Photovoltaic (PV) Panels
- Solar Thermal
- Small-Scale Wind
- Air Source Heat Pump

A more detailed assessment of the four suitable technologies is presented in Table 16 below. In this assessment, as well as possible carbon reductions and the practicalities of their use, the LZCT are considered in relation to the larger energy strategy and how they will integrate into it.

Table 16: Detailed Feasibility Assessment of Suitable LZCT

				
Technology Name	**Photovoltaics (PV)**	**Solar Thermal**	**Small Scale Wind**	**Air Source Heat Pump (ASHP)**
Location	External building mounted	External building mounted	External building mounted	External plant area
Load	Generates electricity, reducing the building's grid electricity consumption and exporting to grid in times of low consumption	Generates domestic hot water (DHW)	Generates electricity, reducing the building's grid electricity consumption and exporting to grid in times of low consumption	Generates hot water for heating (35-55°C), and in some cases DHW and chilled water for cooling
Advantages	• Easy to install • East to connect services • Light weight, low plant space requirements • Zero carbon electricity • Easy 'bolt on' renewable technology • Modular, additional PV panels can be added in the future	• Zero carbon domestic hot water produced • Lightweight	• Easy to install • East to connect services • Zero carbon electricity • Easy 'bolt on' renewable technology	• Heat is extracted from the air to heat the building and the hot water • No boreholes required which reduce capital cost • Option of reversible heat pump to provide cooling, which opens up possibility of heat recovery.
Disadvantages	• Relatively low efficiency compared to solar thermal • High capital cost • Large area of panels required to generate a meaningful amount of electricity • Requires direct sunshine to function efficiently	• Requires more maintenance than a PV system • No way to sell surplus energy like a PV or wind system • Requires a year round domestic hot water demand • Requires significant hot water storage • Low use can result in damage to system	• Issues achieving good output in urban locations • Relatively expensive capital cost • Noise and vibration considerations • Dependent on weather conditions • Larger number of small turbines, or fewer larger turbines required for meaningful contribution • Planning implications of aesthetic and height impact	• Efficiency can be low if the heating system is not weather compensated • Efficiency falls in cold weather where demand peaks • Not as efficient as a ground source heat pump • Discrete location required for siting of external units
Project Compatibility	PV has a strong proven record as a dependable renewable that has low maintenance requirements with good paybacks compared to similar technologies. The nature of the site with little overshadowing to the roof will maximise the potential of any installed PVs, however the impact to building's heritage significance and its setting limits the options, and roof space is already quite limited, so there is difficulty finding suitable locations. Therefore PV is not proposed to form part of the energy strategy for the project.	Solar panels would compete for the same available roof installation space as PV. The Hop Exchange is likely to have relatively low, and variable, hot water demand – as offices typically do, and without knowing the details of the kitchens in advance the system would be difficult to design. It is therefore thought the electricity generated by PVs will be of more value to the project. Solar thermal has not been selected for use.	Studies have found small scale wind to work well on exposed, open sites with a consistent prevailing wind. In urban locations measured output has been found to be a small fraction of predicted. In addition, any turbine would need to be building mounted, and the risks of vibration and noise to the top floor restaurant and office space this entails mean wind turbines are not considered suitable for this development.	As ASHP do not require expensive heat collectors their capital cost is lower than GSHP, however it is still an expensive solution. However, in the Hop Exchange which has been shown to require cooling, this system can be combined with heating and domestic hot water production to achieve very high efficiencies thanks to heat recovery. An ASHP is therefore proposed to form part of the energy strategy for this building.
Suitability	**Medium**	**Low**	**Low**	**High**

9.2 Be Green Results

Air Source Heat Pump Provision
Following the LZCT and 'be clean' analyses, an air source heat pump has emerged as the most appropriate LZCT for the Hop Exchange development.

Due to the cooling demand identified, a reversible VRF heat pump with heat recovery is proposed. This allows simultaneous heating and cooling, with recovery of rejected heat resulting in very high efficiency values. As a VRF based system, heat loss from distribution pipework will be minimised.

The heat pumps will be provided on the basis of two per floor plate, meaning each tenant will have their own installation – making metering, billing, maintenance and upgrading much more straightforward. This will also ensure that plant operation closely matches demand, reducing standing losses from unnecessary operation.

The heat pumps will be sized to meet 100% of the heating and cooling demand. In total, initial selections suggest a nominal heating output of 178kW for the whole building.

An SCOP of 4 and SEER of 6 has been used in the calculations – based on manufacturer's declarations for the operating regime for the Hop Exchange.

Be Green CO_2 Emissions Reduction – Refurbished Areas
Following the application of the air source heat pump heating strategy to the refurbished areas of the Hop Exchange development, the regulated CO_2 emission are 17.7 tonnes CO_2/annum.

Table 17: Emissions and Savings for the Refurbished Areas

Stage	Regulated CO_2 Emissions (Tonnes CO_2/annum)	Regulated CO_2 Savings (Tonnes CO_2/annum)	Regulated CO_2 Savings (%)
Baseline	33.0	-	-
Be Lean	37.6	-4.7	-14
Be Clean	37.6	0	0
Be Green	17.7	20	60
Cumulative On-Site		15.3	46

Be Green CO_2 Emissions Reduction – New-Build Areas
Following the application of the air source heat pump heating strategy to the new-build areas of the Hop Exchange development, the regulated CO_2 emission are 16.8 tonnes CO_2/annum.

Table 18: Emissions and Savings for New-Build Areas

Stage	Regulated CO_2 Emissions (Tonnes CO^2/annum)	Regulated CO_2 Savings (Tonnes CO^2/annum)	Regulated CO_2 Savings (%)
Baseline	29.9	-	-
Be Lean	24.1	5.8	19
Be Clean	24.1	0	0
Be Green	16.8	7.3	25
Cumulative On-Site			44

Be Green CO_2 Emissions Reduction – Overall
Following the application of the air source heat pump heating strategy to the entire Hop Exchange development, the CO_2 emission are 34.5 tonnes CO_2/annum.

Table 19: Overall Carbon Emissions and Savings

Stage	Regulated CO_2 Emissions (Tonnes CO_2/annum)	Regulated CO_2 Savings (Tonnes CO_2/annum)	Regulated CO_2 Savings (%)
Baseline	62.9	-	-
Be Lean	61.8	1.1	2
Be Clean	61.8	0	0
Be Green	34.5	27.3	43
Cumulative On-Site		28.4	45

As can be seen from the results tables, the New Southwark Plan requirement of a 40% on-site carbon emissions reduction has been achieved for the new build and refurbishment – considered both independently and combined.

It is proposed that the outstanding 34.5 tonnes CO2/annum is offset via a payment to the Southwark Council offsetting fund – refer to Section 10.0 for further details.

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10.0 CARBON OFFSETTING

Application of the Be Lean, Be Clean and Be Green energy hierarchy to the development has resulted in a 45% reduction of CO_2 emissions over the baseline emissions calculated in line with GLA guidance.

However, the GLA require all new developments to be net zero carbon, and require any shortfall in on-site carbon reduction to be offset via payment in to the boroughs carbon offset fund, at the rate of £95/tonne CO_2 over the assumed lifetime of the services, assumed to be 30 years.

The remaining CO_2 emissions, after all on-site energy efficiency and renewable energy measures are 34.5 Tonnes CO_2/annum. The cumulative shortfall would be met through a Carbon offset payment to Southwark Council's carbon offset fund.

The CO_2 offset price for the proposed Hop Exchange redevelopment is calculated to be £98,395, which will be recalculated during the detailed design stages of the project.

11.0 AIR QUALITY IMPACTS

Heat generation is proposed to be using grid electricity for ASHPs as identified in previous sections. These heat pumps will be sized to cater for 100% of the building's heat demand, and as such there will be no requirement for back up boilers.

As a result, the development will have no combustion-based systems on site, facilitating an air-quality neutral development. Refer to the standalone Air Quality Assessment for further details of the air quality impacts of the development.

In order to assist the assessment of air quality impacts in line with London Plan policy, the reporting template for air quality impacts is shown in Table 20. The data required to fill in the table has been derived from the fuel consumption information provided under GLA carbon emission spreadsheet.

Table 20: Fuel Consumption Totals for the Development

Energy Source	Total Fuel Consumption (MWh/year)
Grid Electricity	148.2
Gas Boilers	N/A
Gas CHP	N/A
Connection to Existing DH Network	N/A
Other Gas Use (e.g. Cookers)	N/A

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12.0 ENERGY MONITORING (BE SEEN)

The approach to the monitoring and reporting of the development's energy use has been developed with reference to the Mayor London's document "'Be Seen' Energy Monitoring Guidance, Consultation Draft, October 2020"

Energy Consumption calculations for the development (as contained within this Energy Strategy document) have been undertaken. On receipt of Planning Approval these will be reported to the GLA using the 'Be Seen' spreadsheet.

The development contains multiple non-residential tenants. The electrical supplies to each of these units and to the Landlord areas will be separately metered (there are no gas supplies). The readings from each of these supplies will be connected to a common Energy management/BMS system and also be available to the respective users to provide information on their consumption in real time and enable occupants to monitor, manage and reduce their energy consumption.

As Built Stage information – as set out in the Be Seen Guidance document - will be provided at the 'Practical Completion' stage of the project with each 'Reportable Unit' provided with its own 'performance Indicators' with this information uploaded to the GLA 'Be Seen' spreadsheet.

Energy Use reporting will continue during the 'In Use' stage. Energy performance data for each 'Reportable Unit' will be collected and uploaded annually to the GLA 'Be Seen' spreadsheet for a minimum of 5 years after the Defects Liability period.

13.0 FLEXIBILITY AND PEAK ENERGY DEMAND

The part of the whole Hop Exchange complex that is being developed will use grid electricity for heat generation, building services systems and unregulated energy usage (by occupants). The net increase in peak electricity demand arising from the area being developed scheme is 405 kVA. Added to the 500 kVA associated with the existing retained parts results in a peak total demand for the Hope Exchange as a whole of 905 kVA

Initial consultations and an application for this supply to the Distribution Network Operator (DNO) for the area indicated that they wanted the existing electrical supply arrangements to be brought into line with current practice – a single supply rather than multiple supplies to the building – with a new transformer to be provided as part of the development. The proposal for this location has been developed – details attached - and agreed with them and has resulted in a proposal for a new 1MVA transformer to be provided located on the site,

Documentation relating to this application for a new connection are enclosed below and will be subject to a final application.

Demand reduction measures outlined in 'Be Lean' section have reduced the peak demand of the development

The Heating/Cooling units to each tenanted unit by 'Heat Recovery' units utilise 'waste' heat/cooling from one area for cooling/heating in other areas.

The meters for each of the tenant and landlord electrical supplies will be connected to a common Energy management/BMS system and be available to each tenant to provide information on their consumption in real time and enable occupants to monitor, manage and reduce their energy consumption.

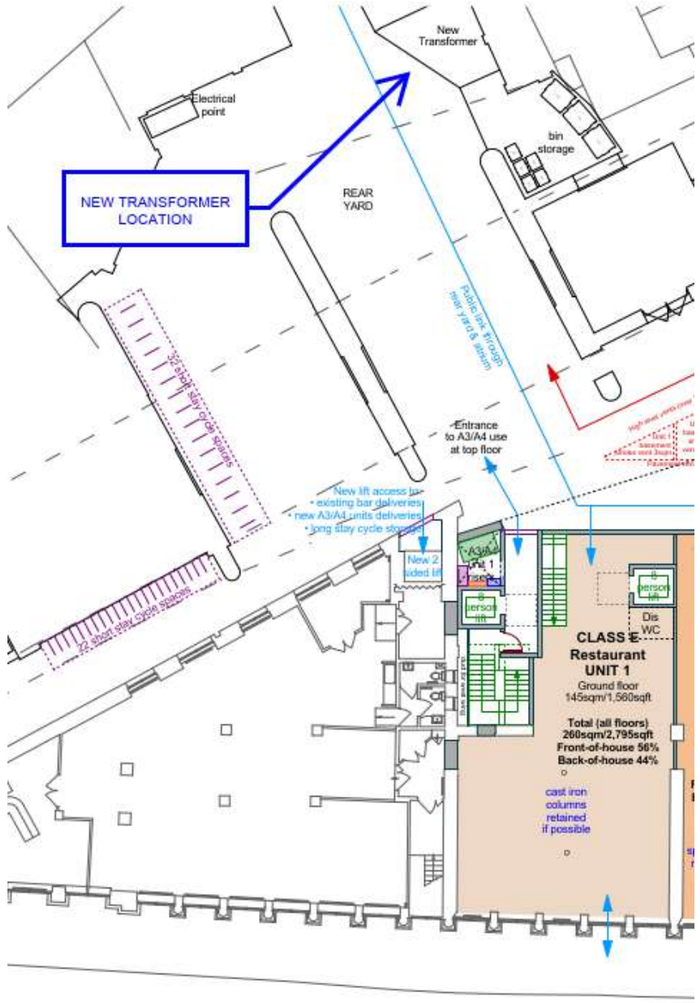

Figure 10 - Extract from Architects floor plans showing the new transformer position

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Registered Office
Newington House
237 Southwark Bridge Road
London SE1 6NP

Company:
UK Power Networks
(Operations) Limited

Registered in England and Wales No: 3870728

Mr. Chris Banyard
Peer Group Plc
Peer Suite, The Hop Exchange
24, Southwark Street
LONDON
SE1 1TY

Date: 03 September 2019

Our Ref: 8500113660 / QID 3500076154

Dear Mr. Banyard

Site Address: 24 Southwark Street, London, SE1 1TY

Thank you for your recent enquiry regarding the above site. I am pleased to be able to provide you with a Quote to carry out the work requested. I am writing to you on behalf of London Power Networks plc the licensed distributor of electricity for the above address trading as and referred to in this Quote as "UK Power Networks".

The Works will enable the provision of an import capacity of 830 kVA and a maximum export capacity of 0 kW.
It will be necessary to:

- Disconnect 4 x existing services
- Install 1 x new 1MVA substation to a GRP enclosure
- Supply 1 x 1600A ACB supply to a single meter point

This service is to supply the commercial development at the above site address.

UK Power Networks would like to carry out all of the requested work for you. However, there are other companies who can do some or all of the work for you; these are Independent Connection Providers (ICPs). You can approach NERS accredited ICPs directly, or you can approach an Independent Distribution Network Operator (IDNO) to request this work and they will arrange for an ICP to carry out the Contestable Works. To find out more about which ICPs work in our area and what work they can undertake please click here.

To give you as much choice as possible we are able to offer you **the following options** for getting your work done:

How much is it going to cost?

		Price excluding VAT	Price including VAT
A	UK Power Networks carries out all of the requested 'contestable' and 'non-contestable' works required for your connection	[redacted]	
B	UK Power Networks carries out all the 'non-contestable' work and the 'contestable closing joint'. The ICP carries out all other requested 'contestable' work		
C	UK Power Networks carries out the 'non-contestable' works only. The ICP carries out all of the works classified as 'contestable'		

A short guide is available to help you understand the three different Prices (options A, B and C). To see this guide please click here.

Terms and Conditions

The Quote is subject to version 7 (September 2016) of our **Terms and Conditions For Connection and Diversionary Works** (the "Terms and Conditions") which you can view here. Alternatively, please let me know if you would like me to send you a copy in the post. These create legally binding obligations so it is important that you take the time to read and understand them. They also contain definitions of terms used in this document and in the linked pages on our website that you may find helpful.

Special Conditions

This offer is subject to the following:-

- Installation and provision of on-site ducts by developer. 125mm black plastic twin walled Rigiduct by Polypipe Civils Ltd. To be provided with draw wire. Depth of cover; 450 in footpath (LV cable); 600mm in footpath (HVcable); 600mm in carriageway (LV cable); 750mm in carriageway (HV cable). All bends to be 1000mm minimum radius. No other plastic ducting is acceptable. **If the cable duct is to be set in concrete, passes through a void or passes through or under a building then steel duct to UKPN specification must be installed.**
- Tri-rated cables are not approved for termination onto any UK Power Networks equipment.
- The customer shall provide the service intake cabinet/intake rooms as per UKPN working standards and in compliance with safe working conditions. Please coordinate your intake room/cabinet location with UKPN delivery team prior to installation onsite.
- The existing supplies will need to be disconnected prior to the new service being established

When can you expect your electricity connection?

Once you have accepted this Quote we will call you to discuss a programme of Works. Subject to the Terms and Conditions the Works referred to in this Quote will be completed on or before 04 December 2020.

We will try to meet your requested dates wherever possible but the completion date will be dependent on:

- The date that the Quote is accepted;
- How much of the work you wish UK Power Networks to complete;
- Any further discussions we may have with you regarding the programming of the works; and
- The completion of work by other people or companies that must be done before we can complete our work.

Interactivity

We have not received a request from any other customer for connections to the same part of our Distribution System, but to find out what happens if they do, please click here.

Post quote call

I will contact you within the next few days to discuss your quote, to ensure you understand the work we will do for the quoted price, your responsibilities, any dependencies and the likely timescales for the work. UK Power Networks are always looking to improve our service offering and as such, the post quote call may be recorded for training purposes. We will not share the recorded call with anyone outside of our connections business and it will be deleted as soon as we have completed the training review. However, if you do not want us to record the call please let me know at the beginning of the call.

What you need to do next

Before you decide to proceed it is really important that you take note of our **Terms and Conditions,** any **special conditions** detailed above and the details in **Your Information Pack** which includes information contained within the hyperlinked text, all of which constitute your **Quote**.

If you would like to accept this Quote you will need to ensure that the requested payment is in our bank account in full and cleared funds and that we have received your signed Acceptance Form from section 5 below by 5pm on 02 December 2019.

If you would like UK Power Networks to carry out all of the Works please accept option A. If you would prefer to use an ICP to carry out the Contestable Work (or an IDNO to arrange for an ICP to carry out the Contestable Works), you can pass this Quote to them and they can accept either option B or option C. Alternatively, you can accept option B or option C yourself, but you will need to ensure that your appointed ICP or IDNO understands what they must do, and what UK Power Networks will do for these options. **You can only accept one option**.

If you have any questions about this Quote or need more information, please do not hesitate to contact me.

Yours sincerely

Christie Halsey

Telephone: 020 7509 6551
Mobile: 07812 263 225
Email: christie.halsey@ukpowernetworks.co.uk

Please support our safety campaign and join the growing number of companies signing up to our Pledge

To download your free safety leaflets and resources visit
UK Power Networks - Safety Page

Your Information Pack

The following pack provides all of the information you should need to successfully complete your electrical connection for the work you have been quoted. Please pay particular attention to the information that is specific to your project.

Do not hesitate to contact me should you require any further support.

Section 1 Scope of Works

Please read the details in this section in conjunction with the customer proposal plan (referred to in the Drawing Schedule in Section 4).

A

UK Power Networks will:

- Disconnect the 4no. existing services
- Install 1 x 1MVA transformer to a suitable substation enclosure at ground level
- Commission RTU
- Inspect Substation Civils
- Carry out the 11kV circuit outage
- Supply and install approximately 260 metres of 300 Ali Triplex HV cable
- Excavate and reinstate 4 x HV joint holes in the road
- Excavate and reinstate 4 x LV joint holes in the footway
- Excavate and reinstate approximately 5 meters of HV trench in the footway
- Excavate and reinstate approximately 115 meters of HV trench in the road
- Provide any necessary traffic management
- Install 1 x 1600A ACB supply
- Complete the final closing joints onto the existing HV distribution network
- Raise all required new MPAN's
- Arrange any legal consents in relation to UKPN assets.

The Customer is responsible for:

- The provision and installation of all on-site duct from the back edge of the footpath to the service intake position
- The building of a suitable substation enclosure to house UK Power Networks equipment. The customer is to provide the service intake cabinet/intake rooms, as per UKPN working standards and in compliance with safe working conditions. Please coordinate your intake room/cabinet location with UKPN delivery team prior to installation onsite.

UK Power Networks carries out all the Contestable and Non-Contestable Works.

B

UK Power Networks will:

- Disconnect the 4no. existing services
- Arrange any legal consents in relation to UKPN assets.
- Complete the final closing joints onto the existing HV distribution network
- Commission RTU
- Inspect Substation Civils
- Carry out the 11kV circuit outage
- Complete the final closing joints onto the existing HV distribution network

You will need to arrange for the completion of the remaining Contestable Works by an accredited ICP.

If option B is accepted, your appointed ICP will be responsible for the production of all detailed constructible designs, which must be submitted to UK Power Networks for review and approved prior to the commencement of any Contestable Works. No charge will be made by UK Power Networks for this service.

C

UK Power Networks will:

- Disconnect the 4no. existing services

- Arrange any legal consents in relation to UKPN assets.
- Complete the final closing joints onto the existing HV distribution network
- Commission RTU
- Inspect Substation Civils
- Carry out the 11kV circuit outage

You will need to arrange for the completion of the Contestable Works by an accredited ICP.

If option C is accepted, your appointed ICP will be responsible for the production of all detailed constructible designs, which must be submitted to UK Power Networks for review and approved prior to the commencement of any Contestable Works. No charge will be made by UK Power Networks for this service.

Your Connections

The table below provides a summary of the technical characteristics and the connection types you have requested:

Type of Property	No. of MPANs	Metering Voltage	Phase Type	Import Capacity (kVA)	Export Capacity (kW)
Commercial	1	400V	Three Phase, 50HZ	830	
Meter Position	**Service Cable**	**Fuse Size**	**Earthing**	**Metering**	
Kiosks	Customer to size service cables	Z11	PME(TN-C-S)	CT Metering	

Phases of work

This Quote covers 1 phase(s) of work which may be subject to our performance standards, as detailed in our 'Our Connections Standards of Performance' leaflet which can be found here.

Section 2 Cost Breakdown

Totals

Option	A	B	C
Net Price (Excluding VAT)	[redacted]		

Breakdown of Costs

Description of CONTESTABLE WORK that is included in option A only	
Work involved	**Net price (£)**
HV Plant and Switchgear	
• Establish an 1000kVA unit substation within a GRP housing. Includes 1000kVA transformer, Ring Main Unit, 1600A air circuit breaker, RTU, internal small power/lighting and substation ancillaries. Excludes GRP, civil works, and HV/LV jointing. • Terminate LV cables from ACB • 300mm HV indoor end box termination • Delivery of plant to site in normal weekday working hours • Connect and install COP5 LV metering termination cubicle and multicore termination.	[redacted]
HV Substation Civils	
• Construction & erection of a brown GRP substation housing.	
HV Underground Mains	
• Supply only of 11kV 300mm aluminium Triplex mains cable • Civils groundwork desktop study • Excavate & Reinstate 11kV joint hole in a category 3 or 4 carriageway. • Excavate, lay cable & reinstate 11kV trench in a category 3 or 4 carriageway. • Excavate, lay cable & reinstate 11kV trench in a footway surface type. • Install additional 11kV cable, widen surfaced trench • Install HV duct with no further trench work • Install 11kV cable to duct or cable tray • Excavate & reinstate LV joint hole in a category 3 or 4 carriageway. • Road closure • Road closure application • Transport for London (TfL) Lane Rental Scheme - Low charge per day	
TOTAL	

Description of CONTESTABLE FINAL CLOSING JOINT WORK that is included in option A and in option B	
Work involved	**Net price (£)**
HV Underground Mains	
• 11kV 300 Triplex to 300 Triplex St Jnt	[redacted]
TOTAL	

Description of NON-CONTESTABLE WORK that is included in option A and in option B and in option C	
Work involved	**Net price (£)**

LV Underground Mains		[redacted]
• Pot end of three phase LV PILC service cable & removal of any redundant equipment		
HV Plant and Switchgear		
• Commissioning of a Remote Terminal Unit (RTU) • 11kV outage associated with the provision of an 11kV substation		
HV Substation Civils		
• Inspection of substation civil works • Legal fees for a Freehold/Leasehold for the establishment of a substation in a new physical location.		
Transactional Charges		
• Assessment & Design Charges		
Other charges		
TOTAL		

Please note that payment is required in full, in advance of the work being programmed.

Section 3 Your Responsibilities

This section provides information about the work that you are responsible for should you accept this Quote.

We have made all of our general information about your responsibilities available in our Knowledge Centre on our internet site at www.ukpowernetworks.co.uk. Links to each of the relevant articles are in the table below.

Please let me know if you think we can improve the information we have provided.

Job Specific Responsibilities

Subject	Link to our Knowledge Library
On-site trenches and cable route	Section 3.1 Click here
Ducts	Section 3.2 Click here
Commercial or industrial connections - CT metering large low voltage connections more than 400As	Section 3.10 Click here
Land rights required from You in connection with land within Your occupation, ownership or control (time to complete the legal work between Your solicitors and UK Power Networks' solicitors associated with acquiring substation sites and easements)	Section 3.19 Click here
Land rights required from You in connection with land within Your occupation, ownership or control (the freehold/leasehold of the substation site)	Section 3.20 Click here

Generic Responsibilities Applicable to all Quotes

Subject	Link to our Knowledge Library
Construction (Design & Management) Regulations 2015 (CDM)	Section 3.25 Click here
Appoint an electricity supplier	Section 3.26 Click here
Works to be undertaken by the ICP/IDNO if UK Power Networks is undertaking the non-contestable Works only	Section 3.27 Click here
Land rights for option B or C - where UK Power Networks is undertaking the non-contestable Works only	Section 3.28 Click here

Section 4 Information to Help You Plan For Your Work

Drawing Schedule

The table below shows a summary of the standard drawings that may be useful for this Quote, along with hyperlinks to the drawings that are currently applicable. Our drawings are revised periodically so the links in the table below may not work in the future if the drawings are superseded. However the latest versions of all of our standard drawings can be found here. If you have not used our G81 web pages before you will be asked to register your credentials for future logins and updates.

Drawing Number	Drawing Description
8500113660_POC	Site Plan showing proposed Point of Connection
ECS 02-0019	LV/HV/EHV cable trench details View
EDS 07-3102_01	Unit or Padmount substation in GRP enclosure View
EDS 07-3102_16	Freestanding brick-built substation for a single transformer up to 1000kVA with ACB & LV Boards (Earth Ring) View
EDS 08-2110.16	Balancing and Settlements Code of Practice 5 LV & HV Meter Chamber View
Substation drawing	This will be provided separately at a later date (after the Quote)

Job Specific Information

Subject	Link to our Knowledge Library
Supply characteristics at the Point of Supply for LV metered and un-metered customers	Section 4.2 Click here
Earth Fault Loop Impedance (EFLI)	Section 4.4 Click here
Cables between UK Power Networks and Customer installations up to 400A	Section 4.5 Click here
Private generation	Section 4.6 Click here
Interactive process	Section 4.10 Click here

Generic Information Applicable to all Quotes

Subject	Link to our Knowledge Library
Information common to all Quotes	Section 4.1 Click here

If you are unhappy with our service please follow our Complaints Procedure Specific to Commercial and Industrial Projects which can be found here. This document details your right to contact Ofgem for a formal determination if we have been unable to resolve the matter to your satisfaction.

Section 5 Acceptance Form

Job Reference: 8500113660 / 3500076154

Site Address: 24 Southwark Street / LONDON SE1 1TY

Please return your completed form by post or email:

CC Proj.
UK Power Networks
Metropolitan House
Darkes Lane
Potters Bar, Herts, EN6 1AG

Email: billingteam-networks@ukpowernetworks.co.uk

Please indicate which option you accept:

		Please tick one only	Price excluding VAT	Price including VAT
A	UK Power Networks carries out all of the requested 'contestable' and 'non-contestable' works required for your connection	○	[redacted]	
B	UK Power Networks carries out all the 'non-contestable' work and the 'contestable closing joint'. The ICP carries out all other requested 'contestable' work	○		
C	UK Power Networks carries out the 'non-contestable' works only. The ICP carries out all of the works classified as 'contestable'	○		

Payment Profile

I understand that the Price, including VAT, must be paid in full to accept this Quote. I also understand that where VAT has been charged a Tax Invoice for the Price will be issued by UK Power Networks on receipt of payment.

Please indicate your method of payment:

○ Cheque	Please make cheques payable to **UK Power Networks** and **put our reference number on the back.**
○ Debit/Credit Card	Please call **0203 282 0610** and have your card to hand. We are sorry we cannot accept American Express/Diners Club.
○ BACS/CHAPS	**Account:** HSBC Bank Plc **Sort Code:** 40 05 30 **Account Number:** 02302934 **UK Power Networks Ref. Number** 3500076154 **(You MUST include this reference so we know which job is being paid):**

The Invoice Address	Your Site Contact
Name / Company name:	Name / Company name:
Contact name:	Contact name:
Address:	Address:
Telephone:	Telephone:
Email:	Email:

Your Acceptance

I accept your quotation for carrying out the DNO Works in accordance with the Quote for the option I have chosen overleaf.

To accept this Quote, the signed Acceptance Form and payment in cleared funds must reach UK Power Networks by 5pm on 02 December 2019. Acceptance Forms and payments received after this date may be returned and you will need to request a new Quote.

Signed:	Date:
Print name:	
Agent acting on behalf of:	

Job Reference: 8500113660 / 3500076154

Acceptance Form Part 2

Land Rights

If you are appointing a Solicitor to complete any legal work associated with acquiring substation sites and easements work, please provide UK Power Networks with their details by completing the table below.

Please also provide us with the name and address of the owner of any affected land.

Solicitors Information

Name / Company name:
Contact name:
Address:
Telephone:
Email:

Land Owners Information

Name / Company name:
Contact name:
Address:
Telephone:
Email:

Title: 8500113660 - 24 Southwark Street, London, SE1 1TY

STANDARD PLOT

1 x 1600A ACB service:
Bulk Supply - 830kVA
Total: 830kVA

2 x 300alTX cables - approximately 130m each

1 x new 1MVA dedicated substation to supply customer load of 830kVA

1 x ACB supply for customer BNO load to terminate in adjacent switch room

125mm ducts
Installation and provision of on-site ducts by developer. 125mm black plastic twin walled Rigiduct by Polypipe Civils Ltd. To be provided with draw wire. Depth of cover; 450 in footpath (LV cable); 600mm in footpath (HVcable); 600mm in carriageway (LV cable); 750mm in carriageway (HV cable). All bends to be 1000mm minimum radius. No other plastic ducting is acceptable.
If the cable duct is to be set in concrete, passes through a void or passes through or under a building then steel duct to UKPN specification must be installed.

Existing services to be disconnected

HV Point of Connection - feeder E1, Bankside C MSS between Panel 69 and substation 'Lower Thames Street St Magnus Hse. (41621).'

The customer shall provide the service intake cabinet/intake rooms as per UKPN working standards and in compliance with safe working conditions. Please coordinate your intake room/cabinet location with UKPN delivery team prior to installation onsite.

Drawing is for indicative purposes only

0m 5m 10m 15m 20m 25m 30m 35m 40m 45m 50m 55m 60m

The quality and accuracy of any print will depend on your printer, your computer and its print settings. Measurements scaled from this plan may not match measurements between the same points on the ground.

LV Cable or Line
HV Cable or Line
EHV Cable or Line approx. Location
Duct Ends
Service Discon & Street Furniture
Substation & Link Box

1. The position of the apparatus shown on this drawing is believed to be correct but the original landmarks may have been altered since the apparatus was installed.
2. The exact position of the apparatus should be verified – use approved cable avoidance tools prior to excavation using suitable hand tools.
3. It is essential that trial holes are carefully made avoiding the use of mechanical tools or picks until the exact location of all cables have been determined.
4. It must be assumed that each property and item of street furniture has an electricity supply. A separate record is kept for each service cable but its route is not necessarily shown on this record.
5. All cables must be treated as being live unless proved otherwise by UK Power Networks.
6. The information provided must be given to all people working near UK Power Networks' plant & equipment. Do not use plans more than 3 months after the issue date for excavation purposes.
7. Please be aware that electric cables/lines belonging to other owners of licensed electricity distribution systems may be present and it is your responsibility to identify their location.

Contact UK Power Networks on 0800 056 5866 for details of EHV Cable routes before commencing work.

1. UK Power Networks does not warrant that the information provided to you is correct. You rely upon it at your own risk.
2. UK Power Networks does not exclude or limit its liability if it causes the death of any person or causes personal injury to a person where such death or personal injury is caused by its negligence.
3. Subject to paragraph 2 UK Power Networks has no liability to you in contract, in tort (including negligence), for breach of statutory duty or otherwise for any loss, damage, cost, claims, demands, or expenses that you or any third party may suffer or incur as a result of using the information provided whether for physical damage to property or for any economic loss (including without limitation loss of profit, loss of opportunity, loss of savings, loss of goodwill, loss of business, loss of use) or any special or consequential loss or damage whatsoever.
4. This plan has been provided to you on the basis of the terms of use set out in the covering letter that accompanies this plan. If you do not accept and/or do not understand the terms of use set out in the covering letter you must not use the plan and you must return it to the sender of the letter.
5. You are responsible for the security of the information provided to you. It must not be given, sold or made available upon payment of a fee to a third party.

Grid Ref: TQ3280SE
Scale 1:663
(When Plotted at A3)
Plotted on: 15/06/2019
Plotted by: <anonymous>

UK Power Networks

IF IN DOUBT – ASK! PHONE 0800 056 5866
EMERGENCY – If you damage a cable or line Phone 0800 780 0780 (24hrs) URGENTLY

Raster Visibilities:				
Comp	HV	LV	Mains	Ways
ON	ON	ON	ON	ON

Maps produced at 1:2500 scale are LV Geo-Schematics which show LV mains cables and overhead lines (in some cases all voltages). Prior to carrying out excavations you must refer to the 1:500 records to determine the location of all known underground plant and equipment.

MAX FORDHAM

14.0 APPENDIX 1: BRUKL OUTPUT DOCUMENTS

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

HopExchange_NewBuild_BeLean

As designed

Date: Thu Feb 04 00:18:02 2021

Administrative information

Building Details

Address: 24 Southwark St, London, SE1 1TY

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, $kgCO_2/m^2.annum$	23
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	23
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.8
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	0.18	0.18	UG000010:Surf[0]
Floor	0.25	0.12	0.12	UG000017:Surf[0]
Roof	0.25	0.12	0.12	05000009:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.1	1.1	04000001:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
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	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- GasBoiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	5	0	0	0.82
Standard value	0.91*	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Circ 000	-	1.1	0	-	-	-	-	-	-	-	N/A
01_WC 006	-	-	0.4	-	-	-	-	-	-	-	N/A
01_WC 007	-	-	0.4	-	-	-	-	-	-	-	N/A
02 _Circ 010	-	1.1	0	-	-	-	-	-	-	-	N/A
02_WC 013	-	-	0.4	-	-	-	-	-	-	-	N/A
02_WC 014	-	-	0.4	-	-	-	-	-	-	-	N/A
03_Circ 016	-	1.1	0	-	-	-	-	-	-	-	N/A
03_WC 021	-	-	0.4	-	-	-	-	-	-	-	N/A
03_WC 022	-	-	0.4	-	-	-	-	-	-	-	N/A
04_Circ 024	-	1.1	0	-	-	-	-	-	-	-	N/A
04_Circ 025	-	1.1	0	-	-	-	-	-	-	-	N/A
04_Office 027	-	1.1	0	-	-	-	-	-	-	-	N/A
04_Office 028	-	1.1	0	-	-	-	-	-	-	-	N/A
04_WC 029	-	-	0.4	-	-	-	-	-	-	-	N/A
04_WC 030	-	-	0.4	-	-	-	-	-	-	-	N/A
04_WC 031	-	-	0.4	-	-	-	-	-	-	-	N/A
05_Circ 032	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Circ 033	-	1.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
05_Circ 034	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Dining 035	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Kitchen 036	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Office 038	-	1.1	0	-	-	-	-	-	-	-	N/A
05_WC 039	-	-	0.4	-	-	-	-	-	-	-	N/A
05_WC 040	-	-	0.4	-	-	-	-	-	-	-	N/A
05_WC 041	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Circ 064	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 074	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 075	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 076	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 078	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 081	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_WC 089	-	-	0.4	-	-	-	-	-	-	-	N/A
UG_WC 090	-	-	0.4	-	-	-	-	-	-	-	N/A
UG_Dining 084	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Dining 083	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Office 004	-	1.1	0	-	-	-	-	-	-	-	N/A
02_Office 012	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Office 020	-	1.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Circ 000	-	80	-	61
01_Storage 005	80	-	-	17
01_WC 006	-	80	-	61
01_WC 007	-	80	-	90
02 _Circ 010	-	80	-	61
02_WC 013	-	80	-	90
02_WC 014	-	80	-	61
03_Circ 016	-	80	-	65
03_WC 021	-	80	-	69
03_WC 022	-	80	-	98
04_Circ 024	-	80	-	77
04_Circ 025	-	80	-	74
04_Office 027	80	-	-	1701
04_Office 028	80	-	-	2275
04_WC 029	-	80	-	90
04_WC 030	-	80	-	60
04_WC 031	-	80	-	71
05_Circ 032	-	80	-	104
05_Circ 033	-	80	-	78

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
05_Circ 034	-	80	-	39
05_Dining 035	-	80	15	441
05_Kitchen 036	-	80	-	501
05_Office 038	80	-	-	2272
05_WC 039	-	80	-	62
05_WC 040	-	80	-	92
05_WC 041	-	80	-	70
LG_Circ 064	-	80	-	64
UG_Circ 074	-	80	-	66
UG_Circ 075	-	80	-	99
UG_Circ 076	-	80	-	65
UG_Circ 078	-	80	-	60
UG_Circ 081	-	80	-	48
UG_WC 089	-	80	-	77
UG_WC 090	-	80	-	52
UG_Dining 084	-	80	15	194
UG_Dining 083	-	80	15	184
01_Office 004	80	-	-	1405
02_Office 012	80	-	-	1406
03_Office 020	80	-	-	1422

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Circ 000	N/A	N/A
01_Storage 005	N/A	N/A
01_WC 006	N/A	N/A
01_WC 007	N/A	N/A
02 _Circ 010	N/A	N/A
02_WC 013	N/A	N/A
02_WC 014	N/A	N/A
03_Circ 016	N/A	N/A
03_WC 021	N/A	N/A
03_WC 022	N/A	N/A
04_Circ 024	N/A	N/A
04_Circ 025	N/A	N/A
04_Office 027	NO (-75.1%)	NO
04_Office 028	NO (-41.9%)	NO
04_WC 029	NO (-51.2%)	NO
04_WC 030	N/A	N/A
04_WC 031	NO (-38.4%)	NO
05_Circ 032	NO (-57.5%)	NO
05_Circ 033	N/A	N/A
05_Circ 034	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
05_Dining 035	NO (-79.1%)	NO
05_Kitchen 036	N/A	N/A
05_Office 038	NO (-40.9%)	NO
05_WC 039	N/A	N/A
05_WC 040	NO (-66.5%)	NO
05_WC 041	N/A	N/A
LG_Circ 064	N/A	N/A
UG_Circ 074	N/A	N/A
UG_Circ 075	N/A	N/A
UG_Circ 076	N/A	N/A
UG_Circ 078	N/A	N/A
UG_Circ 081	YES (+3%)	NO
UG_WC 089	N/A	N/A
UG_WC 090	N/A	N/A
UG_Dining 084	YES (+16%)	NO
UG_Dining 083	NO (-14.2%)	NO
01_Office 004	NO (-61.7%)	NO
02_Office 012	NO (-61.6%)	NO
03_Office 020	NO (-61.6%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	2336.8	2336.8
External area [m²]	1798.3	1798.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	568.1	955.22
Average U-value [W/m²K]	0.32	0.53
Alpha value* [%]	10.03	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
13	**A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways**
87	**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
	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	3.6	4.8
Cooling	5.4	9.83
Auxiliary	5.57	2.73
Lighting	15.49	23.65
Hot water	17.01	17.01
Equipment*	46.13	46.13
TOTAL**	**47.07**	**58.02**

* 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]	98.28	149.07
Primary energy* [kWh/m²]	104.35	134.99
Total emissions [kg/m²]	17.8	23

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	10.8	87.5	3.6	5.4	5.6	0.83	4.5	0.91	6
	Notional	14.9	134.2	4.8	9.8	2.7	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	UG000010:Surf[0]
Floor	0.2	0.12	UG000017:Surf[0]
Roof	0.15	0.12	05000009:Surf[0]
Windows, roof windows, and rooflights	1.5	1.1	04000001:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

HopExchange_NewBuild_BeGreen

As designed

Date: Fri Feb 05 13:09:10 2021

Administrative information

Building Details

Address: 24 Southwark St, London, SE1 1TY

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, $kgCO_2/m^2.annum$	21.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	16
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	0.18	UG000010:Surf[0]
Floor	0.25	0.12	0.12	UG000017:Surf[0]
Roof	0.25	0.12	0.12	05000009:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.1	1.1	04000001:Surf[1]
Personnel doors	2.2	-	-	No Personnel doors in building
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	3

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- B1 ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	0	0	0.82
Standard value	2.5*	1	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Circ 000	-	1.1	0	-	-	-	-	-	-	-	N/A
01_WC 006	-	-	0.4	-	-	-	-	-	-	-	N/A
01_WC 007	-	-	0.4	-	-	-	-	-	-	-	N/A
02 _Circ 010	-	1.1	0	-	-	-	-	-	-	-	N/A
02_WC 013	-	-	0.4	-	-	-	-	-	-	-	N/A
02_WC 014	-	-	0.4	-	-	-	-	-	-	-	N/A
03_Circ 016	-	1.1	0	-	-	-	-	-	-	-	N/A
03_WC 021	-	-	0.4	-	-	-	-	-	-	-	N/A
03_WC 022	-	-	0.4	-	-	-	-	-	-	-	N/A
04_Circ 024	-	1.1	0	-	-	-	-	-	-	-	N/A
04_Circ 025	-	1.1	0	-	-	-	-	-	-	-	N/A
04_Office 027	-	1.1	0	-	-	-	-	-	-	-	N/A
04_Office 028	-	1.1	0	-	-	-	-	-	-	-	N/A
04_WC 029	-	-	0.4	-	-	-	-	-	-	-	N/A
04_WC 030	-	-	0.4	-	-	-	-	-	-	-	N/A
04_WC 031	-	-	0.4	-	-	-	-	-	-	-	N/A
05_Circ 032	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Circ 033	-	1.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
05_Circ 034	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Dining 035	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Kitchen 036	-	1.1	0	-	-	-	-	-	-	-	N/A
05_Office 038	-	1.1	0	-	-	-	-	-	-	-	N/A
05_WC 039	-	-	0.4	-	-	-	-	-	-	-	N/A
05_WC 040	-	-	0.4	-	-	-	-	-	-	-	N/A
05_WC 041	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Circ 064	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 074	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 075	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 076	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 078	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 081	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_WC 089	-	-	0.4	-	-	-	-	-	-	-	N/A
UG_WC 090	-	-	0.4	-	-	-	-	-	-	-	N/A
UG_Dining 084	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Dining 083	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Office 004	-	1.1	0	-	-	-	-	-	-	-	N/A
02_Office 012	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Office 020	-	1.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Circ 000	-	80	-	61
01_Storage 005	80	-	-	17
01_WC 006	-	80	-	61
01_WC 007	-	80	-	90
02 _Circ 010	-	80	-	61
02_WC 013	-	80	-	90
02_WC 014	-	80	-	61
03_Circ 016	-	80	-	65
03_WC 021	-	80	-	69
03_WC 022	-	80	-	98
04_Circ 024	-	80	-	77
04_Circ 025	-	80	-	74
04_Office 027	80	-	-	1701
04_Office 028	80	-	-	2275
04_WC 029	-	80	-	90
04_WC 030	-	80	-	60
04_WC 031	-	80	-	71
05_Circ 032	-	80	-	104
05_Circ 033	-	80	-	78

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
05_Circ 034	-	80	-	39
05_Dining 035	-	80	22	441
05_Kitchen 036	-	80	-	501
05_Office 038	80	-	-	2272
05_WC 039	-	80	-	62
05_WC 040	-	80	-	92
05_WC 041	-	80	-	70
LG_Circ 064	-	80	-	64
UG_Circ 074	-	80	-	66
UG_Circ 075	-	80	-	99
UG_Circ 076	-	80	-	65
UG_Circ 078	-	80	-	60
UG_Circ 081	-	80	-	48
UG_WC 089	-	80	-	77
UG_WC 090	-	80	-	52
UG_Dining 084	-	80	22	194
UG_Dining 083	-	80	22	184
01_Office 004	80	-	-	1405
02_Office 012	80	-	-	1406
03_Office 020	80	-	-	1422

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Circ 000	N/A	N/A
01_Storage 005	N/A	N/A
01_WC 006	N/A	N/A
01_WC 007	N/A	N/A
02 _Circ 010	N/A	N/A
02_WC 013	N/A	N/A
02_WC 014	N/A	N/A
03_Circ 016	N/A	N/A
03_WC 021	N/A	N/A
03_WC 022	N/A	N/A
04_Circ 024	N/A	N/A
04_Circ 025	N/A	N/A
04_Office 027	NO (-75.1%)	NO
04_Office 028	NO (-41.9%)	NO
04_WC 029	NO (-51.2%)	NO
04_WC 030	N/A	N/A
04_WC 031	NO (-38.4%)	NO
05_Circ 032	NO (-57.5%)	NO
05_Circ 033	N/A	N/A
05_Circ 034	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
05_Dining 035	NO (-79.1%)	NO
05_Kitchen 036	N/A	N/A
05_Office 038	NO (-40.9%)	NO
05_WC 039	N/A	N/A
05_WC 040	NO (-66.5%)	NO
05_WC 041	N/A	N/A
LG_Circ 064	N/A	N/A
UG_Circ 074	N/A	N/A
UG_Circ 075	N/A	N/A
UG_Circ 076	N/A	N/A
UG_Circ 078	N/A	N/A
UG_Circ 081	YES (+3%)	NO
UG_WC 089	N/A	N/A
UG_WC 090	N/A	N/A
UG_Dining 084	YES (+16%)	NO
UG_Dining 083	NO (-14.2%)	NO
01_Office 004	NO (-61.7%)	NO
02_Office 012	NO (-61.6%)	NO
03_Office 020	NO (-61.6%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	2336.8	2336.8
External area [m^2]	1798.3	1798.3
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	568.1	955.22
Average U-value [W/m^2K]	0.32	0.53
Alpha value* [%]	10.03	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
13	**A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways**
87	**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
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	0.74	1.33
Cooling	2.85	8.24
Auxiliary	5.57	2.73
Lighting	14.21	23.65
Hot water	8.27	6.99
Equipment*	46.13	46.13
TOTAL**	**31.65**	**42.93**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	56.31	96.56
Primary energy* [kWh/m^2]	94.73	124.92
Total emissions [kg/m^2]	16	21.4

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	10.4	45.9	0.7	2.8	5.6	3.9	4.48	4	6
	Notional	12.2	84.3	1.3	8.2	2.7	2.56	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	UG000010:Surf[0]
Floor	0.2	0.12	UG000017:Surf[0]
Roof	0.15	0.12	05000009:Surf[0]
Windows, roof windows, and rooflights	1.5	1.1	04000001:Surf[1]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

HopExchange_ Refurbished_Baseline

As designed

Date: Wed Jan 27 14:49:22 2021

Administrative information

Building Details

Address: 24 Southwark St, London, SE1 1TY

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	26.7
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	26.7
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	32.6
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	0.32	0.55	GD000001:Surf[10]
Floor	0.25	0.25	0.25	BB000013:Surf[0]
Roof	0.25	0.18	0.18	BB00000C:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.84	1.84	GD000001:Surf[0]
Personnel doors	2.2	-	-	No Personnel doors in building
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	15

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- GasBoiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.84	2.6	0	0	0.7
Standard value	0.91*	1	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Circ 001	-	2.2	0.5	-	-	-	-	-	-	-	N/A
01_Circ 002	-	2.2	0.5	-	-	-	-	-	-	-	N/A
01_Circ 003	-	2.2	0.5	-	-	-	-	-	-	-	N/A
01_WC 008	-	-	0.5	-	-	-	-	-	-	-	N/A
02 _Circ 009	-	2.2	0.5	-	-	-	-	-	-	-	N/A
02 _Circ 011	-	2.2	0.5	-	-	-	-	-	-	-	N/A
02_WC 015	-	-	0.5	-	-	-	-	-	-	-	N/A
03_Circ 017	-	2.2	0.5	-	-	-	-	-	-	-	N/A
03_Circ 018	-	2.2	0.5	-	-	-	-	-	-	-	N/A
03_Circ 019	-	2.2	0.5	-	-	-	-	-	-	-	N/A
03_WC 023	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_BOH 042	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_BOH 043	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_BOH 044	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_Circ 045	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_Circ 046	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_Circ 047	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_Circ 048	-	2.2	0.5	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BB_Circ 049	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_Kitchen 050	-	2.2	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 053	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 054	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 055	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 056	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 057	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 058	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_Storage 059	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_WC 060	-	-	0.5	-	-	-	-	-	-	-	N/A
BB_WC 061	-	-	0.5	-	-	-	-	-	-	-	N/A
LG_Circ 062	-	2.2	0.5	-	-	-	-	-	-	-	N/A
LG_Circ 063	-	2.2	0.5	-	-	-	-	-	-	-	N/A
LG_Dining 065	-	2.2	0.5	-	-	-	-	-	-	-	N/A
LG_Dining 066	-	2.2	0.5	-	-	-	-	-	-	-	N/A
LG_Dining 067	-	2.2	0.5	-	-	-	-	-	-	-	N/A
LG_Dining 070	-	2.2	0.5	-	-	-	-	-	-	-	N/A
LG_Storage 071	-	-	0.5	-	-	-	-	-	-	-	N/A
UG_Circ 073	-	2.2	0.5	-	-	-	-	-	-	-	N/A
UG_Circ 077	-	2.2	0.5	-	-	-	-	-	-	-	N/A
UG_Circ 079	-	2.2	0.5	-	-	-	-	-	-	-	N/A
UG_Circ 080	-	2.2	0.5	-	-	-	-	-	-	-	N/A
UG_Circ 082	-	2.2	0.5	-	-	-	-	-	-	-	N/A
UG_Storage 086	-	-	0.5	-	-	-	-	-	-	-	N/A
UG_Storage 087	-	-	0.5	-	-	-	-	-	-	-	N/A
UG_Dining 084	-	2.2	0.5	-	-	-	-	-	-	-	N/A
UG_Dining 083	-	2.2	0.5	-	-	-	-	-	-	-	N/A
01_Office 004	-	2.2	0.5	-	-	-	-	-	-	-	N/A
02_Office 012	-	2.2	0.5	-	-	-	-	-	-	-	N/A
03_Office 020	-	2.2	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Circ 001	-	51	-	103
01_Circ 002	-	51	-	141
01_Circ 003	-	51	-	132
01_WC 008	-	51	-	94
02 _Circ 009	-	51	-	141
02 _Circ 011	-	51	-	132
02_WC 015	-	51	-	94
03_Circ 017	-	51	-	43
03_Circ 018	-	51	-	139

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
03_Circ 019	-	51	-	128
03_WC 023	-	51	-	106
BB_BOH 042	-	51	-	698
BB_BOH 043	-	51	-	1109
BB_BOH 044	-	51	-	837
BB_Circ 045	-	51	-	72
BB_Circ 046	-	51	-	89
BB_Circ 047	-	51	-	37
BB_Circ 048	-	51	-	86
BB_Circ 049	-	51	-	81
BB_Kitchen 050	-	51	-	868
BB_Storage 053	51	-	-	24
BB_Storage 054	51	-	-	37
BB_Storage 055	51	-	-	49
BB_Storage 056	51	-	-	42
BB_Storage 057	51	-	-	60
BB_Storage 058	51	-	-	153
BB_Storage 059	51	-	-	108
BB_WC 060	-	51	-	250
BB_WC 061	-	51	-	142
LG_Circ 062	-	51	-	81
LG_Circ 063	-	51	-	75
LG_Dining 065	-	51	22	80
LG_Dining 066	-	51	22	126
LG_Dining 067	-	51	22	141
LG_Dining 070	-	51	22	84
LG_Storage 071	51	-	-	24
UG_Circ 073	-	51	-	85
UG_Circ 077	-	51	-	80
UG_Circ 079	-	51	-	55
UG_Circ 080	-	51	-	87
UG_Circ 082	-	51	-	76
UG_Storage 086	51	-	-	25
UG_Storage 087	51	-	-	48
UG_Dining 084	-	51	22	458
UG_Dining 083	-	51	22	330
01_Office 004	51	-	-	2063
02_Office 012	51	-	-	2062
03_Office 020	51	-	-	2097

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Circ 001	N/A	N/A
01_Circ 002	N/A	N/A
01_Circ 003	N/A	N/A
01_WC 008	N/A	N/A
02 _Circ 009	N/A	N/A
02 _Circ 011	N/A	N/A
02_WC 015	N/A	N/A
03_Circ 017	N/A	N/A
03_Circ 018	N/A	N/A
03_Circ 019	N/A	N/A
03_WC 023	N/A	N/A
BB_BOH 042	N/A	N/A
BB_BOH 043	N/A	N/A
BB_BOH 044	N/A	N/A
BB_Circ 045	N/A	N/A
BB_Circ 046	N/A	N/A
BB_Circ 047	N/A	N/A
BB_Circ 048	N/A	N/A
BB_Circ 049	N/A	N/A
BB_Kitchen 050	N/A	N/A
BB_Storage 053	N/A	N/A
BB_Storage 054	N/A	N/A
BB_Storage 055	N/A	N/A
BB_Storage 056	N/A	N/A
BB_Storage 057	N/A	N/A
BB_Storage 058	N/A	N/A
BB_Storage 059	N/A	N/A
BB_WC 060	N/A	N/A
BB_WC 061	N/A	N/A
LG_Circ 062	N/A	N/A
LG_Circ 063	N/A	N/A
LG_Dining 065	N/A	N/A
LG_Dining 066	N/A	N/A
LG_Dining 067	N/A	N/A
LG_Dining 070	N/A	N/A
LG_Storage 071	N/A	N/A
UG_Circ 073	N/A	N/A
UG_Circ 077	N/A	N/A
UG_Circ 079	N/A	N/A
UG_Circ 080	N/A	N/A
UG_Circ 082	N/A	N/A
UG_Storage 086	N/A	N/A
UG_Storage 087	N/A	N/A
UG_Dining 084	YES (+11.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
UG_Dining 083	NO (-8.1%)	NO
01_Office 004	NO (-25.8%)	NO
02_Office 012	NO (-55.7%)	NO
03_Office 020	NO (-47.9%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1864.7	1864.7
External area [m²]	1319.8	1319.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	15	3
Average conductance [W/K]	530.6	452.82
Average U-value [W/m²K]	0.4	0.34
Alpha value* [%]	10.05	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
23	**A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways**
77	**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
	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	6.42	2.16
Cooling	13.21	10.74
Auxiliary	15.03	4.59
Lighting	24.84	28.49
Hot water	20.37	18.81
Equipment*	56	56
TOTAL**	**79.87**	**64.79**

* 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]	104.09	153.26
Primary energy* [kWh/m²]	191.56	156.78
Total emissions [kg/m²]	32.6	26.7

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	18.5	85.6	6.4	13.2	14.9	0.8	1.8	0.84	2.6
	Notional	6.7	146.6	2.2	10.7	4.5	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	UG000016:Surf[0]
Floor	0.2	0.25	BB000013:Surf[0]
Roof	0.15	0.18	BB00000C:Surf[1]
Windows, roof windows, and rooflights	1.5	1.84	GD000001:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	15

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

HopExchange_Refurbishment_BeLean

As designed

Date: Wed Feb 03 16:04:59 2021

Administrative information

Building Details

Address: 24 Southwark Street, London, SE1 1TY

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

The building does not comply with England Building Regulations Part L 2013

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	26
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	26
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	29.7
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	0.87	2.01	GD000001:Surf[10]
Floor	0.25	1.63	1.63	BB000013:Surf[0]
Roof	0.25	0.12	0.12	BB00000C:Surf[1]
Windows***, roof windows, and rooflights	2.2	5.6	5.6	GD000001:Surf[0]
Personnel doors	2.2	-	-	No Personnel doors in building
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	15

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- GasBoiler

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	2.6	0	0	0.82
Standard value	0.91*	1	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Circ 001	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Circ 002	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Circ 003	-	1.1	0	-	-	-	-	-	-	-	N/A
01_WC 008	-	-	0.4	-	-	-	-	-	-	-	N/A
02 _Circ 009	-	1.1	0	-	-	-	-	-	-	-	N/A
02 _Circ 011	-	1.1	0	-	-	-	-	-	-	-	N/A
02_WC 015	-	-	0.4	-	-	-	-	-	-	-	N/A
03_Circ 017	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Circ 018	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Circ 019	-	1.1	0	-	-	-	-	-	-	-	N/A
03_WC 023	-	-	0.4	-	-	-	-	-	-	-	N/A
BB_BOH 042	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_BOH 043	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_BOH 044	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 045	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 046	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 047	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 048	-	1.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BB_Circ 049	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Kitchen 050	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_WC 060	-	-	0.4	-	-	-	-	-	-	-	N/A
BB_WC 061	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Circ 062	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Circ 063	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 065	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 066	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 067	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 070	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 073	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 077	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 079	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 080	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 082	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Dining 084	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Dining 083	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Office 004	-	1.1	0	-	-	-	-	-	-	-	N/A
02_Office 012	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Office 020	-	1.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Circ 001	-	80	-	65
01_Circ 002	-	80	-	90
01_Circ 003	-	80	-	84
01_WC 008	-	80	-	60
02 _Circ 009	-	80	-	90
02 _Circ 011	-	80	-	84
02_WC 015	-	80	-	60
03_Circ 017	-	80	-	28
03_Circ 018	-	80	-	88
03_Circ 019	-	80	-	81
03_WC 023	-	80	-	68
BB_BOH 042	-	80	-	445
BB_BOH 043	-	80	-	707
BB_BOH 044	-	80	-	534
BB_Circ 045	-	80	-	46
BB_Circ 046	-	80	-	57
BB_Circ 047	-	80	-	24
BB_Circ 048	-	80	-	55
BB_Circ 049	-	80	-	52

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
BB_Kitchen 050	-	80	-	553
BB_Storage 053	80	-	-	15
BB_Storage 054	80	-	-	24
BB_Storage 055	80	-	-	31
BB_Storage 056	80	-	-	27
BB_Storage 057	80	-	-	38
BB_Storage 058	80	-	-	98
BB_Storage 059	80	-	-	69
BB_WC 060	-	80	-	160
BB_WC 061	-	80	-	90
LG_Circ 062	-	80	-	52
LG_Circ 063	-	80	-	48
LG_Dining 065	-	80	22	51
LG_Dining 066	-	80	22	81
LG_Dining 067	-	80	22	90
LG_Dining 070	-	80	22	54
LG_Storage 071	80	-	-	15
UG_Circ 073	-	80	-	54
UG_Circ 077	-	80	-	51
UG_Circ 079	-	80	-	35
UG_Circ 080	-	80	-	56
UG_Circ 082	-	80	-	48
UG_Storage 086	80	-	-	16
UG_Storage 087	80	-	-	31
UG_Dining 084	-	80	22	292
UG_Dining 083	-	80	22	210
01_Office 004	80	-	-	1315
02_Office 012	80	-	-	1315
03_Office 020	80	-	-	1337

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Circ 001	N/A	N/A
01_Circ 002	N/A	N/A
01_Circ 003	N/A	N/A
01_WC 008	N/A	N/A
02 _Circ 009	N/A	N/A
02 _Circ 011	N/A	N/A
02_WC 015	N/A	N/A
03_Circ 017	N/A	N/A
03_Circ 018	N/A	N/A
03_Circ 019	N/A	N/A
03_WC 023	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
BB_BOH 042	N/A	N/A
BB_BOH 043	N/A	N/A
BB_BOH 044	N/A	N/A
BB_Circ 045	N/A	N/A
BB_Circ 046	N/A	N/A
BB_Circ 047	N/A	N/A
BB_Circ 048	N/A	N/A
BB_Circ 049	N/A	N/A
BB_Kitchen 050	N/A	N/A
BB_Storage 053	N/A	N/A
BB_Storage 054	N/A	N/A
BB_Storage 055	N/A	N/A
BB_Storage 056	N/A	N/A
BB_Storage 057	N/A	N/A
BB_Storage 058	N/A	N/A
BB_Storage 059	N/A	N/A
BB_WC 060	N/A	N/A
BB_WC 061	N/A	N/A
LG_Circ 062	N/A	N/A
LG_Circ 063	N/A	N/A
LG_Dining 065	N/A	N/A
LG_Dining 066	N/A	N/A
LG_Dining 067	N/A	N/A
LG_Dining 070	N/A	N/A
LG_Storage 071	N/A	N/A
UG_Circ 073	N/A	N/A
UG_Circ 077	N/A	N/A
UG_Circ 079	N/A	N/A
UG_Circ 080	N/A	N/A
UG_Circ 082	N/A	N/A
UG_Storage 086	N/A	N/A
UG_Storage 087	N/A	N/A
UG_Dining 084	YES (+170.9%)	NO
UG_Dining 083	YES (+124%)	NO
01_Office 004	YES (+80.2%)	NO
02_Office 012	YES (+8.5%)	NO
03_Office 020	YES (+27.4%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1864.7	1864.7
External area [m²]	1319.8	1319.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	15	3
Average conductance [W/K]	2061.55	452.82
Average U-value [W/m²K]	1.56	0.34
Alpha value* [%]	9.99	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
23	**A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways**
77	**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
	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	41.82	2.16
Cooling	9	10.74
Auxiliary	6.66	3.23
Lighting	17.16	28.49
Hot water	18.81	18.81
Equipment*	56	56
TOTAL**	**93.46**	**63.43**

* 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]	183.18	153.26
Primary energy* [kWh/m²]	172.23	152.7
Total emissions [kg/m²]	29.7	26

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	124.9	58.3	41.8	9	6.7	0.83	1.8	0.91	2.6
	Notional	6.7	146.6	2.2	10.7	3.2	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	UG000016:Surf[0]
Floor	0.2	1.63	BB000013:Surf[0]
Roof	0.15	0.12	BB00000C:Surf[1]
Windows, roof windows, and rooflights	1.5	5.6	GD000001:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	15

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

HopExchange_Refurbshment_BeGreen

As designed

Date: Thu Jan 28 10:14:16 2021

Administrative information

Building Details

Address: 24 Southwark St, London, SE1 1TY

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, $kgCO_2/m^2.annum$	23.6
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	23.6
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	21.2
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	0.87	2.01	GD000001:Surf[10]
Floor	0.25	1.63	1.63	BB000013:Surf[0]
Roof	0.25	0.12	0.12	BB00000C:Surf[1]
Windows***, roof windows, and rooflights	2.2	5.6	5.6	GD000001:Surf[0]
Personnel doors	2.2	-	-	No Personnel doors in building
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	15

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- B1 ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	5	0	0	0.82
Standard value	2.5*	1	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

"No HWS in project, or hot water is provided by HVAC system"

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Circ 001	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Circ 002	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Circ 003	-	1.1	0	-	-	-	-	-	-	-	N/A
01_WC 008	-	-	0.4	-	-	-	-	-	-	-	N/A
02 _Circ 009	-	1.1	0	-	-	-	-	-	-	-	N/A
02 _Circ 011	-	1.1	0	-	-	-	-	-	-	-	N/A
02_WC 015	-	-	0.4	-	-	-	-	-	-	-	N/A
03_Circ 017	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Circ 018	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Circ 019	-	1.1	0	-	-	-	-	-	-	-	N/A
03_WC 023	-	-	0.4	-	-	-	-	-	-	-	N/A
BB_BOH 042	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_BOH 043	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_BOH 044	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 045	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 046	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 047	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Circ 048	-	1.1	0	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
BB_Circ 049	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_Kitchen 050	-	1.1	0	-	-	-	-	-	-	-	N/A
BB_WC 060	-	-	0.4	-	-	-	-	-	-	-	N/A
BB_WC 061	-	-	0.4	-	-	-	-	-	-	-	N/A
LG_Circ 062	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Circ 063	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 065	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 066	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 067	-	1.1	0	-	-	-	-	-	-	-	N/A
LG_Dining 070	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 073	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 077	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 079	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 080	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Circ 082	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Dining 084	-	1.1	0	-	-	-	-	-	-	-	N/A
UG_Dining 083	-	1.1	0	-	-	-	-	-	-	-	N/A
01_Office 004	-	1.1	0	-	-	-	-	-	-	-	N/A
02_Office 012	-	1.1	0	-	-	-	-	-	-	-	N/A
03_Office 020	-	1.1	0	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Circ 001	-	80	-	65
01_Circ 002	-	80	-	90
01_Circ 003	-	80	-	84
01_WC 008	-	80	-	60
02 _Circ 009	-	80	-	90
02 _Circ 011	-	80	-	84
02_WC 015	-	80	-	60
03_Circ 017	-	80	-	28
03_Circ 018	-	80	-	88
03_Circ 019	-	80	-	81
03_WC 023	-	80	-	68
BB_BOH 042	-	80	-	445
BB_BOH 043	-	80	-	707
BB_BOH 044	-	80	-	534
BB_Circ 045	-	80	-	46
BB_Circ 046	-	80	-	57
BB_Circ 047	-	80	-	24
BB_Circ 048	-	80	-	55
BB_Circ 049	-	80	-	52

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
BB_Kitchen 050	-	80	-	553
BB_Storage 053	80	-	-	15
BB_Storage 054	80	-	-	24
BB_Storage 055	80	-	-	31
BB_Storage 056	80	-	-	27
BB_Storage 057	80	-	-	38
BB_Storage 058	80	-	-	98
BB_Storage 059	80	-	-	69
BB_WC 060	-	80	-	160
BB_WC 061	-	80	-	90
LG_Circ 062	-	80	-	52
LG_Circ 063	-	80	-	48
LG_Dining 065	-	80	22	51
LG_Dining 066	-	80	22	81
LG_Dining 067	-	80	22	90
LG_Dining 070	-	80	22	54
LG_Storage 071	80	-	-	15
UG_Circ 073	-	80	-	54
UG_Circ 077	-	80	-	51
UG_Circ 079	-	80	-	35
UG_Circ 080	-	80	-	56
UG_Circ 082	-	80	-	48
UG_Storage 086	80	-	-	16
UG_Storage 087	80	-	-	31
UG_Dining 084	-	80	22	292
UG_Dining 083	-	80	22	210
01_Office 004	80	-	-	1315
02_Office 012	80	-	-	1315
03_Office 020	80	-	-	1337

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Circ 001	N/A	N/A
01_Circ 002	N/A	N/A
01_Circ 003	N/A	N/A
01_WC 008	N/A	N/A
02 _Circ 009	N/A	N/A
02 _Circ 011	N/A	N/A
02_WC 015	N/A	N/A
03_Circ 017	N/A	N/A
03_Circ 018	N/A	N/A
03_Circ 019	N/A	N/A
03_WC 023	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
BB_BOH 042	N/A	N/A
BB_BOH 043	N/A	N/A
BB_BOH 044	N/A	N/A
BB_Circ 045	N/A	N/A
BB_Circ 046	N/A	N/A
BB_Circ 047	N/A	N/A
BB_Circ 048	N/A	N/A
BB_Circ 049	N/A	N/A
BB_Kitchen 050	N/A	N/A
BB_Storage 053	N/A	N/A
BB_Storage 054	N/A	N/A
BB_Storage 055	N/A	N/A
BB_Storage 056	N/A	N/A
BB_Storage 057	N/A	N/A
BB_Storage 058	N/A	N/A
BB_Storage 059	N/A	N/A
BB_WC 060	N/A	N/A
BB_WC 061	N/A	N/A
LG_Circ 062	N/A	N/A
LG_Circ 063	N/A	N/A
LG_Dining 065	N/A	N/A
LG_Dining 066	N/A	N/A
LG_Dining 067	N/A	N/A
LG_Dining 070	N/A	N/A
LG_Storage 071	N/A	N/A
UG_Circ 073	N/A	N/A
UG_Circ 077	N/A	N/A
UG_Circ 079	N/A	N/A
UG_Circ 080	N/A	N/A
UG_Circ 082	N/A	N/A
UG_Storage 086	N/A	N/A
UG_Storage 087	N/A	N/A
UG_Dining 084	YES (+170.9%)	NO
UG_Dining 083	YES (+124%)	NO
01_Office 004	YES (+80.2%)	NO
02_Office 012	YES (+8.5%)	NO
03_Office 020	YES (+27.4%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	NO

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	1864.7	1864.7
External area [m²]	1319.8	1319.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	15	3
Average conductance [W/K]	2061.55	452.82
Average U-value [W/m²K]	1.56	0.34
Alpha value* [%]	9.99	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
23	**A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways**
77	**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
	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	8.74	0.47
Cooling	1.09	7.93
Auxiliary	6.66	3.23
Lighting	17.16	28.49
Hot water	8.2	6.93
Equipment*	56	56
TOTAL**	**41.86**	**47.05**

* 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]	140.32	85.42
Primary energy* [kWh/m²]	125.31	139.15
Total emissions [kg/m²]	21.2	23.6

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	122.7	17.6	8.7	1.1	6.7	3.9	4.48	4	6
	Notional	4.3	81.1	0.5	7.9	3.2	2.56	2.84	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	UG000016:Surf[0]
Floor	0.2	1.63	BB000013:Surf[0]
Roof	0.15	0.12	BB00000C:Surf[1]
Windows, roof windows, and rooflights	1.5	5.6	GD000001:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	15