135-149 Shaftesbury Avenue
London
WC2H 8AH

Energy Statement

Prepared For:
Capital Start Limited

Prepared By:

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December 2017

Table of Contents

1. Executive Summary

In support of the planning application for the proposed development at 135-149 Shaftesbury Avenue, and to comply with the London Plan and Camden Council's requirements on environmental sustainability and efficient energy design an Energy Statement has been produced.

The Energy Statement contained herein describes the recommended solution to service the proposed development in the most energy efficient and sustainable manner, following the Be Lean, Be Clean, Be Green hierarchy as stipulated by the Greater London Authority (GLA). The results of this study recommend the installation of a highly efficient air source heat pump system to provide the space heating, cooling and domestic hot water for the development.

Carbon Emissions

The table below shows the carbon emissions for the development after each stage of the energy hierarchy.

	Carbon dioxide emissions for non-domestic buildings (Tonnes of CO2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	400.45	124.91
After energy demand reduction	393.13	124.91
After heat network / CHP	393.13	124.91
After renewable energy	322.62	124.91

Table 1 Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

The table below shows the different savings at each stage of the energy hierarchy.

	Regulated non-domestic carbon dioxide savings	
	(Tonnes of CO_2 per annum)	(%)
Savings from energy demand reduction	7.32	1.8%
Savings from heat network / CHP	0.00	0.0%
Savings from renewable energy	70.51	17.6%
Cumulative on site savings	**77.83**	**19.44%**

Table 2 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

Through energy efficiency techniques as well as the implementation of renewable technologies as mentioned above, the proposed development will reduce annual carbon emissions by 77.83 tons of CO_2. This accounts for a reduction of approximately 19.4% of the building's expected regulated energy carbon emissions.

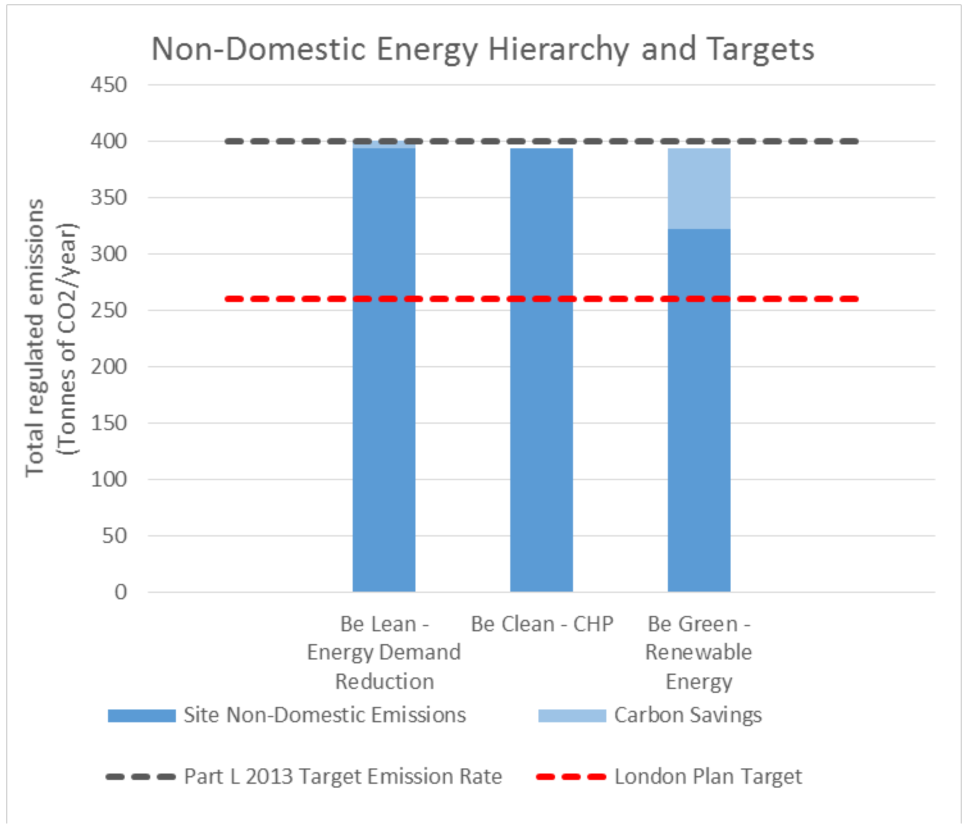


Figure 1 The Non-Domestic Energy Hierarchy

As the development falls short of the London Plan target of 35% reduction in CO_2 emissions a cumulative shortfall calculation for the life of the building has been completed above.

Shortfall in Regulated Carbon Dioxide Savings		
	Annual Shortfall (Tonnes of CO2)	**Cumulative Shortfall (Tonnes of CO2) over 30 years**
Total Target Savings	140	
Shortfall	62	1870

Table 3 Shortfall in Regulated Carbon

The development will need to cover the 1870 tonnes of CO_2 shortfall, as per the London Plan and Camden Council's guidance.

2. Introduction

In support of the planning application, an energy statement study that examines the potential for reduction of carbon emissions for the proposed development at 135-149 Shaftesbury Avenue, The Odeon Shaftesbury Hotel, has been compiled on request of the Applicant.

The proposed development will be a mixed use non-domestic site with a 94 room hotel, a four screen basement cinema, and a spa.

Camden Council has specific requirements with regards to improvements on carbon emissions in comparison to 2013 Building Regulations Part L.

- In line with the London Plan (Policy 5.2), the council's planning guidance (CPG 3) requires that any new development demonstrate that the proposed scheme will provide a 35% improvement on Part L 2013 carbon emissions.
- In line with the London Plan, the proposed development should attempt to meet at least BREEAM Excellent (Refer to DSA's separate Sustainability Report).

This report demonstrates how this development will strive to comply with the Camden Council and GLA's policy requirement of a 35% reduction of carbon emissions on 2013 Building Regulations Part L.

This report follows the Mayor of London's planning guidance of Be Lean, Be Clean, and Be Green.

3. Establishing CO_2 Emissions for a Part L 2013 Compliant Development

Part L 2013 calculations have been performed by using approved modelling SBEM software (HEVACOMP) in order to predict the carbon emissions of the proposed development.

To establish the regulated CO2 emissions for a Part L 2013 compliant development, it has been assumed that the heating will be provided by gas boilers and any active cooling will be provided by electrically powered equipment, in line with GLA guidance on preparing Energy Statements.

Table 7 below shows the carbon emission rate for the development required to meet 2013 Building Regulations (i.e. the Target Emission Rate).

Target Emission Rate for Non-Domestic		
TER	60.2	kgCO2/m²

Table 4 Annual carbon emissions for the proposed development

4. Energy Efficiency Measures *"Be Lean" and Sustainability Strategies*

The energy efficiency measures for the Proposed Development will be maximised through the use of passive design features including:

- solar shading, and good shading coefficient of the glazing throughout to control heat gains;
- thermal mass to manage heat.

The active cooling and heating demand has been minimised as far as possible through passive design measures including efficient building fabric, improved building air tightness and efficient lighting.

Efficiency of glazing to fabric

During the design process, the design of the glazing of the building has been significantly reduced through the use of solar shading on glazing in order to reduce energy required to heat and cool the space. The first four floors of hotel accommodation will be sheltered as they are located within the curtilage of the existing building. These rooms will look into an atrium that is subsequently being shaded by the existing external wall, greatly reducing solar heat gains.

The fully glazed top floors of the hotel will be provided with a copper mesh inset glazing with significantly improves the shading coefficient.

Building fabric U-values

The thermal efficiency of the building elements affects the heating and cooling demand of the building (and thereby affects the demand for natural gas and electricity). Below is a list of the building regulations, and the more stringent target U-values for this development:

Element	Building Regulations (W/m^2K)	Proposed for Odeon Hotel (W/m^2K)
Wall	0.35	0.20
Floor	0.25	0.20
Roof	0.25	0.18
Windows	2.2	1.3 / 1.1 (Copper mesh insert)
Windows (g-Value)	N/A	0.35 / 0.08 (copper mesh insert)

Table 5 U-Values as proposed for the proposed development comparison to Part L 2013

Air permeability

The air permeability (i.e. the tightness to the outdoor elements) of a building affects the heating and cooling demand of the building (and thereby affects the demand for natural gas and electricity). This development will achieve an air permeability which will be significantly more energy efficient than required by building control. The target air permeability rate for this development is 5.0 $m^3/h/m^2$.

The limiting factors which could make it difficult to achieve this air permeability rate are the junctions between the windows, and the openings throughout. The developer and the design team will encourage the contractor to build an airtight building in order to achieve the target set above.

HVAC systems

The efficiency of the mechanical systems has a significant impact on the amount of energy which the building consumes in order to deliver the required heating and cooling loads. Highly efficient equipment will be specified for this development, and wherever practically possible equipment from the government's Energy Technology List will be selected.

A highly efficient air source heat pump system will be installed to provide the space heating and cooling of the development. This heat pump system will also recover heat from the cooling process to pre-heat domestic hot water.

All air handling units for fresh air will be fitted with heat recovery to reduce the energy required for this element.

All new fan coil units shall use direct current variable speed motors. All pumps and fans shall be selected with high efficiency variable drive motors.

Lighting systems

Lighting represents a significant portion of the annual carbon emissions of this development. In order to maximise the natural light and reduce the energy consumed in order to generate artificial light, the following energy efficiency measures have been specified:

- Energy efficient lighting specified for all areas (LEDs);
- Sub-metering of lighting which automatically warns of "out of range" values (commercial only);
- Manual On / Automatic off switching for lighting; and
- PIR sensors in relevant zones (e.g. BOH areas/public toilets/plant rooms/stores).

The table below shows the savings on regulated carbon emissions after the 'Lean' stage of the energy hierarchy for development.

	Regulated non-domestic carbon dioxide savings	
	(Tonnes of CO_2 per annum)	(%)
Savings from energy demand reduction	7.32	1.8%

Table 6 Non domestic carbon emissions after the Be Lean Stage

5. Decentralised Energy (DE) Networks – Be Clean

5.1. District Heating

System Description

The London Plan's Energy Hierarchy and Camden Council's CPG3 guidance encourages developments to connect to existing decentralised energy (DE) networks where these exist or are proposed in the vicinity of the scheme. These systems combine the energy demands and supplies of nearby developments to more efficiently serve the building service requirements of the community as a whole.

Technical Viability

The figure below is an excerpt from the London Heat Map highlighting any existing and proposed DE networks. The black dot in the center indicates the location of the proposed development at 135-149 Shaftesbury Avenue, and shows that the site currently sits outside the reach of any existing/proposed district heating networks. This map also demonstrates that the site sits outside the reach of any 'Heat Mapping Decentralised Energy Potential' zone highlighted in purple.

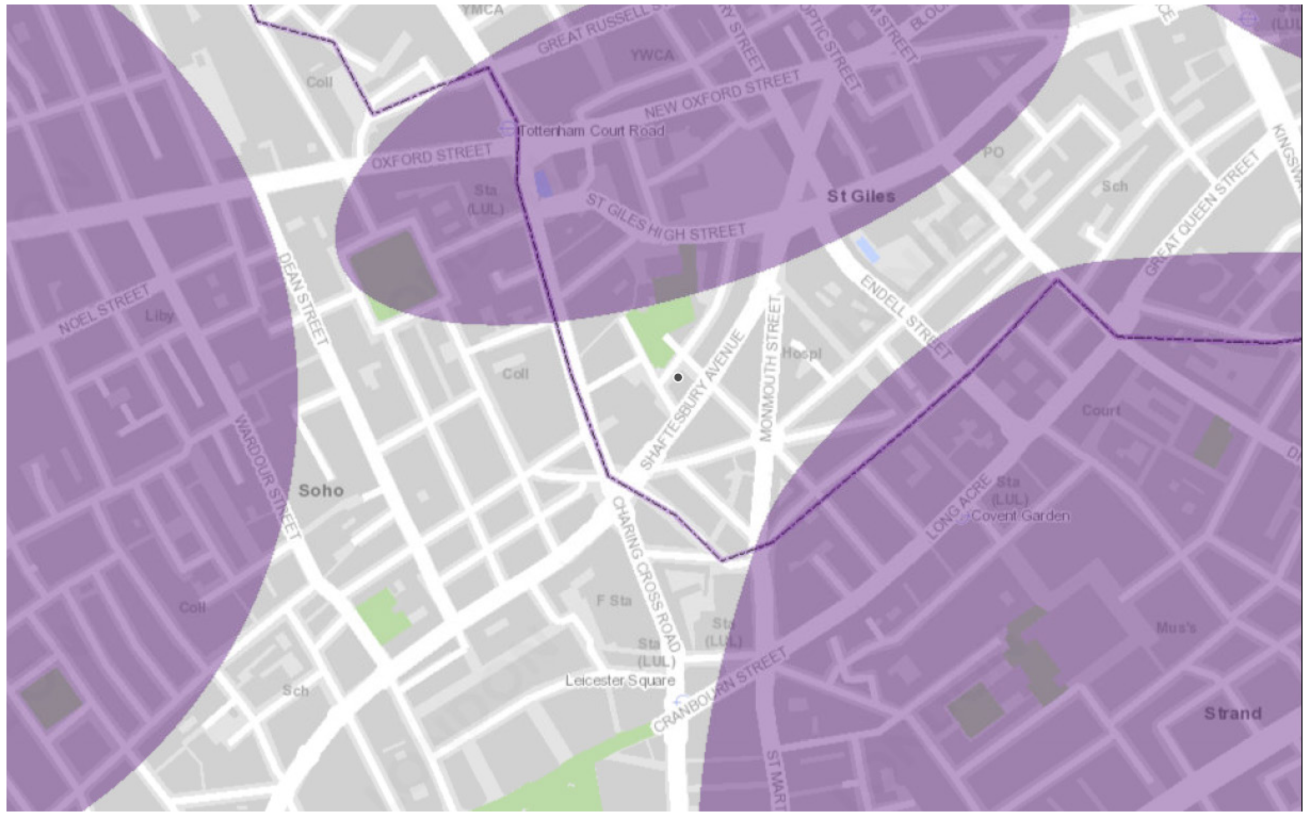


Figure 2 London Heat Map showing that there are no existing or potential networks near the proposed development.

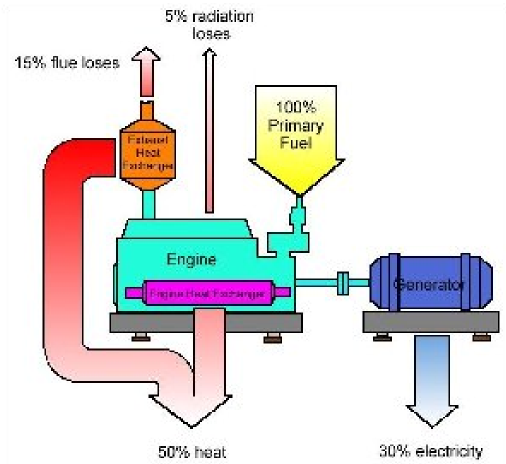
Therefore, connecting to an existing DE network is not a feasible solution for this development.

5.2. Combined Heat and Power (CHP)

CHP Description

Combined Heat and Power, or CHP as it is more commonly referred to, is the simultaneous generation of usable heat and power in a single process. In other words, it utilises the heat produced in electricity generation rather than releasing it wastefully into the atmosphere. In typical conventional power generation, much of the total energy input is wasted. CHP systems, where the heat produced in electricity generation is put to good use, can reach efficiencies up to 85%. A CHP can provide a secure and highly efficient method of generating electricity and heat at the point of use. Due to utilisation of heat from electricity generation and the avoidance of transmission losses because electricity is generated on site, CHP achieves a significant reduction in primary energy usage compared with power stations and heat only boilers. Typically a good CHP scheme can deliver an increase of around 20% in efficiency against the separate energy system it replaces and can result in savings of up to 50% of the annual CO_2 emissions from the site.

Bio-fuel CHP unit



Typical CHP process

Feasibility

For a CHP to be practical for a development there should be a steady demand for hot water and electricity. A CHP should be designed to cope with 100% of the heat base load of a building (i.e. a load that is continuous and steady all year round), with boilers to supply the peaks in demand during the colder months of the year. The only demand for heat that remains constant year round is domestic hot water.

The proposed development will comprise of hotel rooms with a high demand for hot water and could potentially benefit from the installation of a CHP system. However, a central London hotel will also require comfort cooling and the large amount of rejected heat from cooling plant would serve as a free source of heat for domestic hot water if instead of CHP a dual heating and cooling plant like ASHPs would be implemented.

A CHP is therefore not a feasible solution for this development.

The tables below shows the savings on regulated carbon emissions after the 'Be Clean' stage of the energy hierarchy for the development.

	Regulated non-domestic carbon dioxide savings	
	(Tonnes of CO_2 per annum)	(%)
Savings from energy demand reduction	7.32	1.8%
Savings from heat network / CHP	0.00	0.0%

Table 7 Non Domestic Carbon emissions after the Be Clean Stage

6. Cooling and Overheating

6.1. The Cooling Hierarchy

Minimising Internal Heat Generation through Energy Efficient Design

The servicing infrastructure will be designed to minimise heat gains within the hotel rooms, and utilising highly efficient pipe insulation to minimise distribution heat losses.

Reducing the Amount of Heat Entering the Building in Summer

Through the design development the amount of glazing has been significantly reduced from the original proposals. The images on the right demonstrate the reduction in glazing proportional to the area of external fabric walls as the height of fully glazed new floors has reduced.

The current proposals also have reduced the amount of glazing to the façade. The lower floors of the development which will have an internally fully glazed elevation to hotel rooms will benefit shadowing created by the existing fabric to reduce the solar gains entering the building during the summer (see the section 4 of this report). The upper floors have reduced the size of clear glazing to the hotel room floors through the inclusion of a copper mesh inset glazing panels with significantly better shading coefficient.

Internal shades will be provided for all hotel rooms to reduce solar heat gains further.

Use of Thermal Mass and High Ceilings to Manage the Heat within the Building

The design of the proposed development will maximise the use of thermal mass to reduce peaks in cooling and heating requirements.

Passive Ventilation

Although the central London location and associated air and noise pollution prevents the hotel from incorporating passive ventilation, a free cooling strategy will be built into the developments air handling equipment so that cool outside air is used without conditioning to treat indoor spaces whenever external temperatures are cool enough to allow for this.

Mechanical Ventilation

The fresh air system for the building will incorporate a heat recovery system to reduce the cooling and heating load required from mechanical ventilation.

6.1. Overheating Risk Analysis

Refer to Appendix 6 for the BRUKL Output Document which indicates compliance with Criterion 3 of Part L 2013.

In addition Hevacomp modelling software's CIBSE heat gain analysis has been carried out to ensure internal heat gains (lighting, small power, fabric) have been minimised to reduce the requirement for cooling.

Figure 3 Reduction of glazing through design development

6.2. Active Cooling

Although energy efficient design has been one of the key principles for the proposed developments, due to the nature of a high spec central London hotel, cooling will still be provided. The BRUKL document (Appendix 3) provides a comparison of the cooling demand for the actual building vs the notional building. The table below demonstrates that the actual building has a higher cooling demand than the notional building.

Cooling Demand (MJ/m2)	
Actual	389.8
Notional	306.5

Table 8 Cooling Demand for the Actual vs Notional Building

7. Low & Zero Carbon Technologies Feasibility Study - Be Green

The definition of 'renewable energy' used in the National Planning Policy Framework is:

> *"those energy flows that occur naturally and repeatedly in the environment – from the wind, the fall of water, the movement of the oceans, from the sun and also from biomass and deep geothermal heat. Low carbon technologies are those that can help reduce emissions (compared to conventional use of fossil fuels)."*

This definition has been widened by the UK Government by the use of the term 'Low or Zero Carbon Energy Technologies" (LZCs) within the revised ADL documents. The carbon emissions reduction from applying these technologies when compared to the conventional technologies has also been accepted as 'renewable energy' under the GLA methodology.

In the following pages, the technical viability, indicative costs, and contribution towards the carbon emissions reduction are considered for the following systems:

1. Wind Turbines;
2. Ground Sourced Heating;
3. Air Sourced Heat Pumps;
4. Solar Photovoltaic (PV) panels; and
5. Solar Water Heating Systems.

7.1. Wind Turbines

System Description

Wind turbines are modern, high-technology descendants of the old technology windmills that have been around for centuries. The difference is that now the kinetic energy of the wind is used to turn a turbine to generate electricity as opposed to moving water or turning a grist mill wheel. There are two types of wind turbine, one being the horizontal-axis variety which faces up-stream or downstream of the wind and where the rotational movement of the blade is connected to a generator to create electricity. The other type is the vertical-axis design, which is the most flexible type of wind turbine and is best suited for the more urban sites as it operates in any wind direction.


Horizontal-axis wind turbine


Vertical Axis Wind Turbine

Technical Viability

One of the big issues with wind turbines is the available wind speed. Apart from the direction, approximately 4.0 m/s wind velocity is required as a minimum before the turbine will begin to generate electricity. Additionally, if this option were used for this development, the building would need wind turbines protruding from the roof. Wind turbines in urban centres can generate acoustic complaints from both the occupants and the surrounding commercial / residential units.

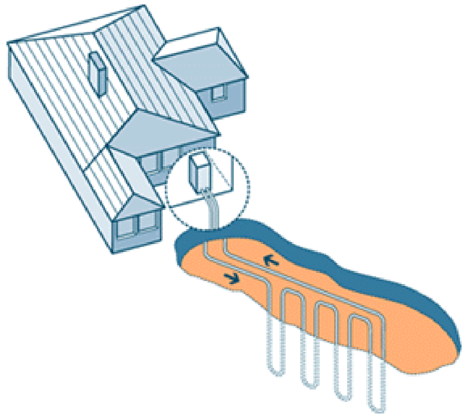
Wind turbines are therefore not recommended for this development.

Wind Turbines	
Land Use	Foundation unless building mounted
Planning Issues	Potentially a problem with gaining planning permission
Noise	Problematic
Tariffs	FiT 8.46 (4.91 for export) pence/kWh

7.2. Ground Source Heat Pump

System Description

Ground source heat pumps take advantage of the stable ground temperatures of 10-12ºC to provide energy efficient heating and cooling to a building. The energy flow is driven by the temperature difference between the ground and the circulating fluid which can be used to reject heat into the ground and deliver heating or cooling to the building.



System Schematic

Horizontal Pipe

Vertical Pipe Drilling Rig

Technical Viability

Proposals to install a Closed Loop Ground Source Heat Pump and/or a direct borehole system to satisfy a large percentage of the heating demand for the building could be a cost-effective option. This system also offers the option of providing "free-cooling" to its occupants via the use of the constant 12°C deep-earth temperature.

This technology can benefit from the Renewable Heat Incentive.

The proposed development has a limited building foot print to house the amount of boreholes required for a successful GSHP installation suitable for a development this size. Furthermore the retained external walls will require the building foot print to reduce in the basements to ensure the foundations of these walls are not compromised, resulting in an even smaller basement footprint. Furthermore an ASHP with simultaneous heating and cooling will prove to be more cost effective than a GSHP.

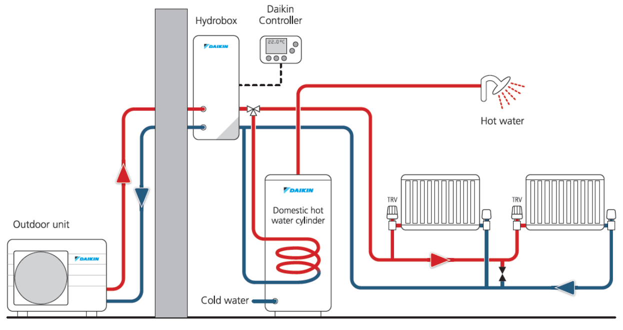
A GSHP system is therefore not a viable solution for the proposed development.

Ground Source Heat Pumps	
Land Use	Below ground, minimal impact on future use of land
Planning Issues	Minimal
Noise	Minimal noise in plant room
Tariffs	Renewable Heat Incentive 8.95/2.67 pence/kWh

7.3. Air Source Heat Pumps

System Description

Air source heat pumps use the atmosphere as a renewable source of heat to generate heating and cooling with a refrigeration machine. The heating and cooling is accomplished by moving refrigerant through the heat pump's various indoor and outdoor coils and components. A compressor, condenser, expansion valve and evaporator are used to change states of the refrigerant from liquid to hot gas and then back from gas to liquid. The refrigerant is used to heat or cool coils in a fan coil unit located in the conditioned space. An external heat exchanger is used to heat or cool the refrigerant by absorbing heat from or rejecting heat to the outside air. This use of outside air is considered renewable, and has lead to the term "Air Source" Heat Pump.



Integrated Heating, Cooling, and DHW ASHP Configuration *Combined 4-Pipe Heat Pump Unit*

Technical Viability

The COPs achievable with modern ASHPs means that these units will produce about 80% of its energy output from the air, a renewable and clean energy source.

Air sourced heating could provide a large proportion of the development's annual energy demand without a large space requirement for mounting equipment. These units can be located in the roof plantroom, providing a combined heating and cooling solution from one source.

This technology can benefit from the Renewable Heat Incentive.

New heat pump technologies can provide simultaneous cooling and heating (4-pipe Units), and with 'Total Heat Recovery' technology these units can achieve a Total Efficiency Ratio in excess of 7. The 'TER' is the efficiency of the system for when the system is in full heat recovery mode. This efficiency takes into account not only the energy generated by the refrigerant process for cooling but also the heat that would normally be rejected to the atmosphere via rooftop condensers. With the simultaneous cooling and heating heat pumps selected, the heat created while in cooling mode will be recovered and used for 'free' heating, instead of dissipated at rooftop.

Air Source Heat Pumps	
Land Use	Requires external plant area
Planning Issues	Potential issue if located in visible position.
Noise	Noise issues will be evident
Tariffs	Renewable Heat Incentive 2.57 pence/kWh

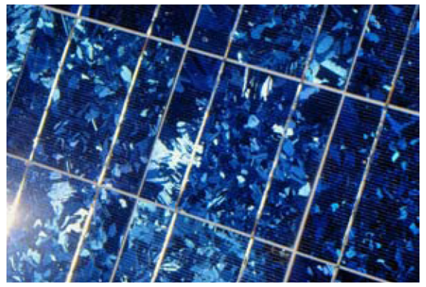
Air source heat pumps providing domestic hot water, space heating and cooling is therefore a viable option for the Proposed Development.

7.4. Solar Photovoltaic Panels

System Description

Solar photovoltaics (PVs) convert energy from daylight into electricity using a semiconductor material such as silicon. When light hits the semiconductor, the energy in the light is absorbed, 'exciting' the electrons in the semiconductor so that they break free from their atoms. This allows the electrons to flow through the semiconductor material producing electricity.

Rooftop Installation



PV Cells

Solar Glass

Technical Viability

Solar PV panels are best mounted at an incline with a southerly orientation, although orientations between south-east and south-west are viable.

This technology can benefit from the Feed in Tariff.

The proposed development has a roof top bar/terrace covering the majority of roof area. The remaining is a plantroom enclosed by screens, which does not allow any space for photovoltaic panels.

Photovoltaics are therefore not a viable solution for the Proposed Development.

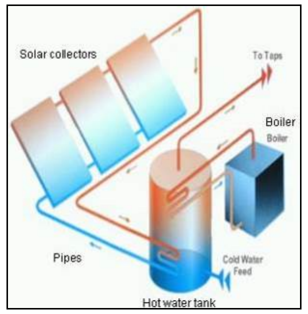
Photovoltaics	
Land Use	No land use (roof mounted)
Planning Issues	Potential issue if located in visible position. Can be located in discrete position.
Noise	None
Tariffs	FiT 2.38 (4.91 for export) pence/kWh

7.5. Solar Water Heating

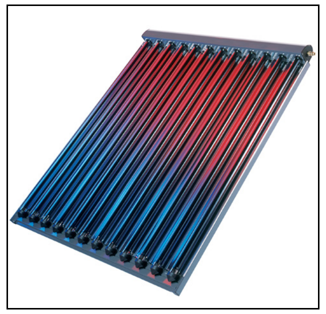
System Description

Solar Water Heating systems convert solar radiation to heat carried by water for use in space heating or the provision of domestic hot water. Solar water heating systems normally operate with a back-up source of heat, such as gas condensing boilers. The solar water heating pre-heats the incoming water, which is topped-up by the back-up heat source when there is insufficient solar energy to reach the target water temperature.

Solar collectors are best mounted at an incline with a southerly orientation, although orientations between south-east and south-west are acceptable. As solar radiation is greatest in the summer when demand is lowest, it is not possible to meet the entire annual demand by increasing the size of the system. It is therefore recommended that a solar hot water system meet no more than 75% of the domestic hot water demand.



System Diagram



Evacuated Tube Collector

Glazed Flat Panel Collector

Technical Viability

In order for a solar panel to perform efficiently, it should be positioned between a 15 and 60 degree incline. As solar radiation is greatest in the summer when demand is lowest, it is not efficient to try to meet the entire annual demand by increasing the size of the system. It is therefore recommended that a solar water heating system meet no more than 65% of the domestic hot water demand.

This technology can benefit from the Renewable Heat Incentive.

Solar hot water systems are more cost efficient on buildings with a high demand for domestic hot water. The proposed development being a hotel, will require a high enough demand for domestic hot water making a solar thermal panel system cost efficient.

As mentioned previously roof area to house any solar equipment is limited by the inclusion of a rooftop bar and plantroom.

Therefore the installation of Solar Thermal panels is not a viable solution.

Solar Hot Water	
Land Use	No land use
Planning Issues	Potential issue if visible. Can be located in discrete location
Noise	None
Tariffs	Renewable Heat Incentive 10.28 pence/kWh

7.6. Recommended Solution

DSA therefore recommends the following renewable energy strategy for the Odeon Shaftesbury Hotel.

The proposed development has the potential of benefiting from the multiple generation of an Air Source Heat Pump System.

The table below shows the savings on regulated carbon emissions after the 'Be Green' stage of the energy hierarchy.

	Regulated non-domestic carbon dioxide savings	
	(Tonnes of CO_2 per annum)	(%)
Savings from energy demand reduction	7.32	1.8%
Savings from heat network / CHP	0.00	0.0%
Savings from renewable energy	70.51	17.6%

Table 9 Carbon emissions after the Be Green Stage

The carbon savings (135.52 Tonnes of CO_2) for the BE GREEN stage of the Energy Hierarchy, can be attributed to the installation of ASHPs.

8. Conclusion

In order for the development to achieve minimum requirements of energy carbon reductions in line with planning policies and to comply with minimum energy requirements for BREEAM the proposed development must achieve:

- An improvement of 35% on the TER for the development dictated by 2013 Part L Building Regulations to comply with the London Plan and Camden's sustainability requirements and provide offset payments for all outstanding emissions (if any).

In order to maximise carbon reductions, the design team has followed the "Be Lean, Be Clean, Be Green" energy hierarchy as advised by the London Plan. This included reducing the buildings energy demand through energy efficient techniques, exploring the possibility of using decentralised energy systems, and including renewable energy technologies on site.

The Proposed Development will be supplied with a highly efficient air source heat pump system to provide the space heating, cooling, and domestic hot water for the development.

This will result in the following carbon emissions following the Be Lean, Be Clean, Be Green energy hierarchy for both regulated and unregulated use.

The table below shows the carbon emissions for the development after each stage of the energy hierarchy.

	Carbon dioxide emissions for non-domestic buildings (Tonnes of CO2 per annum)	
	Regulated	Unregulated
Baseline: Part L 2013 of the Building Regulations Compliant Development	400.45	124.91
After energy demand reduction	393.13	124.91
After heat network / CHP	393.13	124.91
After renewable energy	322.62	124.91

Table 10 Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-domestic buildings

The table below shows the different savings at each stage of the energy hierarchy for the development.

	Regulated non-domestic carbon dioxide savings	
	(Tonnes of CO_2 per annum)	(%)
Savings from energy demand reduction	7.32	1.8%
Savings from heat network / CHP	0.00	0.0%
Savings from renewable energy	70.51	17.6%
Cumulative on site savings	**77.83**	**19.44%**

Table 11 Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-domestic buildings

Through energy efficiency techniques as well as the implementation of renewable technologies as mentioned above, the proposed development will reduce annual carbon emissions by 77.83 tons of CO_2. This account for a reduction of approximately 19.44% of the buildings expected regulated energy carbon emissions.

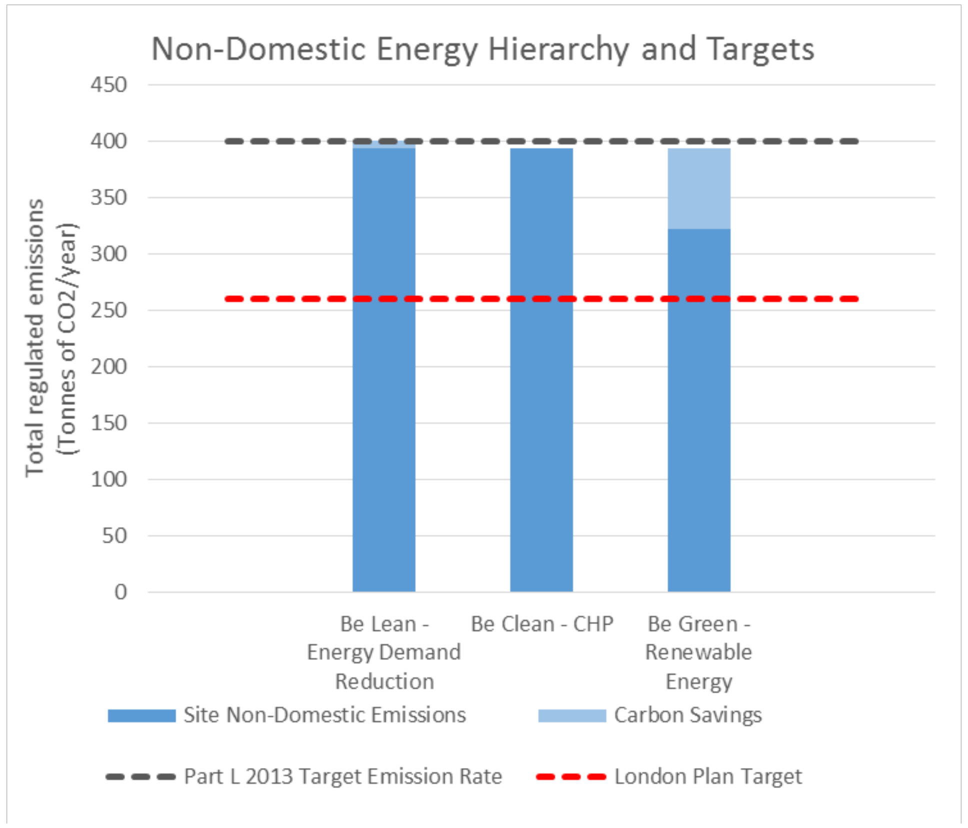


Figure 4 The Non-Domestic Energy Hierarchy

As the development falls short of the London Plan target of 35% reduction in CO_2 emissions a cumulative shortfall calculation for the life of the building has been completed above.

Shortfall in Regulated Carbon Dioxide Savings		
	Annual Shortfall (Tonnes of CO2)	Cumulative Shortfall (Tonnes of CO2) over 30 years
Total Target Savings	140	
Shortfall	62	1870

Table 12 Shortfall in Regulated Carbon

The development will need to cover the 1870 tonnes of CO_2 shortfall, as per the London Plan and Camden's guidance.

9. Appendix

9.1. Appendix 1 – SBEM and BRUKL 'Be Lean'

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

135-147 Shaftesbury Avenue

As designed

Date: Fri Dec 15 16:24:02 2017

Administrative information

Building Details

Address: 135-147 Shaftesbury Avenue, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.b.3

Interface to calculation engine: Design Database

Interface to calculation engine version: v26.02

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Certifier details

Name: DSA Engineering

Telephone number: 02072427272

Address: Damaso House, 31 Isligton Green, London, N1 8DU

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	60.2
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	60.2
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	59.1
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	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 which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.21	0.21	B1 CINE LO Wall 1
Floor	0.25	-	-	"No heat loss floors"
Roof	0.25	0.15	0.15	L4 VOID01 Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.24	1.3	G KITCHEN Window 1
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

2.b Building services

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

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

1- Full Air Systems

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	2.96	-	1.5	0.8
Standard value	0.91*	N/A	N/A	1.6	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* 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- Fan Coils & Fresh Air

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	2.96	-	1	0.8
Standard value	0.91*	N/A	N/A	1.6	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* 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- Default DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	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
B1 CINE LO	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE ST	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE01	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE02	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE03	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE04	-	-	-	-	-	-	-	-	-	-	N/A
G KITCHEN	-	-	-	-	-	-	-	-	-	-	N/A
G LOBBY01	-	-	-	-	-	-	-	-	-	-	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
G LOBBY02	-	-	-	-	-	-	-	-	-	-	N/A
G LOBBY03	-	-	-	-	-	-	-	-	-	-	N/A
G OFF LUG	-	-	-	-	-	-	-	-	-	-	N/A
G POP-UP	-	-	-	-	-	-	-	-	-	-	N/A
G RESTAU	-	-	-	-	-	-	-	-	-	-	N/A
B1 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR05	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR06	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR07	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR08	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 FIRE C	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ03	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ04	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 TOILE01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 TOILE02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 TOILE03	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 BOH01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 PLANT01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 PLANT02	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 PLANT01	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 SPA	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
G B STOR01	-	-	-	-	-	-	-	0.2	-	-	N/A
G BOH01	-	-	-	-	-	-	-	0.2	-	-	N/A
G ELEC INT	-	-	-	-	-	-	-	0.2	-	-	N/A
G LOAD BAY	-	-	-	-	-	-	-	0.2	-	-	N/A
G STAIR01	-	-	-	-	-	-	-	0.2	-	-	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
G STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 LOBBY01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 LOBBY02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 LOBBY03	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 LOBB01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 LOBB02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 LOBB03	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM10	-	-	-	-	-	-	-	0.2	-	-	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
L2 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 VOID	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 LOBB01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 LOBB02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 LOBB03	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 CORR01	-	-	-	-	-	-	-	0.2	-	-	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
L4 LOBB01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 LOBB02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 LOBB03	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 STAIR01	-	-	-	-	-	-	-	0.2	-	-	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
L5 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 VOID03	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 VOID03	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 BOH01	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 ROOFBAR	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A

"LENI calculation for lighting energy provided in a separate submission."

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?
B1 CINE LO	N/A	N/A
B1 CINE ST	N/A	N/A
G LOBBY01	NO (-63.4%)	NO
G LOBBY03	N/A	N/A
G POP-UP	NO (-66.2%)	NO
G RESTAU	NO (-65.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
B1 FIRE C	N/A	N/A
B1 PROJ01	N/A	N/A
B1 PROJ02	N/A	N/A
B1 PROJ03	N/A	N/A
B1 PROJ04	N/A	N/A
B3 SPA	N/A	N/A
L1 LOBBY01	N/A	N/A
L1 ROOM03	NO (-85.8%)	YES
L1 ROOM04	N/A	N/A
L1 ROOM05	N/A	N/A
L1 ROOM06	N/A	N/A
L1 ROOM07	N/A	N/A
L1 ROOM08	N/A	N/A
L1 ROOM09	N/A	N/A
L1 ROOM10	N/A	N/A
L1 ROOM11	N/A	N/A
L1 ROOM12	N/A	N/A
L1 ROOM13	NO (-76.8%)	YES
L1 ROOM14	N/A	N/A
L1 ROOM15	NO (-74.2%)	YES
L1 ROOM16	N/A	N/A
L1. ROOM01	N/A	N/A
L1. ROOM02	NO (-86.7%)	YES
L2 LOBB01	N/A	N/A
L2 ROOM03	NO (-85.8%)	YES
L2 ROOM04	N/A	N/A
L2 ROOM05	N/A	N/A
L2 ROOM06	N/A	N/A
L2 ROOM07	N/A	N/A
L2 ROOM08	N/A	N/A
L2 ROOM09	N/A	N/A
L2 ROOM10	N/A	N/A
L2 ROOM11	N/A	N/A
L2 ROOM12	N/A	N/A
L2 ROOM13	NO (-79.4%)	YES
L2 ROOM14	N/A	N/A
L2 ROOM15	NO (-74.2%)	YES
L2 ROOM16	N/A	N/A
L2. ROOM01	N/A	N/A
L2. ROOM02	NO (-80.1%)	YES
L3 LOBB01	N/A	N/A
L3 ROOM03	NO (-85.8%)	YES
L3 ROOM04	N/A	N/A
L3 ROOM05	N/A	N/A
L3 ROOM06	N/A	N/A
L3 ROOM07	N/A	N/A
L3 ROOM08	N/A	N/A
L3 ROOM09	N/A	N/A
L3 ROOM10	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L3 ROOM11	N/A	N/A
L3 ROOM12	N/A	N/A
L3 ROOM13	NO (-73%)	YES
L3 ROOM14	N/A	N/A
L3 ROOM15	NO (-74.2%)	YES
L3 ROOM16	N/A	N/A
L3. ROOM01	N/A	N/A
L3. ROOM02	NO (-80.1%)	YES
L4 LOBB01	N/A	N/A
L4 ROOM03	NO (-85.8%)	YES
L4 ROOM04	N/A	N/A
L4 ROOM05	N/A	N/A
L4 ROOM06	N/A	N/A
L4 ROOM07	N/A	N/A
L4 ROOM08	N/A	N/A
L4 ROOM09	N/A	N/A
L4 ROOM10	N/A	N/A
L4 ROOM11	N/A	N/A
L4 ROOM12	N/A	N/A
L4 ROOM13	NO (-82.3%)	YES
L4 ROOM14	N/A	N/A
L4 ROOM15	NO (-74.2%)	YES
L4 ROOM16	N/A	N/A
L4. ROOM01	N/A	N/A
L4. ROOM02	NO (-80.1%)	YES
L5 ROOM01	N/A	N/A
L5 ROOM02	NO (-67.7%)	YES
L5 ROOM03	NO (-53.1%)	YES
L5 ROOM04	NO (-65.1%)	YES
L5 ROOM05	NO (-65.1%)	YES
L5 ROOM06	NO (-65.1%)	YES
L5 ROOM07	NO (-65.1%)	YES
L5 ROOM08	NO (-65.1%)	YES
L5 ROOM09	NO (-65.1%)	YES
L5 ROOM10	YES (+34.4%)	YES
L5 ROOM11	YES (+34.4%)	YES
L5 ROOM12	NO (-31.4%)	YES
L5 ROOM13	NO (-95.8%)	YES
L5 ROOM14	NO (-81.5%)	YES
L5 ROOM15	NO (-83.2%)	YES
L5 VOID02	N/A	N/A
L5 VOID03	YES (+1.6%)	NO
L6 ROOM01	N/A	N/A
L6 ROOM02	NO (-67.6%)	YES
L6 ROOM03	NO (-66.5%)	YES
L6 ROOM04	NO (-61.4%)	YES
L6 ROOM05	NO (-60.3%)	NO
L6 ROOM06	NO (-61.4%)	YES
L6 ROOM07	NO (-61.2%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L6 ROOM08	NO (-61.4%)	YES
L6 ROOM09	NO (-61.4%)	YES
L6 ROOM10	YES (+48.7%)	YES
L6 ROOM11	YES (+48.7%)	YES
L6 ROOM12	NO (-10.9%)	YES
L6 ROOM13	NO (-59.7%)	YES
L6 ROOM14	NO (-71.2%)	YES
L6 ROOM15	NO (-71.3%)	YES
L6 VOID02	N/A	N/A
L6 VOID03	YES (+12%)	NO
L7 ROOFBAR	YES (+185.9%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the 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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	6682	6682
External area [m²]	4382.8	4382.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	2535.2	2859.65
Average U-value [W/m²K]	0.58	0.65
Alpha value* [%]	16.93	17.04

* 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
100	**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
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	16.33	12.83
Cooling	14.07	11.86
Auxiliary	22.75	27.56
Lighting	21.02	22.14
Hot water	121.84	121.84
Equipment*	61.52	61.52
TOTAL**	**196.01**	**196.24**

* 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/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	260.42	191.56
Primary energy* [kWh/m²]	341.7	348.57
Total emissions [kg/m²]	59.1	60.2

* 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] Constant volume system (variable fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	2.2	389.8	0.6	30.4	40.5	1	3.56	0.91	5.5
Notional	7.5	306.5	2.5	23.6	28.1	0.82	3.6	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity									
Actual	56.4	177.9	19.4	10.8	19.2	0.81	4.57	0.91	5.5
Notional	43.9	123.4	14.9	9.5	27.5	0.82	3.6	----	----

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-Typ}	U_{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.21	B1 CINE LO Wall 1
Floor	0.2	-	"No heat loss floors"
Roof	0.15	0.15	L4 VOID01 Exposed Roof 1
Windows, roof windows, and rooflights	1.5	1.1	L5 ROOM02 Window 1
Personnel doors	1.5	-	"No external personnel doors"
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-Typ} = Typical individual element U-values [W/(m²K)] U_{i-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	5

SBEM Main Calculation Output Document

Fri Dec 15 16:23:57 2017   v5.2.b.3

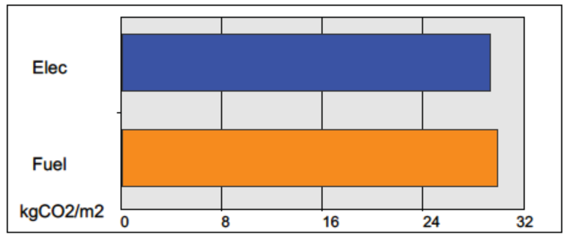
Building name

135-147 Shaftesbury Avenue

Building type: C1 Hotels

SBEM is an energy calculation tool for the purpose of assessing and demonstrating compliance with Building Regulations (Part L for England and Wales, Section 6 for Scotland, Part F for Northern Ireland, Part L for Republic of Ireland and Building Bye-laws Jersey Part 11) and to produce Energy Performance Certificates and Building Energy Ratings. Although the data produced by the tool may be of use in the design process, **SBEM is not intended as a building design tool.**

Building Energy Performance and CO2 emissions

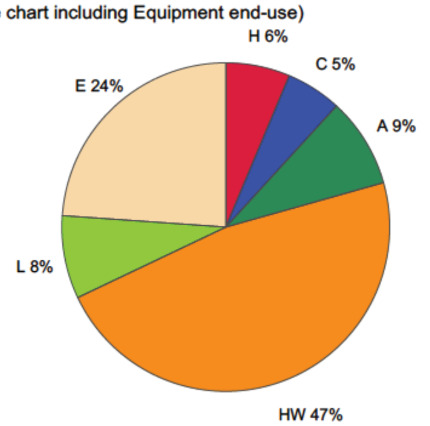


0 kgCO2/m2 displaced by the use of renewable sources.

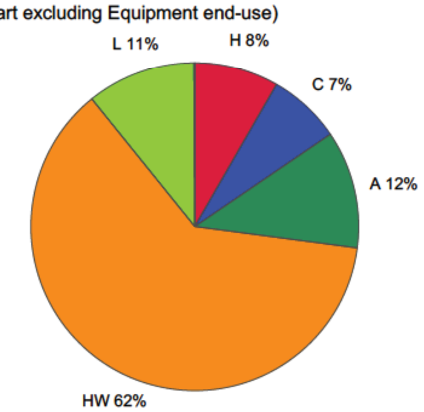
Building area is 6682.02 m2

Annual Energy Consumption

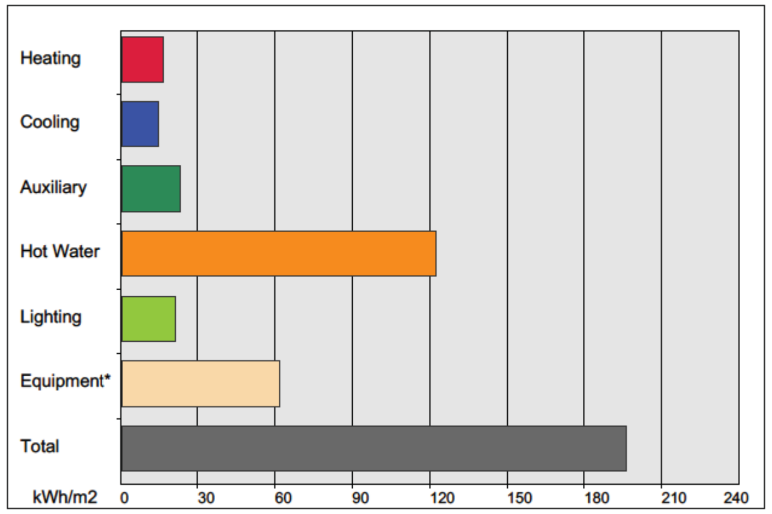
(Pie chart including Equipment end-use)

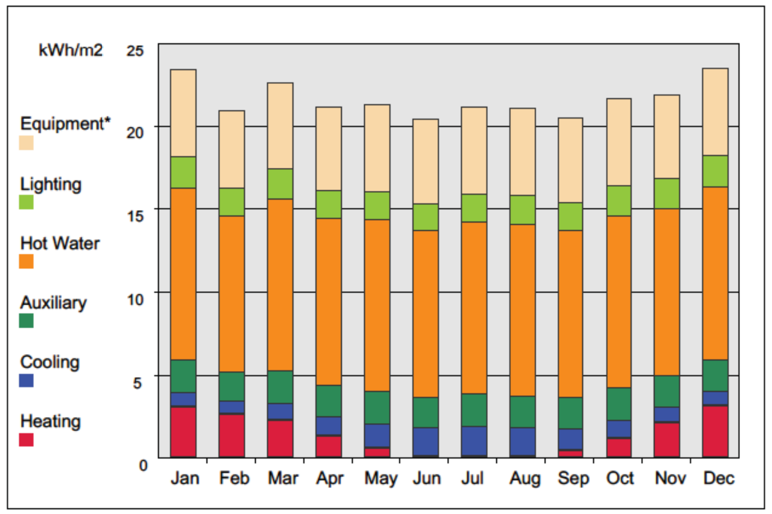


(Pie chart excluding Equipment end-use)

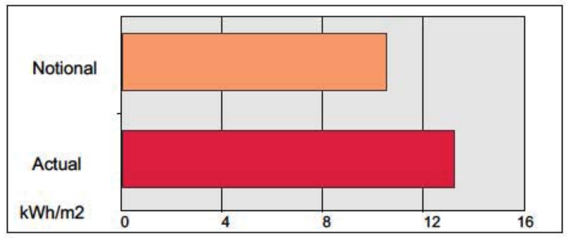


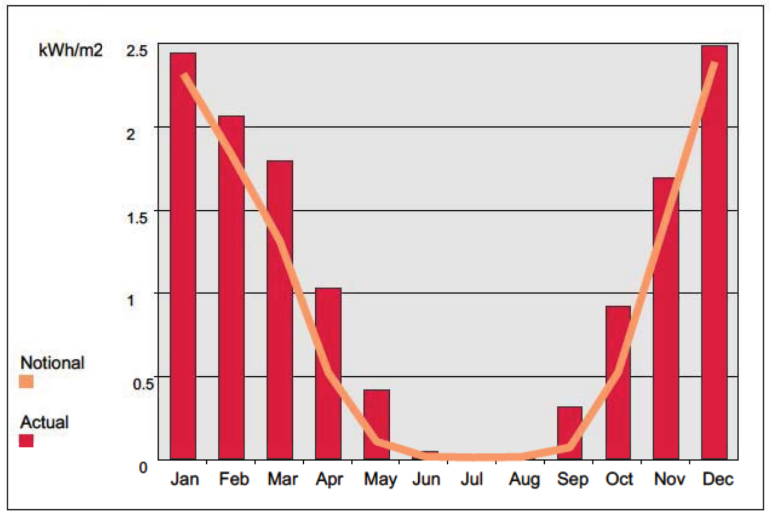
(*) Although energy consumption by equipment is shown in the graphs, the CO2 emissions associated with this end-use have not been taken into account when producing the rating.



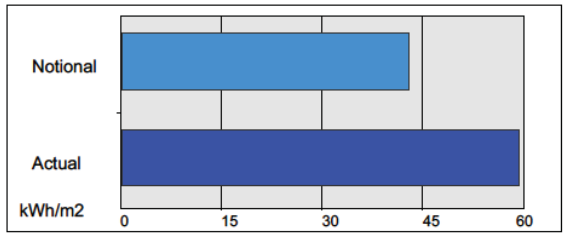


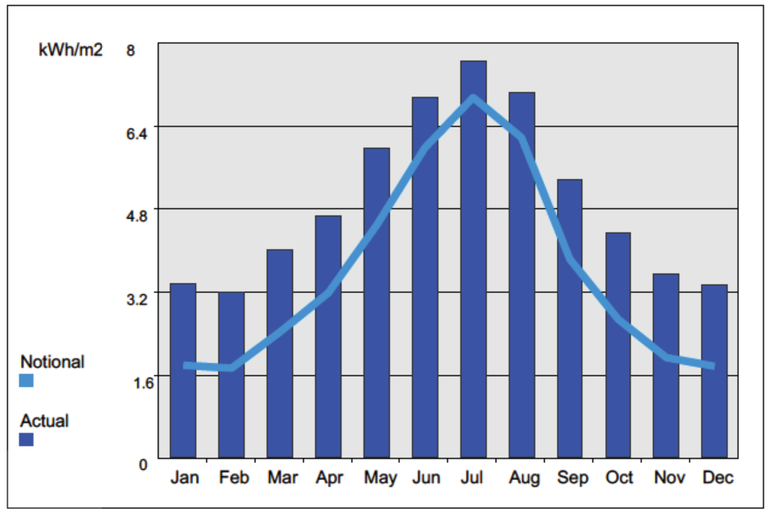
Annual Heating Demand





Annual Cooling Demand





9.2. Appendix 2 – SBEM and BRUKL 'Be Clean'

(Refer to Appendix 1. 'Be Clean' and 'Be Lean' SBEM and BRUKL Reports are identical)

9.3. Appendix 3 - SBEM and BRUKL 'Be Green'

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

135-149 Shaftesbury Avenue

As designed

Date: Fri Dec 15 17:07:19 2017

Administrative information

Building Details

Address: 135-149 Shaftesbury Avenue, London,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.2.b.3

Interface to calculation engine: Design Database

Interface to calculation engine version: v26.02

BRUKL compliance check version: v5.2.b.1

Owner Details

Name: Information not provided by the user

Telephone number: Information not provided by the user

Address: Information not provided by the user, Information not provided by the user, Information not provided by the user

Certifier details

Name: DSA Engineering

Telephone number: 02072427272

Address: Damaso House, 31 Isligton Green, London, N1 8DU

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

1.1	CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	55.9
1.2	Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	55.9
1.3	Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	48.5
1.4	Are emissions from the building less than or equal to the target?	BER =< TER
1.5	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 which do not meet standards in the 2013 Non-Domestic Building Services Compliance Guide are displayed in red.

2.a Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.21	0.21	B1 CINE LO Wall 1
Floor	0.25	-	-	"No heat loss floors"
Roof	0.25	0.15	0.15	L4 VOID01 Exposed Roof 1
Windows***, roof windows, and rooflights	2.2	1.24	1.3	G KITCHEN Window 1
Personnel doors	2.2	-	-	"No external personnel doors"
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

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

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	5

2.b Building services

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

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

1- Full Air Systems

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.75	2.96	-	1.5	0.8
Standard value	2.5*	N/A	N/A	1.6	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* 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- Fan Coils & Fresh Air

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.75	2.96	-	1	0.8
Standard value	2.5*	N/A	N/A	1.6	0.45
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* 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- Default DHW

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	1.94	-
Standard value	2*	N/A

* Standard shown is for all types except absorption and gas engine heat pumps.

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
B1 CINE LO	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE ST	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE01	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE02	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE03	-	-	-	-	-	-	-	-	-	-	N/A
B1 CINE04	-	-	-	-	-	-	-	-	-	-	N/A
G KITCHEN	-	-	-	-	-	-	-	-	-	-	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
G LOBBY01	-	-	-	-	-	-	-	-	-	-	N/A
G LOBBY02	-	-	-	-	-	-	-	-	-	-	N/A
G LOBBY03	-	-	-	-	-	-	-	-	-	-	N/A
G OFF LUG	-	-	-	-	-	-	-	-	-	-	N/A
G POP-UP	-	-	-	-	-	-	-	-	-	-	N/A
G RESTAU	-	-	-	-	-	-	-	-	-	-	N/A
B1 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR05	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR06	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR07	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 CORR08	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 FIRE C	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ03	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 PROJ04	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 TOILE01	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 TOILE02	-	-	-	-	-	-	-	0.2	-	-	N/A
B1 TOILE03	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 BOH01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 PLANT01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 PLANT02	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B2 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 PLANT01	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 SPA	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
B3 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
G B STOR01	-	-	-	-	-	-	-	0.2	-	-	N/A
G BOH01	-	-	-	-	-	-	-	0.2	-	-	N/A
G ELEC INT	-	-	-	-	-	-	-	0.2	-	-	N/A
G LOAD BAY	-	-	-	-	-	-	-	0.2	-	-	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
G STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
G STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 LOBBY01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 LOBBY02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 LOBBY03	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L1. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L1. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 LOBB01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 LOBB02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 LOBB03	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM09	-	-	-	-	-	-	-	0.2	-	-	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
L2 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 VOID	-	-	-	-	-	-	-	0.2	-	-	N/A
L2 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L2. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 BALC04	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 LOBB01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 LOBB02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 LOBB03	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L3. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L3. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 BALC02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 BALC03	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 BALC04	-	-	-	-	-	-	-	0.2	-	-	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
L4 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 LOBB01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 LOBB02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 LOBB03	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 ROOM16	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 VOID01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L4. ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L4. ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 ROOM15	-	-	-	-	-	-	-	0.2	-	-	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
L5 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L5 VOID03	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR03	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 CORR04	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM01	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM03	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM04	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM05	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM06	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM07	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM08	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM09	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM10	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM11	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM12	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM13	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM14	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 ROOM15	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 VOID02	-	-	-	-	-	-	-	0.2	-	-	N/A
L6 VOID03	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 BOH01	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 CORR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 CORR02	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 ROOFBAR	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 STAIR01	-	-	-	-	-	-	-	0.2	-	-	N/A
L7 STAIR02	-	-	-	-	-	-	-	0.2	-	-	N/A

"LENI calculation for lighting energy provided in a separate submission."

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?
B1 CINE LO	N/A	N/A
B1 CINE ST	N/A	N/A
G LOBBY01	NO (-63.4%)	NO
G LOBBY03	N/A	N/A
G POP-UP	NO (-66.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
G RESTAU	NO (-65.7%)	NO
B1 FIRE C	N/A	N/A
B1 PROJ01	N/A	N/A
B1 PROJ02	N/A	N/A
B1 PROJ03	N/A	N/A
B1 PROJ04	N/A	N/A
B3 SPA	N/A	N/A
L1 LOBBY01	N/A	N/A
L1 ROOM03	NO (-85.8%)	YES
L1 ROOM04	N/A	N/A
L1 ROOM05	N/A	N/A
L1 ROOM06	N/A	N/A
L1 ROOM07	N/A	N/A
L1 ROOM08	N/A	N/A
L1 ROOM09	N/A	N/A
L1 ROOM10	N/A	N/A
L1 ROOM11	N/A	N/A
L1 ROOM12	N/A	N/A
L1 ROOM13	NO (-76.8%)	YES
L1 ROOM14	N/A	N/A
L1 ROOM15	NO (-74.2%)	YES
L1 ROOM16	N/A	N/A
L1. ROOM01	N/A	N/A
L1. ROOM02	NO (-86.7%)	YES
L2 LOBB01	N/A	N/A
L2 ROOM03	NO (-85.8%)	YES
L2 ROOM04	N/A	N/A
L2 ROOM05	N/A	N/A
L2 ROOM06	N/A	N/A
L2 ROOM07	N/A	N/A
L2 ROOM08	N/A	N/A
L2 ROOM09	N/A	N/A
L2 ROOM10	N/A	N/A
L2 ROOM11	N/A	N/A
L2 ROOM12	N/A	N/A
L2 ROOM13	NO (-79.4%)	YES
L2 ROOM14	N/A	N/A
L2 ROOM15	NO (-74.2%)	YES
L2 ROOM16	N/A	N/A
L2. ROOM01	N/A	N/A
L2. ROOM02	NO (-80.1%)	YES
L3 LOBB01	N/A	N/A
L3 ROOM03	NO (-85.8%)	YES
L3 ROOM04	N/A	N/A
L3 ROOM05	N/A	N/A
L3 ROOM06	N/A	N/A
L3 ROOM07	N/A	N/A
L3 ROOM08	N/A	N/A
L3 ROOM09	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L3 ROOM10	N/A	N/A
L3 ROOM11	N/A	N/A
L3 ROOM12	N/A	N/A
L3 ROOM13	NO (-73%)	YES
L3 ROOM14	N/A	N/A
L3 ROOM15	NO (-74.2%)	YES
L3 ROOM16	N/A	N/A
L3. ROOM01	N/A	N/A
L3. ROOM02	NO (-80.1%)	YES
L4 LOBB01	N/A	N/A
L4 ROOM03	NO (-85.8%)	YES
L4 ROOM04	N/A	N/A
L4 ROOM05	N/A	N/A
L4 ROOM06	N/A	N/A
L4 ROOM07	N/A	N/A
L4 ROOM08	N/A	N/A
L4 ROOM09	N/A	N/A
L4 ROOM10	N/A	N/A
L4 ROOM11	N/A	N/A
L4 ROOM12	N/A	N/A
L4 ROOM13	NO (-82.3%)	YES
L4 ROOM14	N/A	N/A
L4 ROOM15	NO (-74.2%)	YES
L4 ROOM16	N/A	N/A
L4. ROOM01	N/A	N/A
L4. ROOM02	NO (-80.1%)	YES
L5 ROOM01	N/A	N/A
L5 ROOM02	NO (-67.7%)	YES
L5 ROOM03	NO (-53.1%)	YES
L5 ROOM04	NO (-65.1%)	YES
L5 ROOM05	NO (-65.1%)	YES
L5 ROOM06	NO (-65.1%)	YES
L5 ROOM07	NO (-65.1%)	YES
L5 ROOM08	NO (-65.1%)	YES
L5 ROOM09	NO (-65.1%)	YES
L5 ROOM10	YES (+34.4%)	YES
L5 ROOM11	YES (+34.4%)	YES
L5 ROOM12	NO (-31.4%)	YES
L5 ROOM13	NO (-95.8%)	YES
L5 ROOM14	NO (-81.5%)	YES
L5 ROOM15	NO (-83.2%)	YES
L5 VOID02	N/A	N/A
L5 VOID03	YES (+1.6%)	NO
L6 ROOM01	N/A	N/A
L6 ROOM02	NO (-67.6%)	YES
L6 ROOM03	NO (-66.5%)	YES
L6 ROOM04	NO (-61.4%)	YES
L6 ROOM05	NO (-60.3%)	NO
L6 ROOM06	NO (-61.4%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L6 ROOM07	NO (-61.2%)	YES
L6 ROOM08	NO (-61.4%)	YES
L6 ROOM09	NO (-61.4%)	YES
L6 ROOM10	YES (+48.7%)	YES
L6 ROOM11	YES (+48.7%)	YES
L6 ROOM12	NO (-10.9%)	YES
L6 ROOM13	NO (-59.7%)	YES
L6 ROOM14	NO (-71.2%)	YES
L6 ROOM15	NO (-71.3%)	YES
L6 VOID02	N/A	N/A
L6 VOID03	YES (+12%)	NO
L7 ROOFBAR	YES (+185.9%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the 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?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	6682	6682
External area [m²]	4382.8	4382.8
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	2535.2	2859.65
Average U-value [W/m²K]	0.58	0.65
Alpha value* [%]	16.93	17.04

* 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
100	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
	D2 General Assembly and Leisure, Night Clubs and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others - Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	3.96	4.32
Cooling	14.07	11.86
Auxiliary	22.75	27.56
Lighting	21.02	22.14
Hot water	54.29	67.72
Equipment*	61.52	61.52
TOTAL**	**116.09**	**133.61**

* 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/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	260.42	191.56
Primary energy* [kWh/m²]	284.6	328.63
Total emissions [kg/m²]	48.5	55.9

* 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] Constant volume system (variable fresh air rate), [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	2.2	389.8	0.1	30.4	40.5	4.1	3.56	3.75	5.5
Notional	7.5	306.5	0.9	23.6	28.1	2.43	3.6	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity									
Actual	56.4	177.9	4.7	10.8	19.2	3.32	4.57	3.75	5.5
Notional	43.9	123.4	5	9.5	27.5	2.43	3.6	----	----

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-Typ}	U_{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.21	B1 CINE LO Wall 1
Floor	0.2	-	"No heat loss floors"
Roof	0.15	0.15	L4 VOID01 Exposed Roof 1
Windows, roof windows, and rooflights	1.5	1.1	L5 ROOM02 Window 1
Personnel doors	1.5	-	"No external personnel doors"
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-Typ} = Typical individual element U-values [W/(m²K)] U_{i-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	5

SBEM Main Calculation Output Document

Fri Dec 15 17:07:14 2017 v5.2.b.3

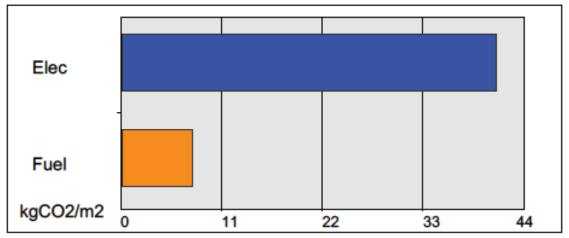
Building name

135-149 Shaftesbury Avenue

Building type: C1 Hotels

SBEM is an energy calculation tool for the purpose of assessing and demonstrating compliance with Building Regulations (Part L for England and Wales, Section 6 for Scotland, Part F for Northern Ireland, Part L for Republic of Ireland and Building Bye-laws Jersey Part 11) and to produce Energy Performance Certificates and Building Energy Ratings. Although the data produced by the tool may be of use in the design process, **SBEM is not intended as a building design tool.**

Building Energy Performance and CO2 emissions

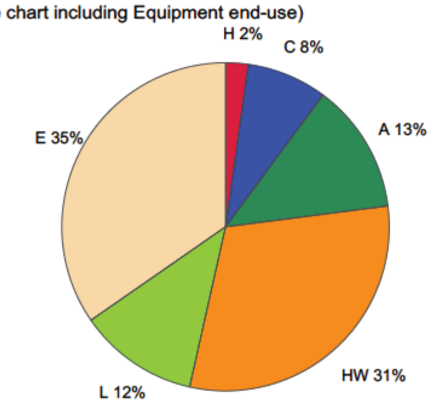


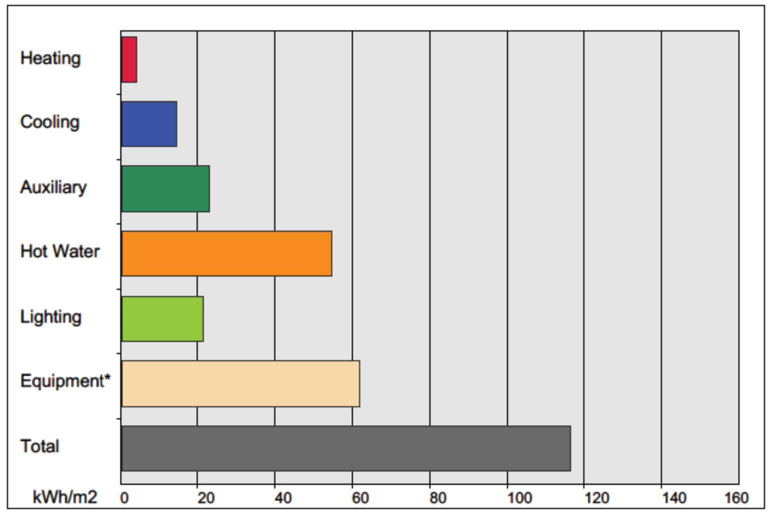
0 kgCO2/m2 displaced by the use of renewable sources.

Building area is 6682.02 m2

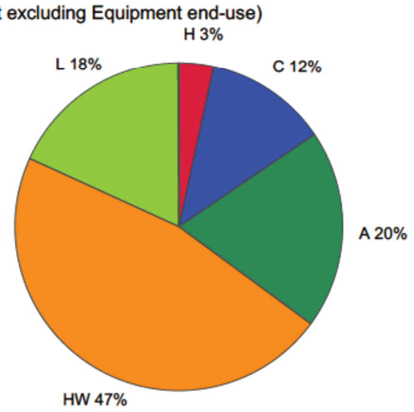
Annual Energy Consumption

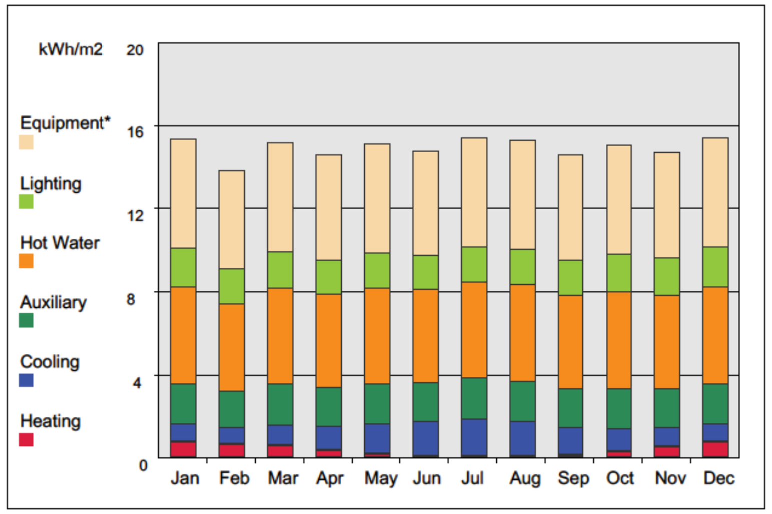
(Pie chart including Equipment end-use)





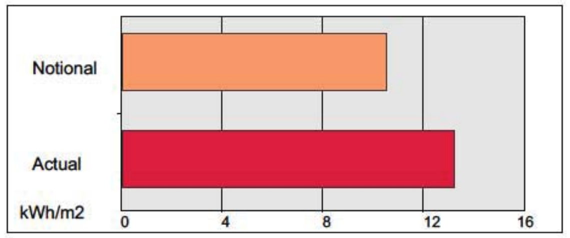
(Pie chart excluding Equipment end-use)

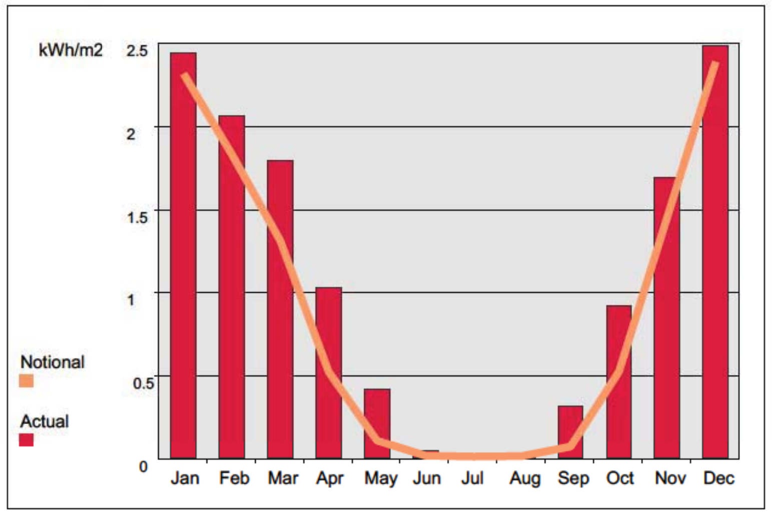




(*) Although energy consumption by equipment is shown in the graphs, the CO2 emissions associated with this end-use have not been taken into account when producing the rating.

Annual Heating Demand





Annual Cooling Demand