eight associates

Eight Associates
Ground Floor
57a Great Suffolk Street
London
SE1 0BB

+44 (0) 20 7043 0418

www.eightassociates.co.uk
info@eightassociates.co.uk

Planning Statement
Energy Assessment
KOKO

Document information:

Prepared for:
Martin Smith,
Burke Hunter Adams

Date of current issue:
13/03/2017

Issue number: 2

Our reference:
2165-Energy Assessment-1703-13om.docx

Assessment information:

Prepared by:
Yiota Paraskeva

Signature:
Yiota Paraskeva

Quality assured by:
Chris Hocknell

Signature:
Chris Hocknell

Disclaimer:

Contents:

Executive Summary....1
Carbon Emission Reduction (Part L2B)....2
Financial Contribution....4
Introduction....5
Establishing Emissions: The Carbon Profile....6
'Be Lean': Demand Reduction Measures....7
'Be Clean': Heating Infrastructure & CHP....11
'Be Clean': Connection to Existing and Planned Networks....12
'Be Clean': Site Wide Networks and CHP....13
'Be Clean': Cooling....14
'Be Green': Renewable Energy....19
'Be Green': Summary of Renewable Technologies....26
'Be Green': Photovoltaic....27
'Be Green': ASHP....29
Energy Analysis Conclusion....30
Water Management....31
Environment and People....32
Materials and Waste....33
Conclusion....34
Appendix....35

eight associates

Executive Summary
Energy Assessment
KOKO

About the Scheme:	The proposal comprises a new build hotel extension and 'wrap around' and limited refurbishment of an existing venue in the London Borough of Camden. The existing building is Grade II listed, situated within the Camden Town conservation area. The total GIA is approximately 7,250m^2 (6,025m^2 existing, 1,225m^2 hotel extension).
Planning Policy	In accordance with the Camden's CS13 policy, the existing venue and hotel extension must demonstrate improvements in carbon emissions over Part L2B, the approved building standard for refurbishment projects. To ensure compliance with the BREEAM assessment for the hotel extension, measures to ensure compliance with Part L2A have been incorporated into the new build elements. For the purpose of this report, carbon emission reductions have been based over Part L2B, outlining the measures implemented for both the existing venue and the hotel extension. As per Camden's Core Strategy Policy CS13, paragraph 13.9; at least 10% of the project cost should be spent on environmental improvements. This reports details the measures proposed for the scheme. The design team will provide information outlining any associated costs for these improvements. The scheme complies with the 2013 Building Regulations Part L2B minimum energy efficiency targets in the following documents have been followed: • Refurbishment (Part L2B) – Consequential improvements to refurbished areas have been made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally, and economically feasible. Where site constraints limit viability of performance measures, justification is given.

eight associates

Carbon Emission Reduction (Part L2B)

Energy Assessment

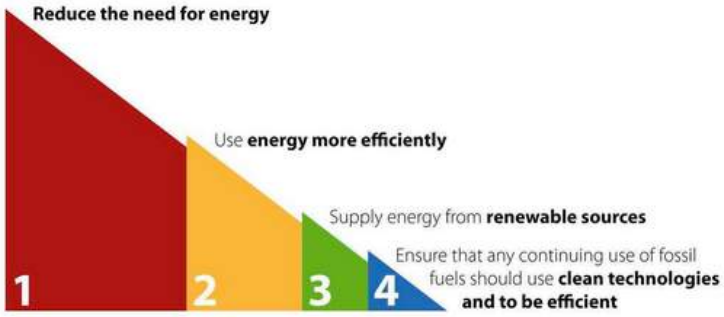
KOKO

London Plan compliance

The following regulated carbon emissions table and demand graph identifies the carbon emissions savings of the scheme over Part L2B minimum building regulations.

The Energy Hierarchy (Part L2B):

The proposed scheme has followed the energy hierarchy that is illustrated below:



The resulting energy savings are shown below in accordance with the GLA's Energy Hierarchy:

GLA's Energy Hierarchy – Regulated Carbon Emissions				
	Baseline:	Be Lean:	Be Clean:	Be Green:
CO_2 emissions (Tonnes CO_2/yr)	364.33	311.47	-	277.91
CO_2 emissions saving (Tonnes CO_2/yr)	-	52.87	-	33.56
Saving from each stage (%)	-	14.5	-	9.2
Total CO_2 emissions saving (Tonnes CO_2/yr)	86.42			
23.7% Total carbon emissions savings over Part L2B of the Building Regulations 2013 and existing building achieved				

eight associates

Carbon Emission Reduction (Part L2B)

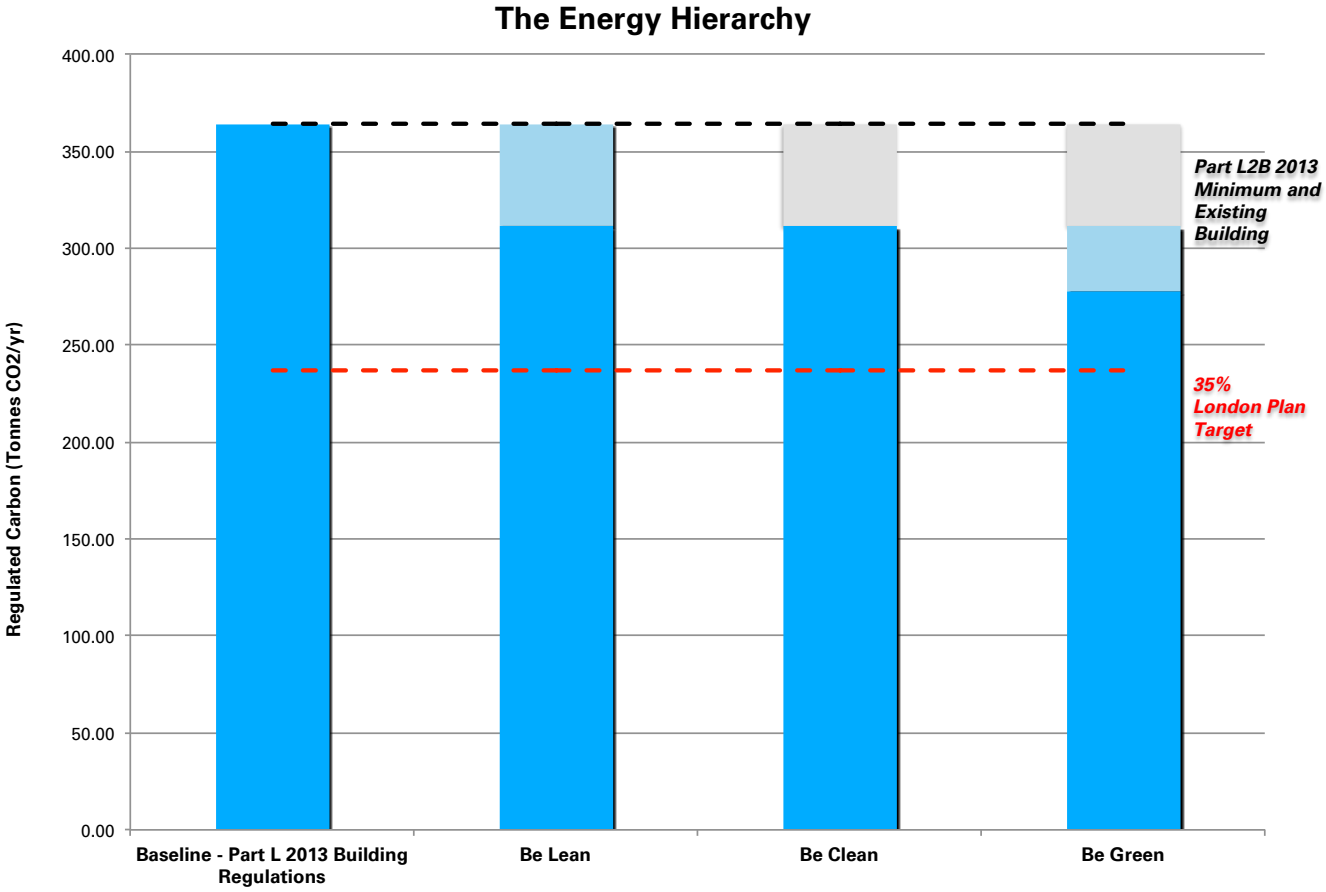
Energy Assessment

KOKO

GLA's Energy Hierarchy – Regulated Carbon Emissions:

A graphical illustration of how the scheme performs in relation to Building Regulations and the Energy Hierarchy is shown below.

Figure:



Summary:

Although there are performance constraints of upgrading an existing building, a 14.5% carbon emission reduction has been achieved through 'be lean' measures. Utilising photovoltaic panels on the roof as well as specifying VRF air source heat pumps for space heating has significantly reduced the space heating demand whilst also generating additional electricity, which reduces the scheme's regulated carbon emissions by 23.7% over Part L2B and the existing building.

eight associates

Financial Contribution
Energy Assessment
KOKO

Total Carbon Emissions:

As required by the GLA both the regulated and unregulated emissions of the development must be quantified and demonstrated. The total emissions for the scheme are shown below.

Carbon Dioxide Emissions – Regulated and Unregulated (Tonnes CO_2/yr)			
	Regulated Emissions	Unregulated Emissions	Total Emissions
Baseline: Part L2A 2013	364.33	112.06	476.39
Be Lean: After demand reduction	311.47	112.06	423.52
Be Clean: After CHP	-	-	-
Be Green: After Renewable energy	277.91	112.06	389.97

eight associates

Introduction
Energy Assessment
KOKO

Aim of this study:

The purpose of an energy assessment is to demonstrate that climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

Methodology:

The methodology followed in this report follows the guidance set out by the Greater London Authority (GLA) for developing energy strategies as detailed in the document "ENERGY PLANNING: Greater London Authority guidance on preparing energy assessments (May 2016)"

In accordance with the GLA's London Plan Policy 5.2 and the London borough of Camden's Core Strategy Policy CS13, applications for major developments should be accompanied by an energy statement. The energy statement should provide information demonstrating how the energy hierarchy has been followed i.e. 'Lean, Clean, Green', including consideration of passive design and decentralised energy options such CHP/Community CHP.

This report has followed these documents and comprises the following components:

- BASELINE: A calculation of the Part L2B 2013 Building Regulations and existing building CO_2 emission baseline. The baseline assumes a gas boiler would provide heating and any active cooling would be electrically powered.
- Maximise Energy Efficiency (Be LEAN): A calculation of the impact of demand reduction measures. For example, passive design measures, including optimising orientation and site layout, natural ventilation and lighting, thermal mass and solar shading, and active design measures such as high efficacy lighting and efficient mechanical ventilation with heat recovery.
- Supply Energy Efficiently Using Low Carbon Heating and Cooling Systems (Be CLEAN: COOLING HIERARCHY): in accordance with Policy 5.9 of London Plan, measures that are proposed to reduce the demand for cooling have been set out such as minimisation of solar and internal gains and night cooling strategies.
- CLEAN: in accordance with Policy 5.6 of London Plan, this report has demonstrated how the scheme has selected heating, cooling and power systems to minimise carbon emissions. This comprises an evaluation of the feasibility of connecting to existing low carbon heat networks, planned networks, site-wide and communal heat networks and CHP.
- Incorporate Renewable Technology (Be GREEN): in accordance with Policy 5.7 of London Plan, this report has conducted a feasibility assessment of renewable energy technologies. This comprised a site-specific analysis of the technologies and if applicable how they would be integrated into the heating and cooling strategy for the scheme.

Please note that these findings are currently subject to a detailed analysis from a building services design engineer and qualified quantity surveyor.

eight associates

Establishing Emissions: The Carbon Profile

Energy Assessment

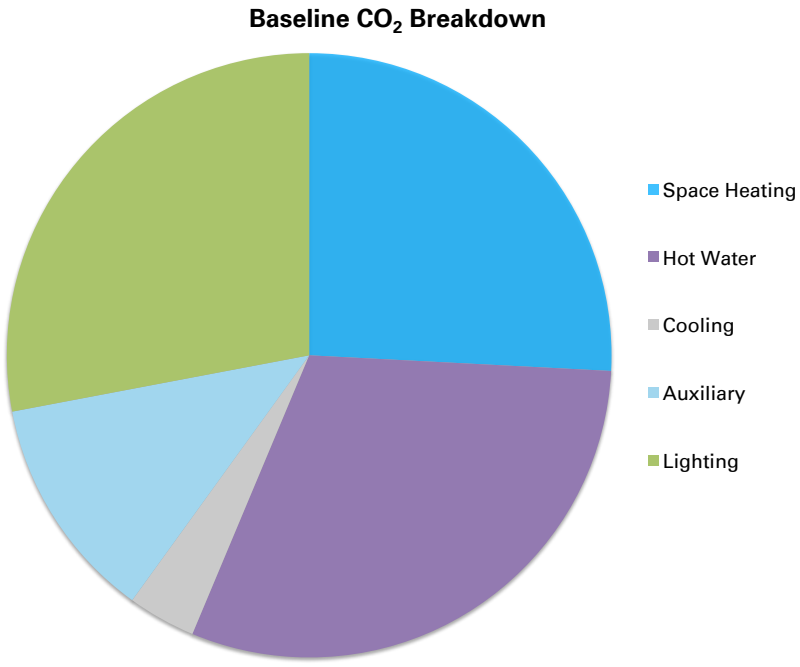
KOKO

Building Regulations Part L 2013 Minimum Compliance:

The 'baseline' carbon emissions for the development are 364.33 Tonnes CO_2/yr, (Part L2B 2013 and existing building)

The pie chart below provides a breakdown of the scheme's baseline carbon emissions by system over the course of one year.

Carbon Emissions in Tonnes CO_2/yr	Heating	Hot Water	Cooling	Auxiliary	Lighting
	91.40	112.86	20.25	35.66	104.16



Overview:

The chart above shows that hot water is the primary source of carbon emissions, and lighting is the second largest, across the scheme as a whole. Hot water accounts for approximately 30% of the baseline scenarios energy demand whilst lighting accounts for 28%

eight associates

‘Be Lean’: Demand Reduction Measures

Energy Assessment

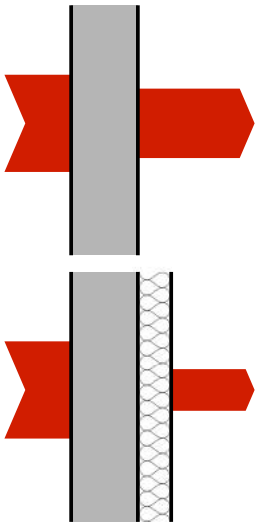
KOKO

Be Lean - Summary:

Demand reduction measures have reduced the scheme’s carbon emissions over the minimum Part L2B 2013 Building Regulations and existing building baseline by 14.5%.

The proposed scheme exceeds minimum building regulations Part L2B (as shown below) for refurbished elements. Where elements are not being refurbished, existing U-values performance figures, based on the building era, have been adopted. Efforts have been made, where possible to ensure the proposed building fabric minimises the development’s heating demand as much as possible. Due to the existing building being Grade II listed however, there are restrictions to the performance of elements and air permeability, specifically within the existing scheme, because of the retained elements.

Building Fabric Passive Design measures:



Graphic illustrations of the heat flow through a wall and how is it minimized with low u-value (consequence of the additional insulation).

U Values:

Element	Minimum Building Regulations Part L2B – U-value, W/m^{2}K	Proposed U-value W/m^{2}K
New build hotel external walls	0.28	0.17
Existing building external walls (remain as existing)	-	1.70
New build hotel basement floor (new)	0.22	0.15
New build hotel exposed floors	0.25	0.15
Existing building ground floor (remain as existing)	-	0.58
Existing building exposed floor (remain as existing)	-	1.00
New build hotel roof	0.18	0.13
Existing building roof (remain as existing)	-	1.80
New build hotel glazing – double glazed (0.4 g-value)	2.20	1.50
New build top floor glazing – double glazed (0.28 g-value)		1.70
Existing building glazing (0.85 g-value)	-	4.96
New build hotel high usage doors	3.50	1.40
Existing building entrance doors (remain as existing)	-	3.00

Many of the existing elements within the existing scheme will not be upgraded because of conservation constraints. Associated interstitial condensation risks with internally insulating existing elements also restrict the scope of upgrading external heat loss elements such as external walls. Full WUFI condensation risk calculations should be undertaken should there be any thermal performance upgrades proposed on the existing building, which have been approved by the conservation officer.

eight associates

‘Be Lean’: Demand Reduction Measures

Energy Assessment

KOKO

Building Fabric
Passive Design measures:
(Continued)

Airtightness:
The target air permeability for the scheme has been modelled as 5 $m^3/(hr.m^2)$ @ 50 pa for the new build hotel. As the hotel is intrinsically connected to the existing building it is unlikely that further improvements to the air permeability will be possible. Where possible existing doors and windows will be draught stripped, however, an improved air permeability performance beyond 25 $m^3/(hr.m^2)$ @50 pa is not likely given the permeability of the existing fabric.

Improving the airtightness for the new build hotel will require careful attention to two key areas:

- Structural leakage
- Services leakage

Structural leakage occurs at joints in the building fabric and around window and door openings, loft hatches and access openings. There will also be some diffusion through materials such and cracks in masonry walls typically this is caused by poor perpends in blockwork inner leafs. Structural leakage is hard to remedy retrospectively. Good detailing at the design stage is therefore essential.

Services leakage occurs at penetrations from pipes and cables entering the building. These can be sewerage pipes, water pipes and heating pipes. As well as electricity cables there may also be telecommunication cables. Attention therefore, needs to be paid to sealing all penetrations during construction.

Thermal Bridging:
Attention to detailing of non-repeating thermal bridges within the new build hotel will be ensured to reduce heat loss through junctions. This should be considered alongside the air permeability strategy for the scheme. An example of reducing heat loss through non-repeating junction would be to ensure continuity of insulation and specifying fixings and brackets with low conductivity where possible.

There is limited scope to minimise heat loss via linear junctions in the existing building, as fabric is not being upgraded.

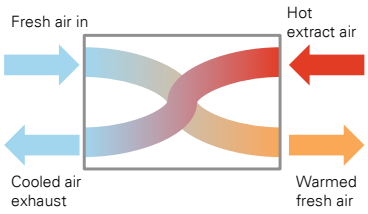
eight associates

‘Be Lean’: Demand Reduction Measures

Energy Assessment

KOKO

Energy Efficient Services Active Design measures:



Graphic illustration of a heat recovery unit, which exploits the extract hot air of the room to heat the cold supply air.

New build hotel:

Space Heating:

Heating, *for the lean scenario only*, will be provided by condensing gas boilers, featuring time and temperature zone control, delayed thermostat and a weather compensator. The heat will be distributed via underfloor heating with pipes in screed above insulation. The gas boiler will have a minimum efficiency of 91%.

Due to the scope of the development and proposals from the mechanical engineer it has been deemed more viable to utilise VRF air source heat pumps to provide space heating and cooling. This technology is described in the feasibility of renewable technologies section (Page 19). Considerations to future proofing the development to accommodate a connection to a District Energy Network (DEN) have been given (see page 11) in light of specifying an air source heat pump for space heating.

Water Heating:
Water heating within the development will be provided from high efficiency condensing gas fuelled storage water heaters. These systems will have a gross thermal efficiency of 91%. The hotel will likely have peak demands in the morning and evening (similar to that of a residential development) therefore a cascade system size approach is proposed to optimise the efficiency of this system and to increase operation and maintenance management.

Ventilation:
Balanced mechanical ventilation with plate heat exchanger heat recovery (53% seasonal efficiency and 1.55 SFP) will be provided to function rooms and office/meeting spaces whilst localised extract ventilation will be specified for wet rooms and kitchen areas with a with an SFP of 0.3 W/l/s.

Air Conditioning:
Cooling will be provided to the principle rooms via a centralised system and bedrooms with a multi-split system, with a minimum energy efficiency rating of 3.6 and seasonal energy efficiency rating of 5.0.

Lighting:
High efficiency lighting has been specified for the development with a minimum luminous efficacy of 85 lumens per circuit watt. Manual controls will be specified for main hotel areas.

‘Be Lean’: Demand Reduction Measures
Energy Assessment
KOKO

Energy Efficient Services Active Design measures: (Continued)

Existing KOKO venue and associated areas

Heating (for the *lean* scenario only) will be provided by a separate condensing gas boiler, featuring time and temperature zone control, delayed thermostat and a weather compensator. The heat will be distributed via underfloor heating with pipes in screed above insulation. Because of the existing function of the development and occupancy use it has been deemed appropriate to upgrade the AHU for heating, cooling and ventilation. The air to water heat pumps will have a minimum heating energy efficiency rating of 3.5.

Ventilation:
System 3 mechanical ventilation will provide ventilation to the existing development. No localised systems will be specified and existing intermittent extracts, where present, will be retained in W/C areas.

Mechanical ventilation will also be provided to the roof cupola, with 500 litres per second ensuring adequate air changes to minimise the risk of overheating. Ventilation will be provided to the roof lobby to ensure an effective hourly air change of 3. Separate reports detailing the overheating strategy for the hotel, roof lobby and cupola have been provided as an accompaniment to this report.

Air Conditioning:
Cooling will be provided for the main existing building, the roof lobby and cupola. As per the GLA’s guidance on energy statements and per the request of the council, passive design measures have been incorporated to minimise the cooling capacity for the roof lobby and cupola. Details of these measures can be found on page 15 of this report.

eight associates

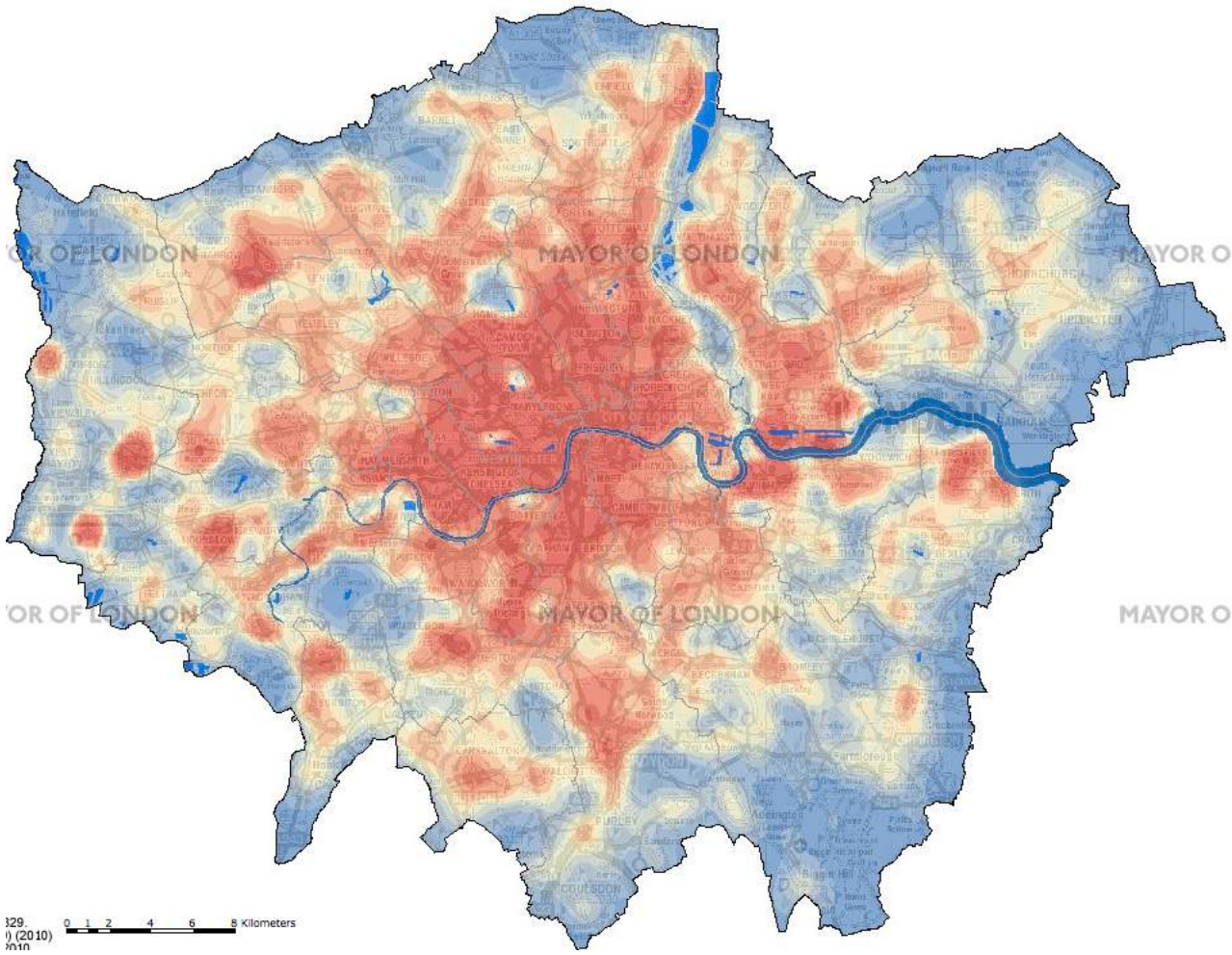
‘Be Clean’: Heating Infrastructure & CHP Energy Assessment KOKO

Heating Infrastructure including CHP:

Once demand for energy has been minimised, schemes must demonstrate how their energy systems have been selected in accordance with the order of preference in Policy 5.6B of London Plan. This has involved a systematic appraisal of the potential to connect to existing or planned heating networks and on site communal and CHP systems.

Heating Infrastructure:

The London Heat Map (shown below) has been consulted to establish the possibility of connecting to heating infrastructure.



Source: http://www.londonheatmap.org.uk/Mapping

eight associates

‘Be Clean’: Connection to Existing and Planned Networks

Energy Assessment

KOKO

Existing and Planned Networks:

Existing networks:

A review of the London Heat Map demonstrates that there are no existing networks present within connectable range of the scheme. A map of the existing and potential networks in the scheme’s location is shown below.

Existing DH Networks

Potential DH Networks

There are no existing networks within (500m) of the scheme. There is a potential network within 1km of the site whilst two areas of Decentralised energy potential are highlighted within close proximity. A connection is not currently possible, however, the hotel scheme will be made ‘connection ready’ through appropriate specification of domestic hot water service and distribution network.

eight associates

‘Be Clean’: Site Wide Networks and CHP

Energy Assessment

KOKO

Site-wide Heat Networks:	The hotel scheme will adopt a site wide domestic hot water heating network. This will comprise a single energy centre for the scheme where all mechanical heat generating plant will be housed. The communal domestic hot water heating system will serve the hotel scheme. The energy centre will be approximately 25m^2, a floor plan showing the location and layout of the communal heating plant can be found in the mechanical services proposals and documentation.
Combined Heat and Power (CHP)	In accordance with section 8.3 of the GLA guidance for Energy Planning where connection to an area wide heat network will not be available in the foreseeable future i.e. 5 years following completion, or the development is of such a scale that it could be the catalyst for an area wide heat network, applicants should evaluate the feasibility of on-site CHP The heat demand profile of this hotel and events venue is not suitable for CHP. For CHP systems to be economically viable they need to run for at least 5,000 hours per year which would not be possible based on the space and domestic hot water demands of the scheme. Therefore, a CHP system would most likely be oversized, and as a result less efficient and economic. The boutique hotel extension will also have a small electricity demand, with lighting demands having been reduced via the specification of low energy lighting. Therefore a CHP installed to meet the base heat load would typically require the export of electricity to the grid. The administrative burden of managing CHP electricity sales at a small scale without an active energy service companies (ESCOs) is prohibitive for smaller operators of residential developments. The centralised plant room will make allowances to be ‘connection ready’ should any future connection become available. Capped pipework and plant room allocation for connection to future networks will be made. Low temperature hot water boilers have been specified to provide DHW to the scheme at 80 degrees Celsius. Pipework has been sized accordingly, therefore any future connection to a DEN can be accommodated without the resizing of pipework or heat emitters.
Future proofing for connection to network	It is accepted that the proposed space heating system (VRF ASHP pumps with warm air distribution) is not particularly compatible for future connection to LTHW district heating networks. It is therefore recommended that dedicated space be provided within the plant room to allow for a change to the heating strategy, should the energy networks within the Borough change to accommodate connection to a district heating network. This space has been detailed on the mechanical service drawings provided separately. Metering will also be installed to record flow volumes and energy delivered on the primary circuit.

eight associates

‘Be Clean’: Cooling
Energy Assessment
KOKO

Policy 5.9 Overheating and Cooling:

The aim of this policy is to reduce the impact of the urban heat island effect in London and encourage the design of spaces to avoid overheating and excessive heat generation, and to mitigate overheating due to the impact of climate change.

Where design measures and the use of natural and/or mechanical ventilation are not enough to guarantee the occupant’s comfort, in line with the cooling hierarchy the development’s cooling strategy must include details of the active cooling plant being proposed, including efficiencies, and the ability to take advantage of free cooling and/or renewable cooling sources.

Where appropriate, the cooling strategy should investigate the opportunities to improve cooling efficiencies through the use of locally available sources such as ground cooling and river/dock water-cooling.

The Cooling Hierarchy:

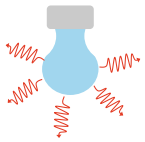
Major developments should reduce potential overheating and reliance on air conditioning systems and demonstrate this with the Cooling Hierarchy:

1) **Minimise internal heat generation through energy efficient design**
2) **Reduce the amount of heat entering the building in summer (e.g. shading and fenestration)**
3) **Manage the heat within the building through thermal mass, room height and green roofs**
4) **Passive ventilation**
5) **Mechanical ventilation**
6) **Active cooling systems (ensuring the lowest carbon option)**

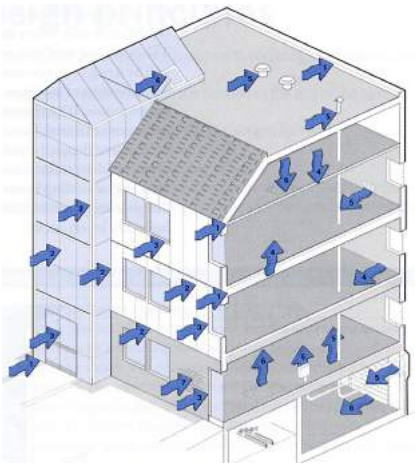
eight associates

‘Be Clean’: Cooling
Energy Assessment
KOKO

Avoiding Overheating Measures taken:



LED bulbs can emit 80% less heat compared to an incandescent bulb and their life span is up to 41 times more.



Examples of possible air leakage points in a building

The following measures have been taken in accordance with the cooling hierarchy to reduce overheating and the need for cooling:

1) Minimise internal heat generation through energy efficient design

Internal heat gains have been minimised where possible. The hotel is being fully fitted and therefore will target the BREEAM Energy 8 credit: Energy Efficient Equipment. Energy Efficient appliances will help reduce internal heat gain and reduce the cooling requirement.

Energy efficient lighting will also be specified throughout the hotel and in the existing building where possible as part of the development works. Internal lighting will have a luminous efficacy of 85 lumens per circuit watt with manual controls for most occupied areas.

2) Reduce the amount of heat entering the building in summer (e.g. shading and fenestration)

Direct solar gains will be controlled in the following ways:

- Orientation of building – the front façade of the new build hotel is orientated northeast, reducing excessive solar gains.
- Solar control – methods controlling solar gain to within tolerable limits have been considered for the hotel and the roof lobby. The design and type of window openings and glazing have been optimised, and reduced solar gain factors from low emissivity windows. A g-value of 0.40 has been specified for the hotel, and g-value of 0.28 has been specified for the roof lobby.
- Internal shade rolls are proposed for the hotel whilst internal light coloured motorised shade rolls are proposed for the roof lobby as a measure for controlling solar gains.

Heat transfer and infiltration has been controlled in the following ways:

- Insulation levels have been maximised for the hotel and the resulting U-values are lower than required by Building Regulations. The build-ups therefore prevent the penetration of heat as much as practically possible. See the ‘Be Lean’ section of this report for target U-values.
- A reduced air permeability rate of 5 $m^3/(hr.m^2)$ @ 50 pa has been targeted for the new build hotel to minimise uncontrolled air infiltration. This will require attention to detailing and sealing. See ‘Be Lean’ section of this report for details of how this will be achieved. Due to the condition of the existing building and limited fabric upgrades no air permeability target has been specified. Where new windows are specified, in keeping with the original design, these will be draught stripped to reduce air leakage.

‘Be Clean’: Cooling
Energy Assessment
KOKO

Avoiding Overheating Measures taken:

Examples of how the thermal mass absorbs heat during day and emits it during night.

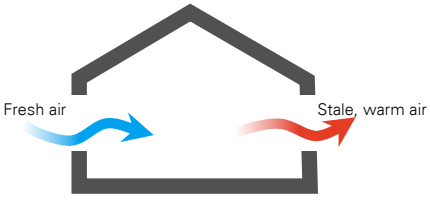
3) Manage the heat within the building through thermal mass, room height and green roofs.

The following measures have been specified to manage heat accumulation within the building:

- High thermal mass – existing building fabric materials such as masonry (walls) and concrete (floors) act as ‘thermal batteries’; they absorb heat gains during the day when the building is occupied and ‘store’ it for an extended period, thereby helping to stabilise daytime temperatures. At night this heat can be dissipated, which ‘resets’ the heating cycle. Ventilation will also be used at night to purge the stored heat within the structure. A ‘ground coupled’ system that uses the thermal storage capacity of the ground has not been specified as the passive ventilation option has been selected instead.
- Room heights – high ceilings are traditionally used in hot climates to allow thermal stratification so that occupants can inhabit the lower cooler space, and to decrease the transfer of heat gain through the roof. The existing building has floor to ceiling heights of approximately 3.5m (excluding the main dance floor) whilst the hotel has floor to ceiling heights of 2.7m. As the roof will be well insulated to achieve a U-value of 0.13 W/m^{2}K, there will be minimal penetration of heat through the roof.
- Green roofs – a small area for green roof has been specified for the scheme. Although it is likely to be a wildflower blanket with a shallow substrate depth, this will act as an insulation barrier and the ecological processes will reduce the amount of solar energy absorbed by the roof membrane. This will reduce temperatures below the surface and cool the building areas directly below.

4) Passive ventilation

Ventilation that does not use fans or mechanical system has been specified to reduce the cooling load.



Typical building section demonstrating passive cross ventilation.

- Openable windows and rooflights are specified on most facades of the building. Cross ventilation will be achieved by opening windows and rooflights and ensuring there is a clear path for airflow.
- Night time cooling will also be utilised via opening windows. This will work in tandem with high thermal mass materials specified. The larger temperature differential that exists between internal and external temperatures at night will allow effective stack ventilation and purging of heat accumulated within the structure during the day.

‘Be Clean’: Cooling
Energy Assessment
KOKO

Avoiding Overheating Measures taken:

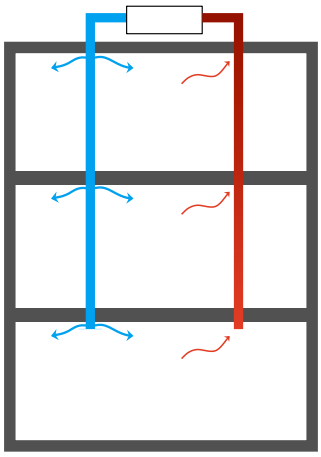
5) Mechanical ventilation

Passive ventilation will not be adequate to cool the building to the required temperature. Mechanical ventilation will be utilised in the following forms:

- A mixed mode system will be implemented. This will be complimentary to the passive cooling measures taken. During summer months, mechanical ventilation using fans will circulate and remove hot air from the building. The building will also adopt a zoned design to allow natural ventilation where possible and mechanical ventilation where there are increased cooling loads such as high-density offices or function rooms.

- Fan powered ventilation: single point extracts will be used in WCs and food preparation areas. A whole building system will be specified which will use air handling units with separate supply and extract fans. Heat recovery units will also be specified in the hotel to reduce energy demand, optimal performance will be achieved by the reduced air permeability rate of 5 $m^3/(hr.m^2)$ @ 50 pa.

- The mechanical systems will have the following efficiencies which are in compliance with the Non-Domestic Building Services Compliance Guide:
  - ✓ Specific fan power of 0.3 W/l/s for extract fans
  - ✓ Specific fan power of 1.55 W/l/s for whole ventilation systems with heat recovery
  - ✓ Heat recovery efficiency of 53%
  - ✓ Specific fan power of 1.9 W/l/s for the central system for the existing building



Typical building section demonstrating a simple method of supply and extract ventilation system.

Ventilation will also be used at night to purge the stored heat within the structure. A ‘ground coupled’ system that uses the thermal storage capacity of the ground has not been specified as a passive ventilation option has been selected instead. As the existing building is not being internally insulated there will be the potential for night-time purging. Internal air can be ‘purged’ at anytime during the night by the mechanical ventilation system. This will allow thermal energy to be removed from the structure.

Overheating Risk:

According to the GLA guidance on preparing energy assessments (March 2016), Section 11, dynamic modelling to assess the risk of overheating should be carried out. The overheating risk assessment according to dynamic thermal modelling confirms that without active cooling measures there is a risk of overheating. Separate overheating reports have been provided outlining the measures required to ensure the risk of overheating is minimised. This includes a progression of scenarios that incorporate natural ventilation measures, passive design measures, the implementation of a mixed mode ventilation strategy and finally a scenario with active cooling proposed.

‘Be Clean’: Cooling
Energy Assessment
KOKO

Efficiency Measures taken:

6) Active cooling systems (ensuring the lowest carbon option)

Passive design measures and the use of natural and/or mechanical ventilation are not enough to guarantee the occupant’s comfort. Therefore, air conditioning has been specified for hotel, roof lobby and cupola to provide the required level of comfort. Following the cooling hierarchy methodology however, this has progressively reduced the demand for cooling.

To ensure the cooling system is the most carbon efficient possible the following parameters have been selected:

- Location: Indoor cooling units have been specified on a localised basis where internal gains are too high. The hotel will be fully fitted with local temperature controls for optimal usage whilst the roof lobby and cupola will have a separate system and controls.

- The AC systems in the hotel will have the following efficiencies which are in compliance with the Non-Domestic Building Services Compliance Guide:
  - ✓ Seasonal Energy Efficiency Ratio of 5
  - ✓ Energy Efficiency Ratio of 3.6

- The AC systems for the roof lobby and cupola will have the following efficiencies which are in compliance with the Non-Domestic Building Services Compliance Guide:
  - ✓ Seasonal Energy Efficiency Ratio of 5
  - ✓ Energy Efficiency Ratio of 3.6

- The AC systems for the existing auditorium will have the following efficiencies which are in compliance with the Non-Domestic Building Services Compliance Guide:
  - ✓ Seasonal Energy Efficiency Ratio of 4.8
  - ✓ Energy Efficiency Ratio of 3.3

eight associates

‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Renewable Energy Feasibility:

In line with Policy 5.7 of the London Plan the feasibility of renewable energy technologies has been considered. A detailed site-specific analysis and associated carbon saving calculations has also been provided for renewable energy technologies considered feasible.

Renewable Energy Technology Comparison:

Each technology has been assessed under 5 broader categories. There are key criteria for each category on which the technology is evaluated. The key criteria have been given a weighting based on a tick-system, a graphical representation of this is shown below:

✔ ✔ ✔ ✔ ✔ = 1 scored out of a possible 5

The weighting of each of the criteria within the categories is shown below:

- **Local, site-specific impact:** (Maximum score of 4)
  - Local planning criteria = ✔ ✔
  - Land used by all components = ✔
  - Noise impact from operation = ✔
- **Suitability and design impact:** (Maximum score of 4)
  - Interaction on the current building design = ✔ ✔
  - Building orientation suitability = ✔
  - Buildability of installation = ✔
- **Economic viability:** (Maximum score of 5)
  - Capital cost of all components = ✔ ✔
  - Grants and funding available = ✔
  - Payback periods (years) 3-5, 5-10, 10-15 = ✔ ✔ ✔
- **Operation and maintenance:** (Maximum score of 3)
  - Servicing requirements (low or high) = ✔
  - Maintenance costs (low or high) = ✔
  - Resource use from future maintenance (low or high) = ✔
- **CO_2 and sustainability:** (Maximum score of 10)
  - Carbon saving per year = ✔ ✔ ✔ ✔
  - Impact of future grid decarbonisation (gas vs. electric) = ✔ ✔
  - Local air quality/pollution = ✔ ✔
  - Resource use of installation = ✔ ✔

Key comments on each of the criteria and the corresponding score will be provided in a table (example below) for each of the technologies. The score for each of the criteria will be summed and each of the technologies will then be ranked. The assessment of each technology is undertaken on the following pages.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
	✔ ✔ ✔ ✔	✔ ✔ ✔ ✔	✔ ✔ ✔ ✔ ✔	✔ ✔ ✔	✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔

eight associates

‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Biomass & Biofuel:

Rejected

Biomass is normally considered a carbon ‘neutral’ fuel, as the carbon dioxide emitted on burning has been recently absorbed from the atmosphere by photosynthesis. Although some form of fossil fuel derived inputs are required in the production and transportation of the fuel.

Wood is seen as a by-product of other industries and the small quantity of energy for drying, sawing, pelleting and delivery are typically discounted. Biomass from coppicing is likely to have external energy inputs from fertiliser, cutting, drying etc. and these may need to be considered. In this toolkit, all biomass fuels are considered to have zero net carbon emissions.

Biomass can be burnt directly to provide heat in buildings. Wood from forests, urban tree pruning, farmed coppices or farm and factory waste, is the most common fuel and is used commercially in the form of wood chips or pellets. Biomass boilers can also be designed to burn smokeless to comply with the Clean Air Acts.

Boilers can be fed automatically by screw drives from fuel hoppers. This typically involves daily addition of bagged fuels. A biomass boiler could be installed on site for supplementary LTHW heating; however, a major factor influencing the suitability of a biomass boiler is the availability of the biomass fuel. A local and reliable fuel source would be essential for the biomass boiler to be an efficient replacement for a conventional boiler system. Therefore, a very comprehensive feasibility assessment needs to be undertaken to understand the practicalities of such a system.

It is estimated that the heating and hot water demand of the site is too small to meet the required CO_2 emissions reduction if a biomass boiler was a standalone system. Therefore a biomass boiler would need to be combined with energy demand reduction measures and/or CHP. In order to meet a meaningful CO_2 emissions reduction a 50kW biomass boiler would need to be installed. The likely installed cost would be circa £45,000. The additional cost of providing and storing the bio-fuel also needs to be accounted for. The site is likely to be unsuitable for biomass boilers due to site constraints such as limited transport/access issues, and storage of the biomass fuel. For an extensive understanding of the capabilities and feasibility of this technology, a further analysis would be required at the detailed design by an appropriate services engineer.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
Biomass Boiler	✔ ✔ ✔ ✔ Local air quality impacts, increased transport usage on the restricted site, increased plant space.	✔ ✔ ✔ ✔ Increase in plant space required, orientation fine, slightly increased buildability issues.	✔ ✔ ✔ ✔ ✔ Increased capital costs of installation, typical payback of 8 years	✔ ✔ ✔ Increased maintenance relative to gas boiler, resource use not significantly increased if well serviced.	✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ ✔ Very low carbon intensity of feedstock if properly procured. Decarbonisation impact not applicable, air quality issues.

eight associates

‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Photovoltaic (PV):

Accepted

Photovoltaic systems convert energy from the sun into electricity through semi conductor cells. Systems consist of semi-conductor cells connected together and mounted into modules. Modules are connected to an inverter to turn the direct current (DC) output into alternating current (AC) electricity for use in buildings.

Photovoltaic systems can be discreet through being designed as an integral part of the roof. An ‘invisible’ design using slates or shingles as opposed to an architectural statement could be preferable in a sensitive area.

Photovoltaic panels supply electricity to the building and are attached to electricity gird or to any other electrical load. Excess electricity can be sold to the National Grid when the generated power exceeds the local need. PV systems require only daylight, not sunlight to generate electricity (although more electricity is produced with more sunlight), so energy can still be produced in overcast or cloudy conditions.

The cost of PV cells is heavily dependent on the size of the array. There are significant cost reductions available for larger installations.

The most suitable location for mounting photovoltaic panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a potential useable roof area of approximately 70m^2, with no shading from adjacent areas. Accounting for spacing and appropriate layouts the roof space could have up to 23 panels installed.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
Photovoltaic	✔✔✔✔ No local air quality impacts, use of unutilised roof space, conservation officer has concerns for part of the site, no noise issues.	✔✔✔✔ Can be added to the roof, good orientation, and slightly increased buildability issues for wiring and metering.	✔✔✔✔✔ Increased capital costs of installation, typical payback of 8 years, Feed in Tariff available.	✔✔✔ Limited servicing and maintenance i.e. 1 visit per year, inverter will require replacement.	✔✔✔✔✔ ✔✔✔✔✔ High carbon saving from electricity, uses minimal grid electricity, no local air impact, high embodied energy of panels.

eight associates

‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Solar Thermal:

Rejected

Solar water heating systems use the energy from the sun to heat water for domestic hot water needs. The systems use a heat collector, generally mounted on the roof in which a fluid is heated by the sun. This fluid is used to heat up water that is stored in either a separate hot water cylinder or a twin coil hot water cylinder inside the building. The systems work very successfully in all parts of the UK, as they can work in diffuse light conditions.

Like photovoltaic panels the most suitable location for mounting solar hot water panels is on roofs as they usually have the greatest exposure to the sun. The proposed site has a potential useable roof area of approximately 70m^2 and receives moderate shading.

It is estimated that the CO_2 emissions reduction that would be produced by solar hot water as a standalone system would not be adequate to achieve the required CO_2 emissions reduction target. Therefore a solar hot water system would need to be combined with more energy efficiency strategies, a CHP or additional renewable technologies to achieve the carbon reduction target.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
Solar Thermal	✔✔✔✔ No local air quality impacts, use of unutilised roof space, conservation officer has concerns for part of the site, no noise issues.	✔✔✔✔ Can be added to the roof, good orientation, and slightly increased buildability issues for piping and cylinders.	✔✔✔✔✔ Increased capital costs of installation, typical payback of 8 years, Renewable Heat Incentive available.	✔✔✔ Limited servicing and maintenance i.e. 1 visit every two years, heat transfer fluid requires replacing every 10 years.	✔✔✔✔✔✔✔✔✔✔ Lower carbon saving as primarily displacing gas, uses minimal grid electricity, no local air impact, medium embodied energy of panels.

eight associates

‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Wind Energy:

Rejected

Wind energy is a cost effective method of renewable power generation. Wind turbines can produce electricity without carbon dioxide emissions in ranges from watts to megawatt outputs. The most common design is for three blades mounted on a horizontal axis, which is free to rotate into the wind on a tall tower.

The blades drive a generator either directly or via a gearbox to produce electricity. The electricity can either be linked to the grid or charge batteries. An inverter is required to convert the electricity from direct current (DC) to alternating current (AC) for feeding into the grid.

Modern quiet wind turbines are becoming viable in low density areas where ease of maintenance and immediate connection to the grid or direct use of the electricity in a building, may make them cost effective, despite lower wind speeds than open areas.

Wind turbines are generally less suited to dense urban areas as their output will be affected by potentially lower and more disrupted wind speeds, and their use of much more cost effective machines may be prohibited by their proximity to some building types. Small turbines can be used in inner city areas mounted on buildings, although there are relatively few installations.

Typically a 1.5 kW turbine can provide 4,000 kWh of electrical power annually. To achieve the required CO_2 emissions reduction target approximately 32 turbines would be required as a standalone solution. The indicative cost of a smaller roof mounted turbine is £2,000/kW so achieving the required CO_2 emissions reduction would cost approximately £96,000 for installation and maintenance costs.

A detailed wind resource evaluation would be required for the site to fully understand the generation potential and payback period. Also, it is likely that planning restrictions and resistance from small groups within the local community could also affect the viability of wind energy for the project.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
Wind Energy	✔✔✔✔ No local air quality impacts, use of unutilised roof space, conservation officer will have concerns for the site, minor noise issues.	✔✔✔✔ Can be added to the roof, relatively limited wind speeds in local area, increased buildability issues for wiring and metering.	✔✔✔✔✔ Medium capital costs of installation, typical payback < 5 years, Feed in Tariff available.	✔✔✔ Very limited servicing and maintenance, costs of 2-3% typical.	✔✔✔✔✔ ✔✔✔✔✔ High carbon saving from electricity, output limited from urban installation, consumes little grid electricity, no local air impact, low embodied energy of panels.

eight associates

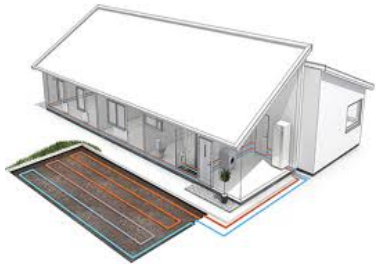
‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Ground Source Heat Pump (GSHP):

Rejected



Geo-thermal energy is essentially heat collected from the ground. Heat obtained from the ground may be considered it as a source of heating and cooling within the UK by the use of a geo-thermal heat pump or ground source heat pumps.

A ground source heat pump is a device for converting energy in the form of low level heat to heat at a usable temperature. The heat pump consists of five main parts; ground collector loop/or bores, heat exchanger, compressor, condenser heat exchanger and expansion valve.

At approximately 1.2-1.5 metres down below ground level the temperature is a constant 10 to 12ºC. Any bores would need to be sunk to an effective depth of 50 – 120m and a ground feasibility report would be required to ascertain if this method of heat source was viable.

From the bores pre-insulated pipework is laid in the ground to the heat exchanger device. The system is filled with water and antifreeze. The cooled water is pumped around the loop / bore gathering energy as it circulates. The water that has been heated to 10-12ºC is returned to the ground source heat exchanger where the energy is transferred to the refrigerant gas. For every 1kW of energy used to compress the refrigerant, the process ‘gives up’ 4 kW of energy for use in the system being used to heat the building.

Typical costs for an installation this are in the region of £250,000 for a commercial installation of this size, with general installation costs at £1200 /kW of energy produced.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
GSHP	✔✔✔✔ No local air quality impacts, not visible so conservation friendly, no noise issues, however the constrained site may prohibit its installation.	✔✔✔✔ Can be added to the roof, good air-flow on roof, increased buildability issues for pipework and heating emitters internally.	✔✔✔✔✔ High capital costs of installation, typical payback of 15 years where gas is displaced, Renewable Heat Incentive available.	✔✔✔ Limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	✔✔✔✔✔ ✔✔✔✔✔ Limited carbon saving from gas displacement, consumes some electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

eight associates

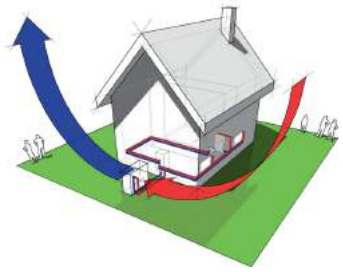
‘Be Green’: Renewable Energy

Energy Assessment

KOKO

Air Source Heat Pump (ASHP):

Accepted



Air source heat pump systems work on the same principle as a ground source heat pump although they use the outside air as the heat source.

The coefficients of performance given by air source heat pump systems are inferior to that of ground source systems due to varying air temperatures. In the depth of winter the energy efficiency of an air source system will be lower than that of a ground source system, and it is likely that more back-up heat will be required if an air source unit is fitted. This back-up heat often comes from a direct electric heater. They operate over a varying temperatures range of -15°C to +25°C, however, the performance will reduce to below the required 3 to 1 carbon saving ratio in winter, and the also require a defrosting mechanism to melt ice that forms on the air heat exchanger.

ASHPs are cheaper to install than ground source heat pumps but are only available on a relatively small scale. If applied across a larger site a number of plant zones would be required for generation of heat, leading to increased plant space requirements. Typical costs for an installation this are in the region of £100,000 for medium sized commercial spaces.

Carbon dioxide emissions savings will typically be less than that of the ground source heat pump. Air source heat pumps may be more suitable as an HVAC solution.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability
ASHP	✔✔✔✔ No local air quality impacts, use of unutilised roof space, conservation officer may have minor concerns over visual impact, no noise issues.	✔✔✔✔ Can be added to the roof, good air-flow on roof, increased buildability issues for pipework and heating emitters internally.	✔✔✔✔✔ Medium- high capital costs of installation, typical payback >15 years where gas is displaced, Renewable Heat Incentive available.	✔✔✔ Limited servicing and maintenance i.e. 1 visit per year, mechanical parts may require replacement over lifespan.	✔✔✔✔✔ ✔✔✔✔✔ Limited carbon saving from gas displacement, less efficient in winter, consumes electricity so benefits from decarbonisation, no local air impact, high embodied energy of equipment.

eight associates

‘Be Green’: Summary of Renewable Technologies

Energy Assessment

KOKO

Summary Comparison Matrix:

An assessment of the feasibility of each of the technologies is shown below.

Renewable Technology	Local, site-specific impact	Suitability and design impact	Economic viability	Operation and maintenance	CO_2 and sustainability	Total Score
Biomass Boiler	✔✔✔✔	✔✔✔✔	✔✔✔✔✔	✔✔✔	✔✔✔✔✔ ✔✔✔✔✔	15 out of 26
Photovoltaic	✔✔✔✔	✔✔✔✔	✔✔✔✔✔	✔✔✔	✔✔✔✔✔ ✔✔✔✔✔	18 out of 26
Solar Thermal	✔✔✔✔	✔✔✔✔	✔✔✔✔✔	✔✔✔	✔✔✔✔✔ ✔✔✔✔✔	16 out of 26
Wind Energy	✔✔✔✔	✔✔✔✔	✔✔✔✔✔	✔✔✔	✔✔✔✔✔ ✔✔✔✔✔	16 out of 26
GSHP	✔✔✔✔	✔✔✔✔	✔✔✔✔✔	✔✔✔	✔✔✔✔✔ ✔✔✔✔✔	15 out of 26
ASHP	✔✔✔✔	✔✔✔✔	✔✔✔✔✔	✔✔✔	✔✔✔✔✔ ✔✔✔✔✔	17 out of 26

Renewable Technology Conclusion & Specification:

Photovoltaic panels have scored the best. It is assumed that wind energy would be considered unsuitable for the area by conservation criteria and that the local residents would raise concerns over potential noise and turbulence. The capital costs of a ground source heat pump combined with the constraints of the site make this unviable. Due to the cooling demand for the scheme air source heat pumps will provide heating and cooling. Solar thermal panels could be installed on the hotel roof to contribute to the hot water demand of the hotel, however the limited roof space means any installation is unlikely to make a significant contribution in terms of carbon emissions. Therefore photovoltaic panels in combination with air source heat pumps in the existing building and new build hotel have been considered to be the optimum balance of sustainable and economic objectives.

eight associates

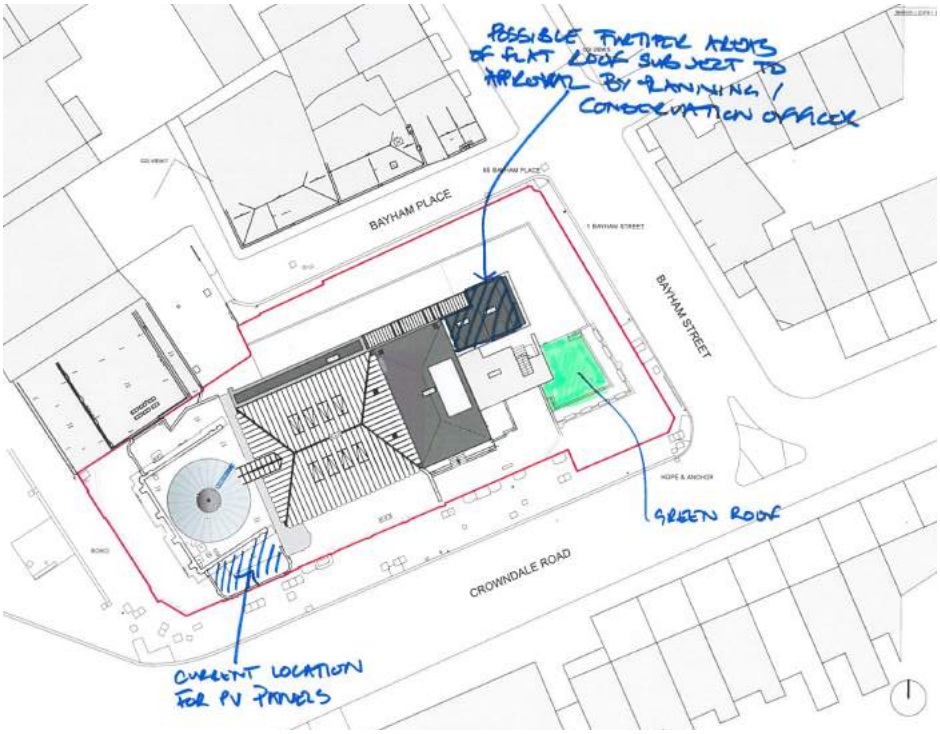
‘Be Green’: Photovoltaic Energy Assessment KOKO

Summary:

A photovoltaic panel system of 6.2 kWp has been specified for the development and detailed summary of the lifecycle cost, revenue and payback for the photovoltaic panels is presented in this section.

Location:

The following drawing shows that there are 70m^2 of available roof that could be used to install photovoltaic modules and lack of shading. PV panels will be oriented south, covering 40m^2 of the roof.



eight associates

'Be Green': Photovoltaic Energy Assessment KOKO

Lifecycle Cost:

The lifecycle of the proposed high efficiency panels is 25 years. To calculate the lifecycle cost of the panels, the maintenance of the system and replacement cost will be included.

The total costs for the proposed system's lifetime is:

- Capital Cost = £8,680
- Maintenance Cost = £2,125
- Operation Cost = £1,800 (replacement inverters etc.)
- Total Costs = £12,605

Revenue and Payback Parameters:

- The cost of electricity to be displaced is 14p/kWh.
- The 6.2 kWp system is estimated to generate 4,876 kWh/yr. Based on the assumption that 100% of the electricity will be used on site, an offset saving of £701/yr will be achieved.
- With the current Feed in Tariff, a tariff of 4.32p/kWh will be received for generation, which gives an additional saving of £216.

Summary Performance Calculations:

The following tables summarise the reduction in carbon emissions and the life cycle cost of the photovoltaic system.

Energy and Carbon Performance Criteria	Value
Predicted Annual Energy Saved (kWh/yr)	4,876
Annual Carbon Emissions Reductions (kg CO_2/year)	2,531
CO_2 Emissions Reduction (%)	0.80

Cost Performance Criteria	Value
Total Cost Over Life Cycle (£)	12,605
Predicted Annual Savings (£)	893
Payback Period (yeas)	14.1

eight associates

‘Be Green’: ASHP
Energy Assessment
KOKO

ASHP:

A detailed summary of the lifecycle cost, revenue and payback for ASHP is given below.

Lifecycle Cost:

The lifecycle of the proposed system is 25 years. To calculate the lifecycle cost of the ASHP, the maintenance of the system and cost of electricity to run the pumps will be included.

Revenue and Payback Parameters:

The following tables summarise the reduction in carbon emissions and the life cycle cost of the ASHP system compared to a gas boiler.

	Baseline System		Proposed System	
	Heating	Cooling	Heating	Cooling
System Type	Gas Boiler	Air Source Heat Pump	Air Source Heat Pump	
Installation Cost	10,000	30,000	60,000	
Maintenance and replacement cost	12,000	10,000	37,500	
Total	62,000		97,500	
Extra Over cost:			**£35,500**	

The development has a heating demand of 392,678 kWh per year using a gas-fired boiler. The cost of gas is 4 p/kWh, therefore the annual operational cost would be £15,707. With the use of an air source heat pump with 3.5 COP (for the new hotel only), the heating demand is reduced to 262,683 kWh per year. The cost of electricity is 14 p/kWh; therefore the annual operational cost would be approximately £15,236.

Consequently, the new build hotel would have an annual saving of £471 and the simple payback time for the proposed system is 75.3 years

Summary Performance Calculations:

Cost Performance Criteria	Value
Extra Cost Over Life Cycle (£)	35,500
Predicted Annual Savings (£)	471
Payback Period (years)	75.3

eight associates

Energy Analysis Conclusion

Energy Assessment

KOKO

Summary

In accordance with the Camden's CS13 policy, the existing venue and hotel extension must demonstrate improvements in carbon emissions over Part L2B, the approved building standard for refurbishment projects. To ensure compliance with the BREEAM assessment for the hotel extension, measures to ensure compliance with Part L2A have been incorporated into the new build elements. The existing venue has specified improved services where possible, the heritage constraints for the scheme has limited the proposed works and subsequently the site wide carbon improvement over Part L2B.

The baseline carbon emissions for the scheme are 364.33 Tonnes CO_2/yr.

As demonstrated above the development will reduce carbon emissions by 14.5% from the fabric energy efficiency measures described in the 'Be Lean' section.

Overall, the proposed measures achieve a 23.7% total site wide carbon emission reduction over Minimum Building regulations Part L and existing building.

GLA's Energy Hierarchy – Regulated Carbon Emissions				
	Baseline:	Be Lean:	Be Clean:	Be Green:
CO_2 emissions (Tonnes CO_2/yr)	364.33	311.47	-	277.91
CO_2 emissions saving (Tonnes CO_2/yr)	-	52.87	-	33.56
Saving from each stage (%)	-	14.5	-	9.2
Total CO_2 emissions saving (Tonnes CO_2/yr)	86.42			
23.7% Total carbon emissions savings over Part L2B of the Building Regulations 2013 and existing building achieved				

eight associates

Water Management
Energy and Sustainability Assessment
KOKO

Water Management Introduction

The Koko design proposals recognise the need to create a scheme that is efficient and adaptable to future climatic scenarios.

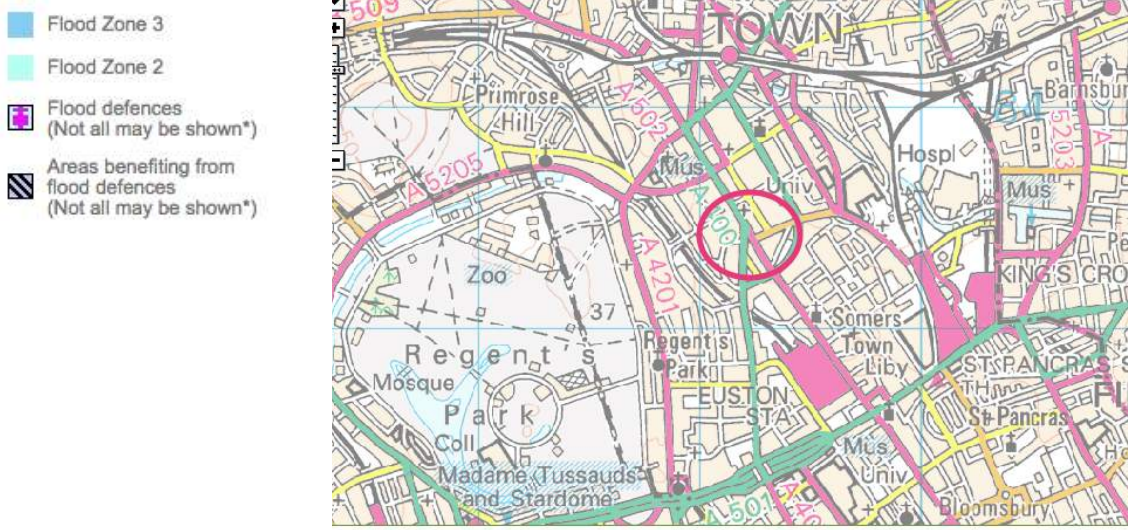
Water Conservation

The design team has committed to achieve a significant reduction in water use for the hotel development. Through the specification of efficient sanitaryware fittings including dual flush W/Cs, low flow rate taps and showers, water consumption within the hotel scheme will not exceed 110 litres per person per day.

Flood Risk and Sustainable Drainage

Koko is located within Flood Zone 1; defined as an area with little or no risk to flooding where the annual probability of flooding with defences where they exist: River, tidal and coastal is <0.1% i.e. less than 1 in 1000 years. It has been noted within Heyne Tillett Steel's (HTS) report identify areas of surface water flooding in Crowndale Road and Bayham street. The report concludes the peak surface water discharge rate for the proposed development will be restricted to 4.5 l/s. Cellular storage will be installed providing 50% betterment for the new build hotel extension. For further details, please refer to HTS's drainage strategy report.

Below shows a flood risk map to demonstrate that KOKO (red circle) is located within Flood Zone 1:



Environment and People
Energy and Sustainability Assessment
KOKO

Construction Environmental Management

The environmental impacts of the construction works will be mitigated as far as possible. This will include the incorporation of the following for the whole site:

- Contractor following environmental management system processes (under ISO14001), including the development of a construction environmental management plan (CEMP) specific to the sites;
- Training and site induction of all site operatives;
- Monitoring of energy, water and transport to and from site during construction;
- Dedicated Sustainability Champion to monitor and record site progress to ensure on-going compliance with sustainability objectives (such as BREEAM and Carbon reductions);
- Management of waste on site and minimisation of air pollution;
- Following best practice pollution guidance from the Environment Agency; and,
- Ensuring all site timber is responsibly sourced in line with the UK Government's Timber Procurement Policy.

Considerate Constructors

The scheme will be registered under the Considerate Constructors Scheme (CCS) and will target at least 35 out of 50 points, including 7 points within each section of the scheme. The CCS scheme aims to recognise and encourage construction sites that are managed in an environmentally and socially considerate, responsible and accountable manner.

Occupant Wellbeing

The development has been designed to ensure the wellbeing of occupants in terms of levels of fresh air, thermal comfort and reduction in overheating risk, access to natural light, good lighting levels internally and externally and acoustic performance.

The building services strategy has been carefully considered in order to balance the need for energy-smart, low carbon technologies with the need for adequate and controllable ventilation, heating and cooling.

Overall, the development will promote health, wellbeing and community engagement within the local community.

eight associates

Materials and Waste
Energy and Sustainability Assessment
KOKO

Materials and Waste Introduction

Sustainable material sourcing and waste management will be considered throughout the life of the building to ensure the scheme's environmental footprint is minimised as far as possible.

Materials Selection and Sourcing

New construction materials will be selected, where feasible, with a low environmental impact. In addition, basic building and finishing elements will be sustainably procured and sourced from local suppliers and manufacturers will be prioritised to encourage growth in economic activity.

The Green Guide for Specification is a reference tool, providing guidance on the relative environmental impacts for a range of different building elemental specifications, based on Life Cycle Assessment and the Environmental Profile Methodology. The design team has committed to using the Green Guide to Specification to help specify materials with a low environmental impact, where feasible.

In addition, the project team has committed to responsibly source materials used on site. This will include, where feasible, non-timber elements to be ISO 14001 or BES 6001 certified and 100% timber to be sourced from FSC or PEFC certified sources.

Waste Management – Construction Waste

The KOKO scheme is committed to promote resource efficiency through effective and appropriate management of construction site waste.

A site waste management plan will be developed for the site which adopts best practice benchmarks for resource efficiency, details procedures and commitments to minimise non-hazardous and hazardous waste at the design stage and monitors/measures waste production on site.

The site waste management plan will also include procedures and commitments to sort and divert waste from landfill through the following:

- Re-use on site;
- Salvage/reclaim for re-use;
- Return to supplier via a 'take-back' scheme;
- Recovery and recycling using an approved waste management contractor.

In addition, the design team has committed to diverting at least 85% by weight or 90% by volume of construction waste from landfill.

eight associates

Conclusion
Energy and Sustainability Assessment
KOKO

Conclusion:

This Sustainability Statement has responded to the borough of Camden's local plan requirements.

In summary the scheme will adopt the following sustainable features:

- Reduced energy consumption by targeting improved thermal performance of building fabric, mechanical service efficiency, airtightness, and low energy lighting for the new build hotel.
- Upgrade core services for the existing development and light fittings where possible to reduce the carbon emissions of the scheme site wide.
- Ensure water consumption for the hotel units meets the Council's requirements of 110 l/p/d water consumption.
- Emphasis on local supply and labour to encourage employment opportunities and to offer a diverse, self-sustaining environment.
- Enforce a sustainable materials procurement policy and an efficient waste strategy on site, including a commitment that at least 85% of construction waste to be diverted from landfill.
- Provide cellular storage and restrict surface water runoff discharge to 4.5 l/s to confirm compliance with Camden's Planning Guidance 3 (CPG3).

eight associates

Appendix
Energy Assessment
KOKO

Further Information:	As required by the GLA, the emission figures and details of the calculations and methodology used to determine the figures provided within the report can be found in the following pages: Baseline – BER from the Baseline BRUKL (PART L2B and existing building) Lean – BER from the Lean BRUKL Clean – There is no 'Be Clean' scenario Green – BER from the Green BRUKL

Appendix
Energy Assessment
KOKO

Baseline

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

KOKO

As designed

Date: Mon Mar 13 10:47:17 2017

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.g.3

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.7.0

BRUKL compliance check version: v5.2.g.3

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Chris Hocknell

Telephone number: 02031790420

Address: 81 Southwark Street, London, SE10HX

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	39.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	39.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	56.8
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 the building services should achieve reasonable overall standards of energy efficiency

Values not achieving 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	0.99	1.7	Rooftop - Dome_W_4
Floor	0.25	0.2	1	104_Forth Floor-Refurbished - RM.4.01_F_7
Roof	0.25	1.05	2.7	Rooftop - Dome_R_9
Windows***, roof windows, and rooflights	2.2	2.28	4.96	104_Forth Floor-Refurbished - RM.4.01_G_9
Personnel doors	2.2	2.37	3	Ex_100_GF_Ground - Reception_D_15
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values $[W/(m^2K)]$
$U_{a\text{-}Calc}$ = 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	16.79

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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Project HVAC-Exisitng Auditorium

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

2- Project HVAC-Part L-Heating

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

3- Project HVAC-Exisitng

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

4- Project HVAC-Part L-Heating+Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	2.6	-	-	-
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.					

1- Project DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.8	0
Standard value	0.8	N/A

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
Ex_099_BF_Basement - Dancefloor	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - EDF	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - Baggage Holding	-	-	-	-	-	-	-	-	-	-	N/A
100_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Bin Store	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Bike Store	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Plant	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Staff Change	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Laundry	-	-	-	1.9	-	-	-	-	-	0.5	0.5
099_BF_Basement - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
099_BF_Gents WC - BF_Gents-WC	-	-	0.5	-	-	-	-	-	-	-	N/A
098_LBF - Storage	-	-	-	-	-	-	-	-	-	-	N/A
098_LBF - Cold Store	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Condensing Unit	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Pantry	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Dressing Rooms	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
102_Second Floor - Dressing Room	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Dome	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Rooftop - WC-2	-	-	0.5	-	-	-	-	-	-	-	N/A
Rooftop - Stair-lobby	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Rooftop - Storage	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Rooftop Lobby	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Rooftop - Plant room	-	-	-	-	-	-	-	-	-	-	N/A
100_Ground Stairs - Ground Stairs	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Plant	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Lobby	-	-	-	1.9	-	-	-	-	-	0.5	0.5
103_Third Floor - Circulation 1	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - BoH	-	-	-	1.9	-	-	-	-	-	0.5	0.5
103_Third Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Pantry	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Stairs to suite	-	-	-	-	-	-	-	-	-	-	N/A
104_Forth Floor-Refurbished - RM.4.01	-	-	-	-	-	-	-	-	-	-	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
Ex_098_LBF_2 - Lift Pit	-	-	-	-	-	-	-	-	-	-	N/A
Ex_098_LBF _1 - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_098_LBF _1 - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Stage	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Green Room	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 3	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 2	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Bar	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - Circulation Private	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Gents Toilet	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 4	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Reception	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Engineer	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Box Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Private Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Circulation 1	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Dance Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_101_First Floor - Private Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Circulation 3	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_101_First Floor - Circulation 2	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Risers 1	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Riser	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_102_Second Floor - Risers	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_103_Third Floor - KOKO Chillers	-	-	-	-	-	-	-	-	-	-	N/A
Ex_103_Third Floor - Stage	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - KOKO Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - Hotel Reception	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - Hope Anchor	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Kitchen	-	-	0.5	1.9	-	-	-	-	-	0.5	0.5
099_BF_Basement - Function	-	-	-	1.9	-	-	-	-	-	0.5	0.5
099_Catering Kitchen - Catering Kitchen	-	0.5	1.9	-	-	-	-	-	0.5	0.5	

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
102_Second Floor - 211	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 204	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 203	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 210	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 209	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 208	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 207	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 206	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 205	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 202	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 201	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 212	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Recording Studio	-	-	-	1.9	-	-	-	-	-	0.5	0.5
101_First Floor - 111	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 110	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 109	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 108	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 104	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 103	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 105	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 106	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 107	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 102	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 101	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Kitchen	-	-	0.5	1.9	-	-	-	-	-	0.5	0.5
101_First Floor - Breakout Room	-	-	-	1.9	-	-	-	-	-	0.5	0.5
101_First Floor - Artist Box	-	-	-	1.9	-	-	-	-	-	0.5	0.5
101_First Floor - Offices	-	-	-	1.9	-	-	-	-	-	0.5	0.5
101_First Floor - Guest Box	-	-	-	1.9	-	-	-	-	-	0.5	0.5
101_First Floor - Royal Box	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 309	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 308	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 303	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 302	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 307	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 304	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 306	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 305	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 301	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 212 A	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Suite 212 D	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - 212 C	-	-	-	-	-	-	-	-	-	-	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	
Ex_099_BF_Basement - Dancefloor	-	45	-	6624
100_Ground - EDF	60	-	-	240
100_Ground - Baggage Holding	60	-	-	36
100_Ground - Circulation	-	60	-	415
099_BF_Basement - Bin Store	60	-	-	30
099_BF_Basement - Bike Store	60	-	-	43
099_BF_Basement - Plant	60	-	-	203
099_BF_Basement - Circulation	-	60	-	266
099_BF_Basement - Staff Change	-	60	-	74
099_BF_Basement - Laundry	-	60	-	244
099_BF_Basement - WC	-	60	-	215
099_BF_Gents WC - BF_Gents-WC	-	60	-	150
098_LBF - Storage	60	-	-	281
098_LBF - Cold Store	60	-	-	11
102_Second Floor - Condensing Unit	60	-	-	89
102_Second Floor - Circulation	-	60	-	560
102_Second Floor - Pantry	60	-	-	81
102_Second Floor - Dressing Rooms	60	-	-	35
102_Second Floor - Bathroom	-	60	-	61
102_Second Floor - Dressing Room	60	-	-	20
102_Second Floor - Stairwell	-	60	-	63
Rooftop - Dome	-	45	15	459
Rooftop - WC-2	-	60	-	69
Rooftop - Stair-lobby	-	60	-	58
Rooftop - WC	-	60	-	99
Rooftop - Storage	60	-	-	17
Rooftop - Circulation	-	60	-	267
Rooftop - Rooftop Lobby	-	60	22	820
Rooftop - Plant room	60	-	-	181
100_Ground Stairs - Ground Stairs	-	60	-	70
101_First Floor - Circulation	-	60	-	328
101_First Floor - Stairwell	-	60	-	68
101_First Floor - Plant	60	-	-	165
101_First Floor - Lobby	-	60	-	30
103_Third Floor - Circulation 1	-	60	-	288
103_Third Floor - Dis WC	-	60	-	71
103_Third Floor - BoH	60	-	-	11
103_Third Floor - Circulation	-	60	-	47
103_Third Floor - Pantry	60	-	-	21
103_Third Floor - WC	-	60	-	166
103_Third Floor - Stairwell	-	60	-	34
103_Third Floor - Stairs to suite	-	60	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
104_Forth Floor-Refurbished - RM.4.01	45	-	-	200
Ex_098_LBF_2 - Lift Pit	-	45	-	107
Ex_098_LBF _1 - Circulation	-	45	-	51
Ex_098_LBF _1 - WC	-	45	-	35
Ex_099_BF_Basement - Stage	-	45	-	2587
Ex_099_BF_Basement - Circulation	-	45	-	359
Ex_099_BF_Basement - Green Room	45	-	-	428
Ex_099_BF_Basement - WC	-	45	-	84
Ex_099_BF_Basement - Circulation 3	-	45	-	267
Ex_099_BF_Basement - Circulation 2	-	45	-	585
Ex_099_BF_Basement - Bar	-	45	-	950
Ex_099_BF_Basement - Circulation Private	-	45	-	175
Ex_099_BF_Basement - Gents Toilet	-	45	-	333
Ex_099_BF_Basement - Circulation 4	-	45	-	261
Ex_100_GF_Ground - Office	45	-	-	385
Ex_100_GF_Ground - Circulation	-	45	-	1347
Ex_100_GF_Ground - Reception	-	45	15	803
Ex_100_GF_Ground - Circulation	-	45	-	1398
Ex_100_GF_Ground - Engineer	45	-	-	273
Ex_100_GF_Ground - Circulation	-	45	-	343
Ex_100_GF_Ground - Box Office	45	-	-	286
Ex_100_GF_Ground - Private Circulation	-	45	-	187
Ex_101_First Floor - Circulation 1	-	45	-	621
Ex_101_First Floor - Dance Lounge	-	45	-	929
Ex_101_First Floor - Private Circulation	-	45	-	369
Ex_101_First Floor - Circulation 3	-	45	-	189
Ex_101_First Floor - WC	-	45	-	134
Ex_101_First Floor - Lounge	-	45	-	319
Ex_101_First Floor - Circulation 2	-	45	-	485
Ex_102_Second Floor - Risers 1	45	-	-	244
Ex_102_Second Floor - Riser	45	-	-	51
Ex_102_Second Floor - Lounge	-	45	-	1448
Ex_102_Second Floor - Risers	45	-	-	196
Ex_102_Second Floor - Circulation	-	45	-	429
Ex_102_Second Floor - Circulation	-	45	-	245
Ex_102_Second Floor - Circulation	-	45	-	154
Ex_103_Third Floor - KOKO Chillers	45	-	-	235
Ex_103_Third Floor - Stage	-	45	-	4286
100_Ground - KOKO Office	60	-	-	244
100_Ground - Hotel Reception	-	60	22	639
100_Ground - Hope Anchor	-	60	22	532
099_BF_Basement - Kitchen	-	60	-	909
099_BF_Basement - Function	60	-	-	578

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
099_Catering Kitchen - Catering Kitchen	-	60	-	461
102_Second Floor - 211	-	60	-	81
102_Second Floor - 204	-	60	-	61
102_Second Floor - 203	-	60	-	60
102_Second Floor - 210	-	60	-	54
102_Second Floor - 209	-	60	-	55
102_Second Floor - 208	-	60	-	61
102_Second Floor - 207	-	60	-	57
102_Second Floor - 206	-	60	-	96
102_Second Floor - 205	-	60	-	60
102_Second Floor - 202	-	60	-	90
102_Second Floor - 201	-	60	-	88
102_Second Floor - 212	-	60	-	134
102_Second Floor - Recording Studio	60	-	-	529
101_First Floor - 111	-	60	-	76
101_First Floor - 110	-	60	-	53
101_First Floor - 109	-	60	-	58
101_First Floor - 108	-	60	-	64
101_First Floor - 104	-	60	-	63
101_First Floor - 103	-	60	-	61
101_First Floor - 105	-	60	-	63
101_First Floor - 106	-	60	-	73
101_First Floor - 107	-	60	-	59
101_First Floor - 102	-	60	-	94
101_First Floor - 101	-	60	-	89
101_First Floor - Kitchen	-	60	-	201
101_First Floor - Breakout Room	-	60	-	43
101_First Floor - Artist Box	-	60	-	89
101_First Floor - Offices	60	-	-	222
101_First Floor - Guest Box	-	60	-	67
101_First Floor - Royal Box	-	60	-	81
103_Third Floor - 309	-	60	-	72
103_Third Floor - 308	-	60	-	70
103_Third Floor - 303	-	60	-	57
103_Third Floor - 302	-	60	-	87
103_Third Floor - 307	-	60	-	70
103_Third Floor - 304	-	60	-	58
103_Third Floor - 306	-	60	-	58
103_Third Floor - 305	-	60	-	62
103_Third Floor - 301	-	60	-	87
103_Third Floor - 212 A	-	60	-	121
103_Third Floor - Suite 212 D	-	60	-	254
103_Third Floor - 212 C	-	60	-	76

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?
Ex_099_BF_Basement - Dancefloor	N/A	N/A
100_Ground - EDF	N/A	N/A
Rooftop - Dome	N/A	N/A
Rooftop - Rooftop Lobby	YES (+656.8%)	YES
101_First Floor - Lobby	N/A	N/A
103_Third Floor - Stairs to suite	N/A	N/A
Ex_099_BF_Basement - Green Room	N/A	N/A
Ex_099_BF_Basement - Bar	N/A	N/A
Ex_100_GF_Ground - Office	N/A	N/A
Ex_100_GF_Ground - Reception	NO (-38.1%)	NO
Ex_100_GF_Ground - Engineer	N/A	N/A
Ex_100_GF_Ground - Box Office	N/A	N/A
Ex_101_First Floor - Dance Lounge	N/A	N/A
Ex_101_First Floor - Lounge	YES (+142.6%)	NO
Ex_102_Second Floor - Lounge	NO (-52.8%)	NO
100_Ground - KOKO Office	NO (-79.9%)	YES
100_Ground - Hotel Reception	NO (-48.5%)	YES
100_Ground - Hope Anchor	NO (-24%)	YES
099_BF_Basement - Kitchen	N/A	N/A
099_BF_Basement - Function	N/A	N/A
099_Catering Kitchen - Catering Kitchen	N/A	N/A
102_Second Floor - 211	NO (-19.5%)	YES
102_Second Floor - 204	NO (-47.9%)	YES
102_Second Floor - 203	NO (-56.7%)	YES
102_Second Floor - 210	NO (-5.5%)	YES
102_Second Floor - 209	NO (-8.1%)	YES
102_Second Floor - 208	NO (-14.9%)	YES
102_Second Floor - 207	NO (-41.4%)	YES
102_Second Floor - 206	NO (-36.6%)	YES
102_Second Floor - 205	NO (-82.8%)	YES
102_Second Floor - 202	NO (-68.8%)	YES
102_Second Floor - 201	NO (-52.9%)	YES
102_Second Floor - 212	N/A	N/A
102_Second Floor - Recording Studio	N/A	N/A
101_First Floor - 111	NO (-8.3%)	YES
101_First Floor - 110	NO (-6.1%)	YES
101_First Floor - 109	NO (-6.7%)	YES
101_First Floor - 108	NO (-16.3%)	YES
101_First Floor - 104	NO (-37.2%)	YES
101_First Floor - 103	NO (-44.6%)	YES
101_First Floor - 105	NO (-84.3%)	YES
101_First Floor - 106	NO (-61.9%)	YES
101_First Floor - 107	NO (-27.9%)	YES
101_First Floor - 102	NO (-60%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
101_First Floor - 101	NO (-33%)	YES
101_First Floor - Kitchen	NO (-79.5%)	YES
101_First Floor - Breakout Room	N/A	N/A
101_First Floor - Artist Box	N/A	N/A
101_First Floor - Offices	NO (-57.1%)	YES
101_First Floor - Guest Box	N/A	N/A
101_First Floor - Royal Box	N/A	N/A
103_Third Floor - 309	NO (-5.2%)	YES
103_Third Floor - 308	NO (-10.9%)	YES
103_Third Floor - 303	NO (-50.8%)	YES
103_Third Floor - 302	NO (-66.3%)	YES
103_Third Floor - 307	YES (+8.1%)	YES
103_Third Floor - 304	NO (-40.9%)	YES
103_Third Floor - 306	NO (-18%)	YES
103_Third Floor - 305	NO (-9.2%)	YES
103_Third Floor - 301	NO (-61.1%)	YES
103_Third Floor - 212 A	NO (-81.4%)	YES
103_Third Floor - Suite 212 D	N/A	N/A
103_Third Floor - 212 C	NO (-74.9%)	YES

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]	6416.3	6416.3
External area [m^2]	6850.1	6850.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	17	3
Average conductance [W/K]	6863.55	2804.52
Average U-value [W/m^2K]	1	0.41
Alpha value* [%]	6.4	17.16

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
54	**C1 Hotels**
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
46	**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	65.95	35.51
Cooling	6.08	3.57
Auxiliary	10.71	5.48
Lighting	31.28	22.66
Hot water	81.43	75.04
Equipment*	33.28	33.28
TOTAL**	**195.47**	**142.26**

* Energy used by equipment does not count towards the total for 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]	354.45	239.41
Primary energy* [kWh/m^2]	327.42	229.78
Total emissions [kg/m^2]	56.8	39.9

* 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	40.4	85.5	13.2	12.9	21.3	0.85	1.85	0.91	2.6
	Notional	3.9	73.8	1.3	5.7	8.3	0.82	3.6	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	206.1	215.3	70.5	0	6.6	0.81	0	0.91	0
	Notional	103.4	119.8	35.1	0	3.8	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	244.4	147.7	83.6	0	13	0.81	0	0.91	0
	Notional	96.5	167.9	32.7	0	6.2	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	164.7	138.7	54	20.9	7.9	0.85	1.85	0.91	2.6
	Notional	161.8	126.6	54.9	13	5.3	0.82	2.7	----	----

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 BCO can give particular attention to items with specifications that 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	0.28	100_Ground - EDF_W_7
Floor	0.2	0.02	098_LBF - Storage_S_3
Roof	0.15	0.18	100_Ground - EDF_R_5
Windows, roof windows, and rooflights	1.5	1.8	100_Ground - Baggage Holding_G_10
Personnel doors	1.5	1.8	100_Ground - EDF_D_8
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = 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	16.79

Appendix
Energy Assessment
KOKO

LEAN Scenario

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

KOKO

As designed

Date: Mon Mar 13 13:11:27 2017

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.g.3

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.7.0

BRUKL compliance check version: v5.2.g.3

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Chris Hocknell

Telephone number: 02031790420

Address: 81 Southwark Street, London, SE10HX

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	39.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	39.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	48.5
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 the building services should achieve reasonable overall standards of energy efficiency

Values not achieving 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	0.92	1.7	Rooftop - Dome_W_4
Floor	0.25	0.17	1	Ex_101_First Floor - Dance Lounge_F_4
Roof	0.25	0.66	2.7	Rooftop - Dome_R_9
Windows***, roof windows, and rooflights	2.2	2.02	4.96	Ex_100_GF_Ground - Reception_G_14
Personnel doors	2.2	2.16	3	Ex_100_GF_Ground - Reception_D_15
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = 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	13.08

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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Project HVAC-Existing Auditorium

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	3.3	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for 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.					

2- Project HVAC-new-Heating

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

3- Project HVAC-Existing

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

4- Project HVAC-new-Heating+Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	3.6	-	-	-
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.					

1- Project DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.91	0
Standard value	0.8	N/A

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
Ex_099_BF_Basement - Dancefloor	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - EDF	-	-	-	1.6	-	-	-	-	-	0.53	0.5
100_Ground - Baggage Holding	-	-	-	-	-	-	-	-	-	-	N/A
100_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Bin Store	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Bike Store	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Plant	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Staff Change	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Laundry	-	-	-	1.6	-	-	-	-	-	0.53	0.5
099_BF_Basement - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
099_BF_Gents WC - BF_Gents-WC	-	-	0.5	-	-	-	-	-	-	-	N/A
098_LBF - Storage	-	-	-	-	-	-	-	-	-	-	N/A
098_LBF - Cold Store	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Condensing Unit	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Pantry	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Dressing Rooms	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
102_Second Floor - Dressing Room	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Dome	-	-	-	1.6	-	-	-	-	-	0.53	0.5
Rooftop - WC-2	-	-	0.5	-	-	-	-	-	-	-	N/A
Rooftop - Stair-lobby	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Rooftop - Storage	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Rooftop Lobby	-	-	-	1.6	-	-	-	-	-	0.53	0.5
Rooftop - Plant room	-	-	-	-	-	-	-	-	-	-	N/A
100_Ground Stairs - Ground Stairs	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Plant	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Lobby	-	-	-	1.6	-	-	-	-	-	0.53	0.5
103_Third Floor - Circulation 1	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - BoH	-	-	-	1.6	-	-	-	-	-	0.53	0.5
103_Third Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Pantry	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Stairs to suite	-	-	-	-	-	-	-	-	-	-	N/A
104_Forth Floor-Refurbished - RM.4.01	-	-	-	-	-	-	-	-	-	-	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
Ex_098_LBF_2 - Lift Pit	-	-	-	-	-	-	-	-	-	-	N/A
Ex_098_LBF _1 - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_098_LBF _1 - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Stage	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Green Room	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 3	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 2	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Bar	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - Circulation Private	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Gents Toilet	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 4	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Reception	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Engineer	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Box Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Private Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Circulation 1	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Dance Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_101_First Floor - Private Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Circulation 3	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_101_First Floor - Circulation 2	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Risers 1	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Riser	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_102_Second Floor - Risers	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_103_Third Floor - KOKO Chillers	-	-	-	-	-	-	-	-	-	-	N/A
Ex_103_Third Floor - Stage	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - KOKO Office	-	-	-	1.6	-	-	-	-	-	0.53	0.5
100_Ground - Hotel Reception	-	-	-	1.6	-	-	-	-	-	0.53	0.5
100_Ground - Hope Anchor	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Kitchen	-	-	0.5	1.6	-	-	-	-	-	0.53	0.5
099_BF_Basement - Function	-	-	-	1.6	-	-	-	-	-	0.53	0.5
099_Catering Kitchen - Catering Kitchen	-	0.5	1.6	-	-	-	-	-	0.53	0.5	

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
102_Second Floor - 211	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 204	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 203	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 210	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 209	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 208	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 207	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 206	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 205	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 202	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 201	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 212	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Recording Studio	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - 111	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 110	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 109	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 108	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 104	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 103	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 105	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 106	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 107	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 102	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 101	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Kitchen	-	-	0.5	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Breakout Room	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Artist Box	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Offices	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Guest Box	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Royal Box	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 309	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 308	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 303	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 302	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 307	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 304	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 306	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 305	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 301	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 212 A	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Suite 212 D	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - 212 C	-	-	-	-	-	-	-	-	-	-	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	
Ex_099_BF_Basement - Dancefloor	-	45	-	6624
100_Ground - EDF	85	-	-	170
100_Ground - Baggage Holding	85	-	-	25
100_Ground - Circulation	-	85	-	293
099_BF_Basement - Bin Store	85	-	-	21
099_BF_Basement - Bike Store	85	-	-	30
099_BF_Basement - Plant	85	-	-	144
099_BF_Basement - Circulation	-	85	-	188
099_BF_Basement - Staff Change	-	85	-	53
099_BF_Basement - Laundry	-	85	-	172
099_BF_Basement - WC	-	85	-	152
099_BF_Gents WC - BF_Gents-WC	-	85	-	106
098_LBF - Storage	85	-	-	198
098_LBF - Cold Store	85	-	-	8
102_Second Floor - Condensing Unit	85	-	-	63
102_Second Floor - Circulation	-	85	-	395
102_Second Floor - Pantry	85	-	-	57
102_Second Floor - Dressing Rooms	85	-	-	25
102_Second Floor - Bathroom	-	85	-	43
102_Second Floor - Dressing Room	85	-	-	14
102_Second Floor - Stairwell	-	85	-	44
Rooftop - Dome	-	85	60	243
Rooftop - WC-2	-	85	-	49
Rooftop - Stair-lobby	-	85	-	41
Rooftop - WC	-	85	-	70
Rooftop - Storage	85	-	-	12
Rooftop - Circulation	-	85	-	188
Rooftop - Rooftop Lobby	-	85	60	579
Rooftop - Plant room	85	-	-	127
100_Ground Stairs - Ground Stairs	-	85	-	50
101_First Floor - Circulation	-	85	-	232
101_First Floor - Stairwell	-	85	-	48
101_First Floor - Plant	85	-	-	116
101_First Floor - Lobby	-	85	-	21
103_Third Floor - Circulation 1	-	85	-	203
103_Third Floor - Dis WC	-	85	-	50
103_Third Floor - BoH	85	-	-	8
103_Third Floor - Circulation	-	85	-	33
103_Third Floor - Pantry	85	-	-	15
103_Third Floor - WC	-	85	-	117
103_Third Floor - Stairwell	-	85	-	24
103_Third Floor - Stairs to suite	-	85	-	23

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
104_Forth Floor-Refurbished - RM.4.01	85	-	-	106
Ex_098_LBF_2 - Lift Pit	-	45	-	107
Ex_098_LBF _1 - Circulation	-	45	-	51
Ex_098_LBF _1 - WC	-	45	-	35
Ex_099_BF_Basement - Stage	-	45	-	2587
Ex_099_BF_Basement - Circulation	-	45	-	359
Ex_099_BF_Basement - Green Room	45	-	-	428
Ex_099_BF_Basement - WC	-	45	-	84
Ex_099_BF_Basement - Circulation 3	-	45	-	267
Ex_099_BF_Basement - Circulation 2	-	45	-	585
Ex_099_BF_Basement - Bar	-	45	-	950
Ex_099_BF_Basement - Circulation Private	-	45	-	175
Ex_099_BF_Basement - Gents Toilet	-	45	-	333
Ex_099_BF_Basement - Circulation 4	-	45	-	261
Ex_100_GF_Ground - Office	45	-	-	385
Ex_100_GF_Ground - Circulation	-	45	-	1347
Ex_100_GF_Ground - Reception	-	45	15	803
Ex_100_GF_Ground - Circulation	-	45	-	1398
Ex_100_GF_Ground - Engineer	45	-	-	273
Ex_100_GF_Ground - Circulation	-	45	-	343
Ex_100_GF_Ground - Box Office	45	-	-	286
Ex_100_GF_Ground - Private Circulation	-	45	-	187
Ex_101_First Floor - Circulation 1	-	45	-	621
Ex_101_First Floor - Dance Lounge	-	45	-	929
Ex_101_First Floor - Private Circulation	-	45	-	369
Ex_101_First Floor - Circulation 3	-	45	-	189
Ex_101_First Floor - WC	-	45	-	134
Ex_101_First Floor - Lounge	-	45	-	319
Ex_101_First Floor - Circulation 2	-	45	-	485
Ex_102_Second Floor - Risers 1	45	-	-	244
Ex_102_Second Floor - Riser	45	-	-	51
Ex_102_Second Floor - Lounge	-	45	-	1448
Ex_102_Second Floor - Risers	45	-	-	196
Ex_102_Second Floor - Circulation	-	45	-	429
Ex_102_Second Floor - Circulation	-	45	-	245
Ex_102_Second Floor - Circulation	-	45	-	154
Ex_103_Third Floor - KOKO Chillers	45	-	-	235
Ex_103_Third Floor - Stage	-	45	-	4286
100_Ground - KOKO Office	85	-	-	172
100_Ground - Hotel Reception	-	85	60	451
100_Ground - Hope Anchor	-	85	60	376
099_BF_Basement - Kitchen	-	85	-	642
099_BF_Basement - Function	85	-	-	408

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
099_Catering Kitchen - Catering Kitchen	-	85	-	325
102_Second Floor - 211	-	85	-	57
102_Second Floor - 204	-	85	-	43
102_Second Floor - 203	-	85	-	42
102_Second Floor - 210	-	85	-	38
102_Second Floor - 209	-	85	-	39
102_Second Floor - 208	-	85	-	43
102_Second Floor - 207	-	85	-	40
102_Second Floor - 206	-	85	-	68
102_Second Floor - 205	-	85	-	42
102_Second Floor - 202	-	85	-	64
102_Second Floor - 201	-	85	-	62
102_Second Floor - 212	-	85	-	95
102_Second Floor - Recording Studio	85	-	-	373
101_First Floor - 111	-	85	-	54
101_First Floor - 110	-	85	-	38
101_First Floor - 109	-	85	-	41
101_First Floor - 108	-	85	-	45
101_First Floor - 104	-	85	-	45
101_First Floor - 103	-	85	-	43
101_First Floor - 105	-	85	-	45
101_First Floor - 106	-	85	-	51
101_First Floor - 107	-	85	-	42
101_First Floor - 102	-	85	-	66
101_First Floor - 101	-	85	-	63
101_First Floor - Kitchen	-	85	-	142
101_First Floor - Breakout Room	-	85	-	31
101_First Floor - Artist Box	-	85	-	63
101_First Floor - Offices	85	-	-	156
101_First Floor - Guest Box	-	85	-	47
101_First Floor - Royal Box	-	85	-	57
103_Third Floor - 309	-	85	-	51
103_Third Floor - 308	-	85	-	49
103_Third Floor - 303	-	85	-	40
103_Third Floor - 302	-	85	-	62
103_Third Floor - 307	-	85	-	50
103_Third Floor - 304	-	85	-	41
103_Third Floor - 306	-	85	-	41
103_Third Floor - 305	-	85	-	44
103_Third Floor - 301	-	85	-	61
103_Third Floor - 212 A	-	85	-	86
103_Third Floor - Suite 212 D	-	85	-	179
103_Third Floor - 212 C	-	85	-	54

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?
Ex_099_BF_Basement - Dancefloor	N/A	N/A
100_Ground - EDF	N/A	N/A
Rooftop - Dome	N/A	N/A
Rooftop - Rooftop Lobby	YES (+330.6%)	YES
101_First Floor - Lobby	N/A	N/A
103_Third Floor - Stairs to suite	N/A	N/A
Ex_099_BF_Basement - Green Room	N/A	N/A
Ex_099_BF_Basement - Bar	N/A	N/A
Ex_100_GF_Ground - Office	N/A	N/A
Ex_100_GF_Ground - Reception	NO (-38.1%)	NO
Ex_100_GF_Ground - Engineer	N/A	N/A
Ex_100_GF_Ground - Box Office	N/A	N/A
Ex_101_First Floor - Dance Lounge	N/A	N/A
Ex_101_First Floor - Lounge	YES (+142.6%)	NO
Ex_102_Second Floor - Lounge	NO (-52.8%)	NO
100_Ground - KOKO Office	NO (-86.3%)	YES
100_Ground - Hotel Reception	NO (-64.7%)	YES
100_Ground - Hope Anchor	NO (-46.7%)	YES
099_BF_Basement - Kitchen	N/A	N/A
099_BF_Basement - Function	N/A	N/A
099_Catering Kitchen - Catering Kitchen	N/A	N/A
102_Second Floor - 211	NO (-45.1%)	YES
102_Second Floor - 204	NO (-64.2%)	YES
102_Second Floor - 203	NO (-70.3%)	YES
102_Second Floor - 210	NO (-35.5%)	YES
102_Second Floor - 209	NO (-37.3%)	YES
102_Second Floor - 208	NO (-41.9%)	YES
102_Second Floor - 207	NO (-60%)	YES
102_Second Floor - 206	NO (-56.7%)	YES
102_Second Floor - 205	NO (-88.2%)	YES
102_Second Floor - 202	NO (-78.1%)	YES
102_Second Floor - 201	NO (-66.2%)	YES
102_Second Floor - 212	N/A	N/A
102_Second Floor - Recording Studio	N/A	N/A
101_First Floor - 111	NO (-37.4%)	YES
101_First Floor - 110	NO (-35.9%)	YES
101_First Floor - 109	NO (-36.3%)	YES
101_First Floor - 108	NO (-42.9%)	YES
101_First Floor - 104	NO (-56.9%)	YES
101_First Floor - 103	NO (-62%)	YES
101_First Floor - 105	NO (-89.2%)	YES
101_First Floor - 106	NO (-74%)	YES
101_First Floor - 107	NO (-50.8%)	YES
101_First Floor - 102	NO (-71.8%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
101_First Floor - 101	NO (-52%)	YES
101_First Floor - Kitchen	NO (-85.3%)	YES
101_First Floor - Breakout Room	N/A	N/A
101_First Floor - Artist Box	N/A	N/A
101_First Floor - Offices	NO (-69.3%)	YES
101_First Floor - Guest Box	N/A	N/A
101_First Floor - Royal Box	N/A	N/A
103_Third Floor - 309	NO (-35.3%)	YES
103_Third Floor - 308	NO (-39.2%)	YES
103_Third Floor - 303	NO (-66.2%)	YES
103_Third Floor - 302	NO (-76.4%)	YES
103_Third Floor - 307	NO (-26.2%)	YES
103_Third Floor - 304	NO (-59.4%)	YES
103_Third Floor - 306	NO (-44.1%)	YES
103_Third Floor - 305	NO (-37.9%)	YES
103_Third Floor - 301	NO (-72.1%)	YES
103_Third Floor - 212 A	NO (-86.7%)	YES
103_Third Floor - Suite 212 D	N/A	N/A
103_Third Floor - 212 C	NO (-82%)	YES

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]	6416.3	6416.3
External area [m^2]	6850.1	6850.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	13	3
Average conductance [W/K]	5836.04	2804.52
Average U-value [W/m^2K]	0.85	0.41
Alpha value* [%]	7.53	17.16

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
54	**C1 Hotels**
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
46	**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	59.63	35.51
Cooling	2.61	3.57
Auxiliary	10.38	5.48
Lighting	25.93	22.66
Hot water	71.59	75.04
Equipment*	33.28	33.28
TOTAL**	**170.14**	**142.26**

* Energy used by equipment does not count towards the total for 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]	300.47	239.41
Primary energy* [kWh/m^2]	279.57	229.78
Total emissions [kg/m^2]	48.5	39.9

* 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	40.4	85.5	13.2	6.7	21.3	0.85	3.55	0.91	5
	Notional	3.9	73.8	1.3	5.7	8.3	0.82	3.6	----	----
[ST] Central heating using water: floor heating, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	170.1	124	58.2	0	6.3	0.81	0	0.91	0
	Notional	103.4	119.8	35.1	0	3.8	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Natural Gas										
	Actual	236.3	145.6	80.8	0	13	0.81	0	0.91	0
	Notional	96.5	167.9	32.7	0	6.2	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	143.7	108.1	47.1	8.5	6.9	0.85	3.55	0.91	5
	Notional	161.8	126.6	54.9	13	5.3	0.82	2.7	----	----

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 BCO can give particular attention to items with specifications that 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	0.17	100_Ground - EDF_W_7
Floor	0.2	0.02	098_LBF - Storage_S_3
Roof	0.15	0.13	100_Ground - EDF_R_5
Windows, roof windows, and rooflights	1.5	1.5	100_Ground - Baggage Holding_G_10
Personnel doors	1.5	1.4	100_Ground - EDF_D_8
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = 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	13.08

Appendix
Energy Assessment
KOKO

GREEN Scenario

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

KOKO

As designed

Date: Mon Mar 13 13:13:47 2017

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.g.3

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v4.7.0

BRUKL compliance check version: v5.2.g.3

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Chris Hocknell

Telephone number: 02031790420

Address: 81 Southwark Street, London, SE10HX

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

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	38.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	38.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	43.3
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 the building services should achieve reasonable overall standards of energy efficiency

Values not achieving 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	0.92	1.7	Rooftop - Dome_W_4
Floor	0.25	0.17	1	Ex_101_First Floor - Dance Lounge_F_4
Roof	0.25	0.66	2.7	Rooftop - Dome_R_9
Windows***, roof windows, and rooflights	2.2	2.02	4.96	Ex_100_GF_Ground - Reception_G_14
Personnel doors	2.2	2.16	3	Ex_100_GF_Ground - Reception_D_15
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = 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	13.08

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	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- Project HVAC-Existing Auditorium Upgraded

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	3.3	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- Project HVAC-new-Heating

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

3- Project HVAC-Existing Upgraded

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

4- Project HVAC-new-Heating+Cooling

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	3.5	3.6	-	-	-
Standard value	2.5*	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 all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

1- Project DHW

	Water heating efficiency	**Storage loss factor [kWh/litre per day]**
This building	0.91	0
Standard value	0.8	N/A

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
Ex_099_BF_Basement - Dancefloor	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - EDF	-	-	-	1.6	-	-	-	-	-	0.53	0.5
100_Ground - Baggage Holding	-	-	-	-	-	-	-	-	-	-	N/A
100_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Bin Store	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Bike Store	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Plant	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Staff Change	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Laundry	-	-	-	1.6	-	-	-	-	-	0.53	0.5
099_BF_Basement - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
099_BF_Gents WC - BF_Gents-WC	-	-	0.5	-	-	-	-	-	-	-	N/A
098_LBF - Storage	-	-	-	-	-	-	-	-	-	-	N/A
098_LBF - Cold Store	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Condensing Unit	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Pantry	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Dressing Rooms	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Bathroom	-	-	0.5	-	-	-	-	-	-	-	N/A
102_Second Floor - Dressing Room	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Dome	-	-	-	1.6	-	-	-	-	-	0.53	0.5
Rooftop - WC-2	-	-	0.5	-	-	-	-	-	-	-	N/A
Rooftop - Stair-lobby	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Rooftop - Storage	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Rooftop - Rooftop Lobby	-	-	-	1.6	-	-	-	-	-	0.53	0.5
Rooftop - Plant room	-	-	-	-	-	-	-	-	-	-	N/A
100_Ground Stairs - Ground Stairs	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Plant	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Lobby	-	-	-	1.6	-	-	-	-	-	0.53	0.5
103_Third Floor - Circulation 1	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Dis WC	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - BoH	-	-	-	1.6	-	-	-	-	-	0.53	0.5
103_Third Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Pantry	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - Stairwell	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Stairs to suite	-	-	-	-	-	-	-	-	-	-	N/A
104_Forth Floor-Refurbished - RM.4.01	-	-	-	-	-	-	-	-	-	-	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
Ex_098_LBF_2 - Lift Pit	-	-	-	-	-	-	-	-	-	-	N/A
Ex_098_LBF _1 - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_098_LBF _1 - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Stage	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Green Room	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 3	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 2	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Bar	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_099_BF_Basement - Circulation Private	-	-	-	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Gents Toilet	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_099_BF_Basement - Circulation 4	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Reception	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Engineer	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_100_GF_Ground - Box Office	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_100_GF_Ground - Private Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Circulation 1	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Dance Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_101_First Floor - Private Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Circulation 3	-	-	-	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - WC	-	-	0.5	-	-	-	-	-	-	-	N/A
Ex_101_First Floor - Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_101_First Floor - Circulation 2	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Risers 1	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Riser	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Lounge	-	-	-	1.9	-	-	-	-	-	0.5	0.5
Ex_102_Second Floor - Risers	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_102_Second Floor - Circulation	-	-	-	-	-	-	-	-	-	-	N/A
Ex_103_Third Floor - KOKO Chillers	-	-	-	-	-	-	-	-	-	-	N/A
Ex_103_Third Floor - Stage	-	-	-	1.9	-	-	-	-	-	0.5	0.5
100_Ground - KOKO Office	-	-	-	1.6	-	-	-	-	-	0.53	0.5
100_Ground - Hotel Reception	-	-	-	1.6	-	-	-	-	-	0.53	0.5
100_Ground - Hope Anchor	-	-	-	-	-	-	-	-	-	-	N/A
099_BF_Basement - Kitchen	-	-	0.5	1.6	-	-	-	-	-	0.53	0.5
099_BF_Basement - Function	-	-	-	1.6	-	-	-	-	-	0.53	0.5
099_Catering Kitchen - Catering Kitchen	-	0.5	1.6	-	-	-	-	-	0.53	0.5	

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
102_Second Floor - 211	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 204	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 203	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 210	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 209	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 208	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 207	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 206	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 205	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 202	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 201	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - 212	-	-	-	-	-	-	-	-	-	-	N/A
102_Second Floor - Recording Studio	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - 111	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 110	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 109	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 108	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 104	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 103	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 105	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 106	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 107	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 102	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - 101	-	-	-	-	-	-	-	-	-	-	N/A
101_First Floor - Kitchen	-	-	0.5	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Breakout Room	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Artist Box	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Offices	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Guest Box	-	-	-	1.6	-	-	-	-	-	0.53	0.5
101_First Floor - Royal Box	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 309	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 308	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 303	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 302	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 307	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 304	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 306	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 305	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 301	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - 212 A	-	-	-	-	-	-	-	-	-	-	N/A
103_Third Floor - Suite 212 D	-	-	0.5	-	-	-	-	-	-	-	N/A
103_Third Floor - 212 C	-	-	-	-	-	-	-	-	-	-	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	
Ex_099_BF_Basement - Dancefloor	-	45	-	6624
100_Ground - EDF	85	-	-	170
100_Ground - Baggage Holding	85	-	-	25
100_Ground - Circulation	-	85	-	293
099_BF_Basement - Bin Store	85	-	-	21
099_BF_Basement - Bike Store	85	-	-	30
099_BF_Basement - Plant	85	-	-	144
099_BF_Basement - Circulation	-	85	-	188
099_BF_Basement - Staff Change	-	85	-	53
099_BF_Basement - Laundry	-	85	-	172
099_BF_Basement - WC	-	85	-	152
099_BF_Gents WC - BF_Gents-WC	-	85	-	106
098_LBF - Storage	85	-	-	198
098_LBF - Cold Store	85	-	-	8
102_Second Floor - Condensing Unit	85	-	-	63
102_Second Floor - Circulation	-	85	-	395
102_Second Floor - Pantry	85	-	-	57
102_Second Floor - Dressing Rooms	85	-	-	25
102_Second Floor - Bathroom	-	85	-	43
102_Second Floor - Dressing Room	85	-	-	14
102_Second Floor - Stairwell	-	85	-	44
Rooftop - Dome	-	85	60	243
Rooftop - WC-2	-	85	-	49
Rooftop - Stair-lobby	-	85	-	41
Rooftop - WC	-	85	-	70
Rooftop - Storage	85	-	-	12
Rooftop - Circulation	-	85	-	188
Rooftop - Rooftop Lobby	-	85	60	579
Rooftop - Plant room	85	-	-	127
100_Ground Stairs - Ground Stairs	-	85	-	50
101_First Floor - Circulation	-	85	-	232
101_First Floor - Stairwell	-	85	-	48
101_First Floor - Plant	85	-	-	116
101_First Floor - Lobby	-	85	-	21
103_Third Floor - Circulation 1	-	85	-	203
103_Third Floor - Dis WC	-	85	-	50
103_Third Floor - BoH	85	-	-	8
103_Third Floor - Circulation	-	85	-	33
103_Third Floor - Pantry	85	-	-	15
103_Third Floor - WC	-	85	-	117
103_Third Floor - Stairwell	-	85	-	24
103_Third Floor - Stairs to suite	-	85	-	23

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
104_Forth Floor-Refurbished - RM.4.01	85	-	-	106
Ex_098_LBF_2 - Lift Pit	-	45	-	107
Ex_098_LBF _1 - Circulation	-	45	-	51
Ex_098_LBF _1 - WC	-	45	-	35
Ex_099_BF_Basement - Stage	-	45	-	2587
Ex_099_BF_Basement - Circulation	-	45	-	359
Ex_099_BF_Basement - Green Room	45	-	-	428
Ex_099_BF_Basement - WC	-	45	-	84
Ex_099_BF_Basement - Circulation 3	-	45	-	267
Ex_099_BF_Basement - Circulation 2	-	45	-	585
Ex_099_BF_Basement - Bar	-	45	-	950
Ex_099_BF_Basement - Circulation Private	-	45	-	175
Ex_099_BF_Basement - Gents Toilet	-	45	-	333
Ex_099_BF_Basement - Circulation 4	-	45	-	261
Ex_100_GF_Ground - Office	45	-	-	385
Ex_100_GF_Ground - Circulation	-	45	-	1347
Ex_100_GF_Ground - Reception	-	45	15	803
Ex_100_GF_Ground - Circulation	-	45	-	1398
Ex_100_GF_Ground - Engineer	45	-	-	273
Ex_100_GF_Ground - Circulation	-	45	-	343
Ex_100_GF_Ground - Box Office	45	-	-	286
Ex_100_GF_Ground - Private Circulation	-	45	-	187
Ex_101_First Floor - Circulation 1	-	45	-	621
Ex_101_First Floor - Dance Lounge	-	45	-	929
Ex_101_First Floor - Private Circulation	-	45	-	369
Ex_101_First Floor - Circulation 3	-	45	-	189
Ex_101_First Floor - WC	-	45	-	134
Ex_101_First Floor - Lounge	-	45	-	319
Ex_101_First Floor - Circulation 2	-	45	-	485
Ex_102_Second Floor - Risers 1	45	-	-	244
Ex_102_Second Floor - Riser	45	-	-	51
Ex_102_Second Floor - Lounge	-	45	-	1448
Ex_102_Second Floor - Risers	45	-	-	196
Ex_102_Second Floor - Circulation	-	45	-	429
Ex_102_Second Floor - Circulation	-	45	-	245
Ex_102_Second Floor - Circulation	-	45	-	154
Ex_103_Third Floor - KOKO Chillers	45	-	-	235
Ex_103_Third Floor - Stage	-	45	-	4286
100_Ground - KOKO Office	85	-	-	172
100_Ground - Hotel Reception	-	85	60	451
100_Ground - Hope Anchor	-	85	60	376
099_BF_Basement - Kitchen	-	85	-	642
099_BF_Basement - Function	85	-	-	408

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
099_Catering Kitchen - Catering Kitchen	-	85	-	325
102_Second Floor - 211	-	85	-	57
102_Second Floor - 204	-	85	-	43
102_Second Floor - 203	-	85	-	42
102_Second Floor - 210	-	85	-	38
102_Second Floor - 209	-	85	-	39
102_Second Floor - 208	-	85	-	43
102_Second Floor - 207	-	85	-	40
102_Second Floor - 206	-	85	-	68
102_Second Floor - 205	-	85	-	42
102_Second Floor - 202	-	85	-	64
102_Second Floor - 201	-	85	-	62
102_Second Floor - 212	-	85	-	95
102_Second Floor - Recording Studio	85	-	-	373
101_First Floor - 111	-	85	-	54
101_First Floor - 110	-	85	-	38
101_First Floor - 109	-	85	-	41
101_First Floor - 108	-	85	-	45
101_First Floor - 104	-	85	-	45
101_First Floor - 103	-	85	-	43
101_First Floor - 105	-	85	-	45
101_First Floor - 106	-	85	-	51
101_First Floor - 107	-	85	-	42
101_First Floor - 102	-	85	-	66
101_First Floor - 101	-	85	-	63
101_First Floor - Kitchen	-	85	-	142
101_First Floor - Breakout Room	-	85	-	31
101_First Floor - Artist Box	-	85	-	63
101_First Floor - Offices	85	-	-	156
101_First Floor - Guest Box	-	85	-	47
101_First Floor - Royal Box	-	85	-	57
103_Third Floor - 309	-	85	-	51
103_Third Floor - 308	-	85	-	49
103_Third Floor - 303	-	85	-	40
103_Third Floor - 302	-	85	-	62
103_Third Floor - 307	-	85	-	50
103_Third Floor - 304	-	85	-	41
103_Third Floor - 306	-	85	-	41
103_Third Floor - 305	-	85	-	44
103_Third Floor - 301	-	85	-	61
103_Third Floor - 212 A	-	85	-	86
103_Third Floor - Suite 212 D	-	85	-	179
103_Third Floor - 212 C	-	85	-	54

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?
Ex_099_BF_Basement - Dancefloor	N/A	N/A
100_Ground - EDF	N/A	N/A
Rooftop - Dome	N/A	N/A
Rooftop - Rooftop Lobby	YES (+330.6%)	YES
101_First Floor - Lobby	N/A	N/A
103_Third Floor - Stairs to suite	N/A	N/A
Ex_099_BF_Basement - Green Room	N/A	N/A
Ex_099_BF_Basement - Bar	N/A	N/A
Ex_100_GF_Ground - Office	N/A	N/A
Ex_100_GF_Ground - Reception	NO (-38.1%)	NO
Ex_100_GF_Ground - Engineer	N/A	N/A
Ex_100_GF_Ground - Box Office	N/A	N/A
Ex_101_First Floor - Dance Lounge	N/A	N/A
Ex_101_First Floor - Lounge	YES (+142.6%)	NO
Ex_102_Second Floor - Lounge	NO (-52.8%)	NO
100_Ground - KOKO Office	NO (-86.3%)	YES
100_Ground - Hotel Reception	NO (-64.7%)	YES
100_Ground - Hope Anchor	NO (-46.7%)	YES
099_BF_Basement - Kitchen	N/A	N/A
099_BF_Basement - Function	N/A	N/A
099_Catering Kitchen - Catering Kitchen	N/A	N/A
102_Second Floor - 211	NO (-45.1%)	YES
102_Second Floor - 204	NO (-64.2%)	YES
102_Second Floor - 203	NO (-70.3%)	YES
102_Second Floor - 210	NO (-35.5%)	YES
102_Second Floor - 209	NO (-37.3%)	YES
102_Second Floor - 208	NO (-41.9%)	YES
102_Second Floor - 207	NO (-60%)	YES
102_Second Floor - 206	NO (-56.7%)	YES
102_Second Floor - 205	NO (-88.2%)	YES
102_Second Floor - 202	NO (-78.1%)	YES
102_Second Floor - 201	NO (-66.2%)	YES
102_Second Floor - 212	N/A	N/A
102_Second Floor - Recording Studio	N/A	N/A
101_First Floor - 111	NO (-37.4%)	YES
101_First Floor - 110	NO (-35.9%)	YES
101_First Floor - 109	NO (-36.3%)	YES
101_First Floor - 108	NO (-42.9%)	YES
101_First Floor - 104	NO (-56.9%)	YES
101_First Floor - 103	NO (-62%)	YES
101_First Floor - 105	NO (-89.2%)	YES
101_First Floor - 106	NO (-74%)	YES
101_First Floor - 107	NO (-50.8%)	YES
101_First Floor - 102	NO (-71.8%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
101_First Floor - 101	NO (-52%)	YES
101_First Floor - Kitchen	NO (-85.3%)	YES
101_First Floor - Breakout Room	N/A	N/A
101_First Floor - Artist Box	N/A	N/A
101_First Floor - Offices	NO (-69.3%)	YES
101_First Floor - Guest Box	N/A	N/A
101_First Floor - Royal Box	N/A	N/A
103_Third Floor - 309	NO (-35.3%)	YES
103_Third Floor - 308	NO (-39.2%)	YES
103_Third Floor - 303	NO (-66.2%)	YES
103_Third Floor - 302	NO (-76.4%)	YES
103_Third Floor - 307	NO (-26.2%)	YES
103_Third Floor - 304	NO (-59.4%)	YES
103_Third Floor - 306	NO (-44.1%)	YES
103_Third Floor - 305	NO (-37.9%)	YES
103_Third Floor - 301	NO (-72.1%)	YES
103_Third Floor - 212 A	NO (-86.7%)	YES
103_Third Floor - Suite 212 D	N/A	N/A
103_Third Floor - 212 C	NO (-82%)	YES

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]	6416.3	6416.3
External area [m^2]	6850.1	6850.1
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	13	3
Average conductance [W/K]	5836.04	2804.52
Average U-value [W/m^2K]	0.85	0.41
Alpha value* [%]	7.53	17.16

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
54	**C1 Hotels**
	C2 Residential Inst.: Hospitals and Care Homes
	C2 Residential Inst.: Residential schools
	C2 Residential Inst.: Universities and colleges
	C2A Secure Residential Inst.
	Residential spaces
	D1 Non-residential Inst.: Community/Day Centre
	D1 Non-residential Inst.: Libraries, Museums, and Galleries
	D1 Non-residential Inst.: Education
	D1 Non-residential Inst.: Primary Health Care Building
	D1 Non-residential Inst.: Crown and County Courts
46	**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	15.5	11.97
Cooling	2.61	3.57
Auxiliary	10.38	5.48
Lighting	25.93	22.66
Hot water	71.59	75.04
Equipment*	33.28	33.28
TOTAL**	**126.01**	**118.72**

* Energy used by equipment does not count towards the total for 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	0.76	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]	300.47	239.41
Primary energy* [kWh/m^2]	254.42	222.28
Total emissions [kg/m^2]	43.3	38.3

* 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	40.4	85.5	3.4	6.7	21.3	3.26	3.55	3.5	5
	Notional	3.9	73.8	0.4	5.7	8.3	2.43	3.6	----	----
[ST] Central heating using water: floor heating, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Natural Gas										
	Actual	170.1	124	15.1	0	6.3	3.12	0	3.5	0
	Notional	103.4	119.8	11.8	0	3.8	2.43	0	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Natural Gas										
	Actual	236.3	145.6	21	0	13	3.12	0	3.5	0
	Notional	96.5	167.9	11	0	6.2	2.43	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	143.7	108.1	12.2	8.5	6.9	3.26	3.55	3.5	5
	Notional	161.8	126.6	18.5	13	5.3	2.43	2.7	----	----

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 BCO can give particular attention to items with specifications that 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	0.17	100_Ground - EDF_W_7
Floor	0.2	0.02	098_LBF - Storage_S_3
Roof	0.15	0.13	100_Ground - EDF_R_5
Windows, roof windows, and rooflights	1.5	1.5	100_Ground - Baggage Holding_G_10
Personnel doors	1.5	1.4	100_Ground - EDF_D_8
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = 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	13.08