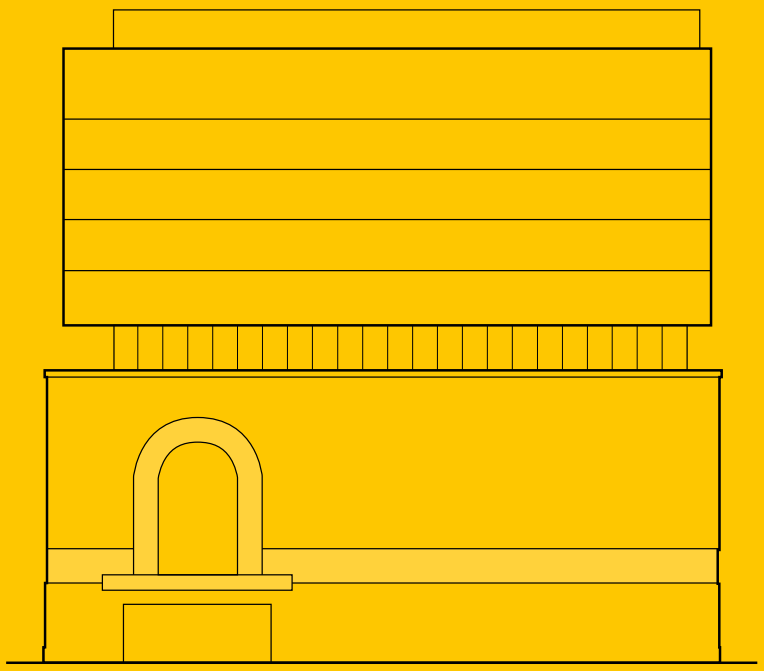

SAVILLE THEATRE

135 SHAFTESBURY AVENUE

ENERGY STRATEGY

HOARE LEA

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	26/01/2024	Issue for planning - DRAFT	E. Ray/J. Young	T. Brown	G. Jones
02	31/01/2024	Issue for planning	J. Young	T. Brown	G. Jones
03	28/02/2024	Issue for planning	S. James	E. Ray	G. Jones
04	01/03/2024	Response to comments prior to submission	C. Dutton	D. Nambiar	G. Jones
05	05/03/2024	Update following comments	S. James	C. Dutton	G. Jones

Project number: 2325236
Document reference: REP-2325236-05-JY-20240124-Saville Theatre Energy Strategy-Rev05.docx

Contents.

Executive summary.

This energy strategy has been prepared by Hoare Lea on behalf of YC Saville Theatre Limited. (hereafter referred to as 'the applicant') in support of the planning application for the development at Saville Theatre mixed-use development at 135-149 Shaftesbury Avenue (hereafter 'the Proposed Development') within the London Borough of Camden.

The proposed development.

The Proposed Development seeks to re-introduce a live performance venue to the Site and introduce a new hotel use on upper floors. The Proposed Development includes a 6-storey extension, plus plant, on top of the existing Building.

The Proposed Development would retain, stabilise, and refurbish the existing grade II listed building. New basement levels will be excavated to accommodate the theatre, with the introduction of retail and theatre lobby, box office and front of house facilities at ground floor level.

The Proposed Development seeks to re-introduce a live performance venue to this Site and introduce a new hotel use on upper floors. The Proposed Development includes a 6-storey extension, plus plant, on top of the existing Building.

The Proposed Development would include part-demolition, part-retention and stabilisation and refurbishment of the existing grade II listed building. New basement levels will be excavated to accommodate the theatre, with the introduction of retail and theatre lobby, box office and front of house facilities at ground floor level.

The Proposed Development would become the first UK-based permanent home of Cirque du Soleil. At upper levels, the affordable luxury boutique hotel would be operated by citizenM.

Table 1: Area schedule.

Space type	Scope of works	Space use	Floor area (GIA)
Non-domestic	New Build	Hotel	3,999 m^2
Non-domestic	New Build	Theatre	2,329 m^2
Non-domestic	Refurbishment	Hotel	2,165 m^2
Total			10,539 m^2 (including ancillary/plant)

Scope of works.

"Part demolition, restoration and refurbishment of the existing Grade II listed building, roof extension, and excavation of basement space, to provide a theatre at lower levels, with ancillary restaurant / bar space (Sui Generis) at ground floor level; and hotel (Class C1) at upper levels; provision of ancillary cycle parking, servicing and rooftop plant, and other associated works."

The proposed works are expected to trigger a requirement to comply with Part L of the Building Regulations and the GLA Energy Assessment Guidance. Due to the sensitivity of the site location Part L 2021 exemptions are a possibility; however, the newly excavated basement theatre space will be assessed as a new build under Part L2 and the upper level hotel assessment will be split into two separate; refurbished areas assessed against the existing building baseline as per GLA Energy Assessment Guidance and the extension assessed as a new build under Part L2.

Applicable policy and regulations.

With respect to energy and carbon performance, this project must comply with the following policies and regulations:

New London Plan (2021)

- Policy SI 2: Major development should minimise annual and peak energy demand according to the energy hierarchy: be lean – be clean – be green – be seen.
- Policy SI 2: Non-residential developments should target 'zero carbon' – i.e., 100% reduction in CO_2 emissions for regulated uses. Of this target, 15% should be from passive measure and a total 35% reduction should be achieved from on-site measures. Any shortfall is expected to be made up by a cash-in-lieu payment.
- Policy SI 3: major development should follow the heating hierarchy when selecting the heat source for the communal heating system:
  - Connect to local existing or planned heat networks
  - Use zero-emission or local secondary heat sources (in conjunction of heat pumps if required)
  - Use low-emission combined heat and power (CHP)
  - Use ultra-low NOx gas boilers
- Policy SI 2 (A) (4) : major developments to monitor and report their energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor's net zero-carbon target

Camden Local Plan (2017)

- Policy CC1: Climate Change mitigation
  - All developments are required to reduce carbon emissions through following the steps in the energy hierarchy.
  - Support and encourage energy efficiency improvements to existing buildings
- Policy CC2:
  - Active cooling (air conditioning) will only be permitted where its need is demonstrated and the steps in the cooling hierarchy are followed.
  - Development is expected to reduce overheating risk through following the steps in the cooling hierarchy. All new development should submit a statement demonstrating how the cooling hierarchy has been followed.
  - BREEAM Excellent is required for all non-residential development of 500sqm or more floorspace.

Camden SPD Energy efficiency and adaptation (2021)

- Policy 1: All developments are expected to reduce carbon emissions by following the energy hierarchy.
- Policy 2: Major residential development to achieve 10%, and non-residential development to achieve 15% reduction (beyond part L Building regulations), in accordance with the new London Plan, through on-site energy efficient measures (Be lean stage).

Building Regulations Part L 2021

- The development will be required to achieve compliance with Building Regulations Part L 2021.

Results summary- Sitewide.

This assessment report demonstrates a betterment over Part L of the Building Regulations, will be achieved for the Proposed Development. The Be Lean scenario shows a reduction of **5.3%** over the Baseline building, designed to Part L standards. This fails to meet the London Plan 2022 Guidance 15% reduction policy using energy efficiency alone, however it still demonstrates a reduction in carbon emissions over the GLA baseline.

The Be Green scenario proposed achieves a **11.9%** reduction in annual regulated carbon emissions when compared to the Part L 2021 baseline. Although this fails to meet the London Plan 2021 Guidance demanding a 35% reduction over Part L 2021 using low or zero carbon technologies and renewables, it still shows a reduction in carbon emissions over the GLA baseline.

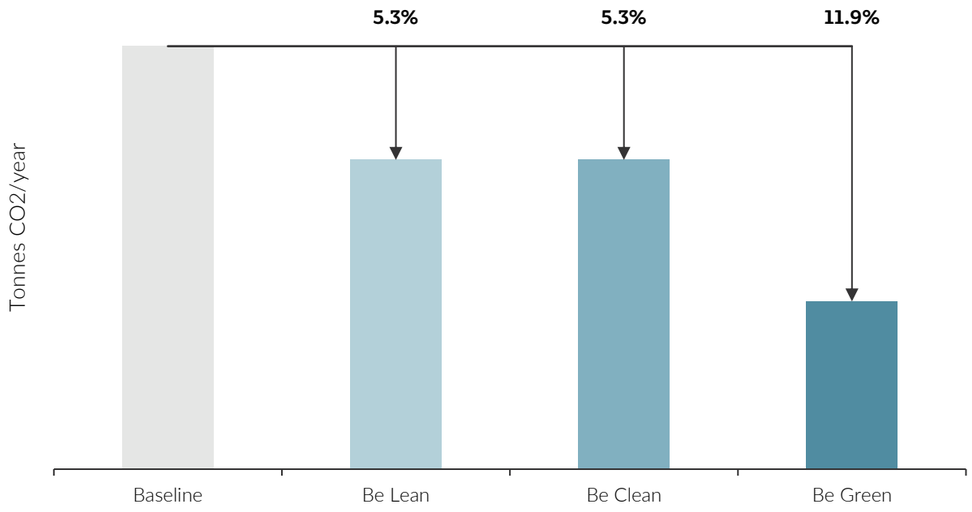

Figure 1: Sitewide carbon reduction summary

Be lean.

Target: 15% carbon reduction	5.3% reduction over baseline Appendix A details the target fabric and system performance parameters.

Be clean.

Target: DHN Connection	5.3% reduction over baseline There are no existing or planned district energy networks within feasible vicinity of the site that would enable a connection the Proposed Development, nor are there currently any feasible future connections planned.

Be green.

Target: 35% carbon reduction	11.9% reduction over baseline Air source heat pumps will provide space heating, cooling, and hot water for the hotel and theatre areas. 160 m^2 solar photovoltaic array proposed at roof level, with 20 m^2 of vertical panels.

Be seen.

Target: disclosure of the development's energy use	GLA's be seen webform submitted as part of this planning application. An updated "as built" be seen webform is to be submitted during RIBA Stage 6. The development will include the necessary metering, energy monitoring and data processes to facilitate the annual reporting requirements.

Results summary- New build
This assessment demonstrates that compliance with the GLA, to provide a betterment over Part L of the Building Regulations, will be not achieved for the new basement theatre and upper-level hotel extension. The Be Lean scenario shows an exceedance of 9.4% over the Baseline building, designed to Part L standards, and as such, fails to meet the London Plan 2021 15% reduction policy using energy efficiency alone.

The new basement theatre and upper-level hotel extension provides a 0.9% reduction in annual regulated carbon emissions at Be Green when compared to the Part L 2021 baseline. Although this fails to meet the London Plan 2021 guidance requiring a 35% reduction over Part L 2021 using low or zero carbon technologies and renewables, it still provides a reduction is carbon emissions over the Part L 2021 baseline.

Table 2 below shows a breakdown of the anticipated carbon reduction for the new build extension hotel.
Table 2: Carbon reduction summary- New Build Hotel.

	Site-Wide Regulated Carbon Dioxide Emission Savings (tonnes CO_2/yr.)	
	Regulated	Unregulated
Baseline: Part L 2021	60.1	3.13
After energy demand reduction (Be Lean)	65.5	3.13
After heat network / CHP (Be Clean)	65.5	3.13
After renewable energy (Be Green)	59.5	3.13
	Site-Wide Regulated domestic carbon dioxide savings	
	(tonnes CO_2/yr.)	(%)
Savings from energy demand reduction	-5.4	-9.0%
Savings from heat network / CHP	0.0	0.0%
Savings from renewable energy	6.0	9.9%
Cumulative on-site savings	0.5	0.9%

Table 3 below shows a breakdown of the anticipated carbon reduction for the new build theatre.

Table 3: Carbon reduction summary- New Build Theatre.

	Site-Wide Regulated Carbon Dioxide Emission Savings (tonnes CO_2/yr.)	
	Regulated	Unregulated
Baseline: Part L 2021	17.2	8.18
After energy demand reduction (Be Lean)	19.0	8.18
After heat network / CHP (Be Clean)	19.0	8.18
After renewable energy (Be Green)	17.0	8.18
	Site-Wide Regulated domestic carbon dioxide savings	
	(tonnes CO_2/yr.)	(%)
Savings from energy demand reduction	-1.8	-10.5%
Savings from heat network / CHP	0.0	0.0%
Savings from renewable energy	2.0	11.5%
Cumulative on-site savings	0.2	1.1%

Results summary- Refurbishment

This assessment report demonstrates that compliance with the GLA to provide a betterment over Part L of the Building Regulations can be achieved for the hotel refurbishment. The Be Lean scenario offers a **22.5%** betterment above the existing building baseline, designed to GLA standards (GLA energy assessment guidance 2022), and as such, meets the London Plan 2021 15% reduction policy at Be Lean.

The hotel refurbishment achieves a **24.7%** reduction in annual regulated carbon emissions at Be Green when compared to the existing building baseline. This fails to meet the London Plan 2021 guidance requiring a 35% reduction over the existing building baseline for refurbishments using low or zero carbon technologies and renewables, but still demonstrates a significant reduction in carbon emissions.

Table 4: Carbon reduction summary- Refurbishment Hotel.

	Site-Wide Regulated Carbon Dioxide Emission Savings (tonnes CO_2/yr.)	
	Regulated	Unregulated
Baseline: Existing building baseline	65.9	3.13
After energy demand reduction (Be Lean)	51.0	3.13
After heat network / CHP (Be Clean)	51.0	3.13
After renewable energy (Be Green)	49.6	3.13
	Site-Wide Regulated domestic carbon dioxide savings	
	(tonnes CO_2/yr.)	(%)
Savings from energy demand reduction	14.8	22.5%
Savings from heat network / CHP	0.0	0.0%
Savings from renewable energy	1.5	2.2%
Cumulative on-site savings	16.3	24.7%

Carbon offset payment.

Target: 100% reduction **£359,576**

Table 5: 1. Sitewide Carbon offset payment calculation

	Regulated carbon dioxide emission savings (tonnes CO_2/yr)	
	Regulated	Unregulated
Baseline	143.2	11.9
After energy demand reduction (be lean)	135.6	11.9
After heat network / CHP (be clean)	135.6	11.9
After renewable energy (be green)	126.2	11.9
	Regulated carbon dioxide savings	
	(tonnes CO_2/yr)	(%)
Savings from energy demand reduction	7.6	5.3%
Savings from heat network / CHP	0.0	0.0%
Savings from renewable energy	9.4	6.6%
Cumulative on-site savings	17.0	11.9%
Total target savings	143.171	100%
Residual emissions	126	88.1%
Local carbon offset price (£/tCO_2)	£95	
Offset period (years)	30	
Total offset payment	£359,576	

Total offset payment = Residual emissions x local carbon offset price x offset period

1. Introduction.

This strategy has been developed on behalf of YC Saville Theatre Limited., hereafter referred to as 'the Applicant'. The following strategy forms part of the full planning application for the proposed non-residential development, the development at Saville Theatre mixed-use development at 135-149 Shaftesbury Avenue hereafter referred to as the Proposed Development.

"Part demolition, restoration and refurbishment of the existing Grade II listed building, roof extension, and excavation of basement space, to provide a theatre at lower levels, with ancillary restaurant / bar space (Sui Generis) at ground floor level; and hotel (Class C1) at upper levels; provision of ancillary cycle parking, servicing and rooftop plant, and other associated works."

1.1 The proposed development

Location: 135-149 Shaftesbury Avenue, London

Local Authority: London Borough of Camden

The Proposed Development seeks to re-introduce a live performance venue to the Site and introduce a new hotel use on upper floors. The Proposed Development includes a 6-storey extension, plus plant, on top of the existing Building.

The Proposed Development would retain, stabilise, and refurbish the existing grade II listed building. New basement levels will be excavated to accommodate the theatre, with the introduction of retail and theatre lobby, box office and front of house facilities at ground floor level.

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The Proposed Development would become the first UK-based permanent home of Cirque du Soleil. At upper levels, the affordable luxury boutique hotel would be operated by citizenM.

1.2 Site description

The former Saville Theatre at 135-149 Shaftesbury Avenue is a grade II listed building. It was built in 1930-1931 as a three-level theatre and opened in 1931. The building was designed by architect T.P Bennett & Son. The building was damaged during the blitz in 1941 but later restored.

In the 1960's, the Theatre was bought by Brian Epstein and opened as a music venue in 1966, hosting artists such as The Who, Jimmi Hendrix and Elton John. After Brian Epstein's death in 1967, The Saville hosted shows created by Cameron Mackintosh.

In 1970, the Building opened as a two-screen ABC Cinema. It was subsequently acquired by Cannon Cinemas as part of a takeover in 1986, which then folded into the MGM chain in 1992. The Site was taken over by Odeon in 2001 as a four-screen cinema, and the layout that is visible today.

The Site is an island site, bordered by Shaftesbury Avenue to the south, St Giles Passage to the east, Stacey Street to the west, and New Compton Street to the south.

The Site is not located within a Conservation Area but abuts the Denmark Street Conservation Area to the north, and the Seven Dials Conservation Area to the south.

The Site has excellent connectivity with a Public Transport Accessibility Level ("PTAL") of 6b, which is the highest possible PTAL score and is defined as 'excellent'. Key transport facilities in the vicinity of the Site include Tottenham Court Road Underground Station, Covent Garden Station and many bus routes.

The Applicant acquired the Site in October 2021. After commissioning a survey of its condition, it was discovered that the Building is currently in a poor state of repair, having suffered from corrosion-related damage (also known as 'Regent Street Disease').

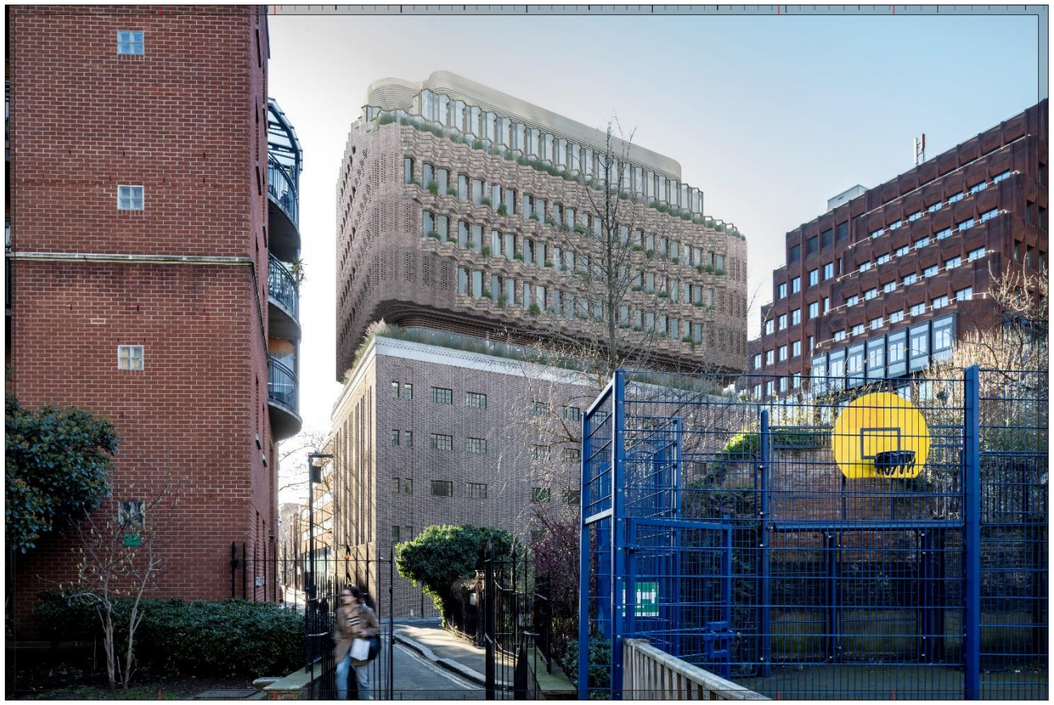

Figure 2: View from Shaftesbury Avenue of Proposed Development. (Source: SPPARC, Date received: 5th March 2024).

1.3 Approach to the strategy

This energy statement proposes recommendations regarding the approach to reducing carbon dioxide (CO_2) emissions and optimising energy efficiency within the development. This strategy summarises the pertinent regulatory and planning policies applicable to the Proposed Development, and sets targets commensurate with these policies, which the Proposed Development will seek to achieve.

The Energy Strategy has been developed using a 'fabric first' approach through the 'be lean', 'be clean', 'be green' energy hierarchy.

Disclaimer

The appraisals within this statement are based on Part L calculation methodology and should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

1.4 National policy.

Building Regulations: Approved Document Part L

Approved Document Part L (2021, England edition), here forward referred to as ADL 2021, is the Building Regulation relating to the conservation of fuel and power in buildings. ADL 2021 has two parts, Part L1 relates to dwellings and Part L2 relates to buildings other than dwellings.

Part L of the Building Regulations is the mechanism by which government is driving reductions in the regulated CO_2 emissions from refurbished, change of use and new buildings. For new non-domestic buildings ADL 2021 has four performance metrics as follows:

- Primary energy target
- CO_2 emissions target
- Minimum standards for fabric and fixed building services

With respect to refurbishments, it is not a requirement to achieve a primary energy target or CO_2 emissions target. Instead, minimum standards are set for upgrading thermal elements, services etc. Energy modelling, to generate a target energy rate or CO_2 emission can be undertaken, to allow for greater design flexibility.

1.5 Local policy.

The following summarises the relevant policies to the application relating to energy and CO_2 emissions.

London Plan (2021)

Table 6: London Plan 2021 policy summary.

London Plan (2021)	
Policy SI 2: Minimising Greenhouse Gas Emissions	Major development should be net zero-carbon – reducing greenhouse gas emissions and energy demand in accordance with the 'Be Lean – Be Clean – Be Green – Be Seen' energy hierarchy. A minimum on-site reduction of at least 35% beyond Building Regulations Part L (2013) Target Emissions Rate (TER). Residential development should achieve 10% and non-residential development should achieve 15% through energy efficiency measures. Any shortfall should be provided through a carbon offset payment to the relevant borough.
Policy SI 3: Energy Infrastructure	Major development within Heat Network Priority Areas should have a communal low-temperature heating system where the heat source for the system is selected in accordance with the following heating hierarchy: a. Connect to local existing or planned heat networks b. Use zero-emission or local secondary heat sources (in conjunction with heat pump if required) c. Use low-emission combined heat and power (CHP) d. Use ultra-low NOx gas boilers
Policy SI 4: Managing Heat Risk	Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. B Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy: 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure 2) minimise internal heat generation through energy efficient design 3) manage the heat within the building through exposed internal thermal mass and high ceilings 4) provide passive ventilation 5) provide mechanical ventilation 6) provide active cooling systems.

Energy Assessment Guidance (June 2022)

The new Energy Assessment Guidance aligns with the London Plan (2021), and provides further guidance on the methodology required to demonstrate compliance with the London Plan (2021).

Table 7: Key policy summary for non-residential developments.

Development type	Energy Hierarchy Stage	Target
New Build elements of the proposed development	All Major Developments	Zero Carbon for regulated emissions against Part L 2021 Baseline (i.e. 100% reduction in carbon emissions)
	Be Green	35% reduction in regulated emissions against Part L 2021 Baseline to be met on-site with remainder to be met via offset payments.

Development type	Energy Hierarchy Stage	Target
	Be Lean	15% reduction in regulated emissions against the Part L 2021 Baseline from energy efficiency measures only (i.e. Be Lean stage reduction)
Refurbishment elements of the proposed development	All Stages	Improvement against a GLA Refurbishment Baseline, based on Energy Assessment Guidance Appendix 3, at each stage of the energy hierarchy. No specific numerical target for improvement but "...every effort should be made to improve the energy performance of the building in line with London Plan carbon targets and to follow the energy hierarchy." (6.25)

1.6 Site-specific policy.

Summary of the key targets and requirements found in the Borough of Camden local policy with regards to energy and sustainability.

Camden Local Plan (2017)

- Policy CC1: Climate Change mitigation
  - All developments are required to reduce carbon emissions through following the steps in the energy hierarchy.
  - Support and encourage energy efficiency improvements to existing buildings
- Policy CC2:
  - Active cooling (air conditioning) will only be permitted where its need is demonstrated and the steps in the cooling hierarchy are followed.
  - Development is expected to reduce overheating risk through following the steps in the cooling hierarchy. All new development should submit a statement demonstrating how the cooling hierarchy has been followed.
  - BREEAM Excellent is required for all non-residential development of 500sqm or more floorspace.

Camden SPD Energy efficiency and adaptation (2021)

- Policy 1: All developments are expected to reduce carbon emissions by following the energy hierarchy.
- Policy 2: Major residential development to achieve 10%, and non-residential development to achieve 15% reduction (beyond part L Building regulations), in accordance with the new London Plan, through on-site energy efficient measures (Be lean stage).

2. Cooling and overheating.

In tandem with the energy and CO_2 emissions appraisal, measures for the minimisation of cooling demand and mitigating risk of overheating have been considered.

2.1 Cooling hierarchy.

The London Plan Policy 5.9 (Overheating and Cooling) requests that developments should reduce potential overheating risk and reliance on air conditioning systems. A 'cooling hierarchy' is provided and the Proposed Development has sought to follow this hierarchy.

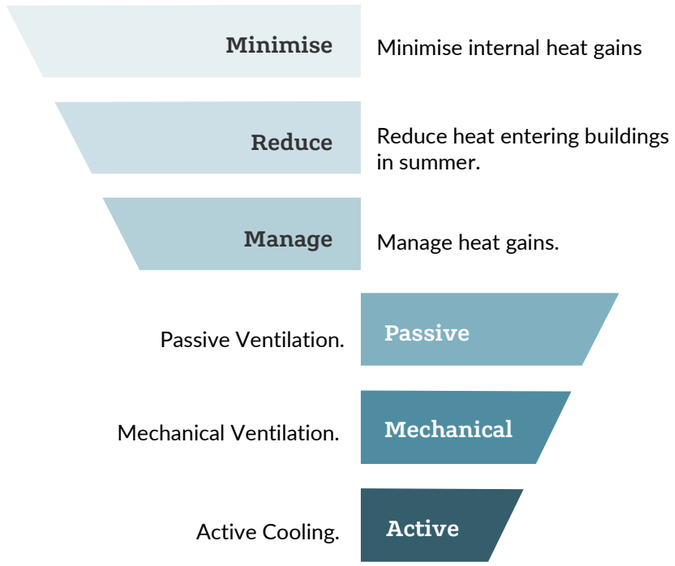

Figure 3: Cooling hierarchy.

2.2 Cooling demand reduction.

The table below compares the cooling energy demand of the actual building against a notional building built to Part L2 parameters, indicating the actual building cooling demand exceeds the notional.

Table 8: Cooling Demand Reduction.

Space Use	Notional building	Actual building
Heating + cooling demand (MJ/m^2)	110	120
Cooling demand	13.50	19.23

2.3 Mitigation strategy.

Minimising internal heat gains
The following mitigation methods will be implemented to minimise the internal heat generation through energy efficient design at the Proposed development:

- Energy efficient lighting (i.e. LED) with low heat output.
- Insulation to heating and hot water pipework and minimisation of dead-legs to avoid standing heat loss.
- Energy efficient equipment with low heat output to reduce unnecessary heat gain.

Reducing the amount of heat entering the building in summer
The following mitigation methods will be implemented to reduce the amount of heat entering the building in summer within the proposed development:

- Facades have been developed with suitable glazing-to-solid ratios, with particular focus on south facing orientations. Glazing ratios for the development are provided in Appendix A.
- Suitable g-values will be specified to further control solar heat gains as required; and
- Buildings will have the capability for internal blinds to be installed to improve occupant comfort.

Manage heat gains
Opportunities to expose thermal mass to help to further regulate internal temperatures will be explored where possible.

Passive ventilation
The potential for passive ventilation via opening facades to facilitate a mixed-mode ventilation strategy has been considered within the facade design and will be evaluated further during the next stage of design.

Mechanical ventilation
Mechanical ventilation is an important element of building services, to maintain good indoor air quality throughout the day by providing fresh air and extracting vitiated air. Providing fresh air minimises the risk of stale and stagnant air and limits the risk of condensation and mould growth as well as benefitting the occupants' physical and mental wellbeing. Heat recovery mechanisms will be provided to save heating energy.

Mechanical ventilation plant will be located away from pollution sources, typically at roof level. It is anticipated that the design flow rates specified will aid the regulation of internal temperatures in summer months.

Active cooling
As the final step active cooling is specified, in order to keep internal temperatures within acceptable limits. The façade and building services have the ability to enable a fan coil unit cooling solution.

3. Be lean.

Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the proposed development. This energy strategy aims reduce the energy demand initially by optimising the envelope and building services within the development

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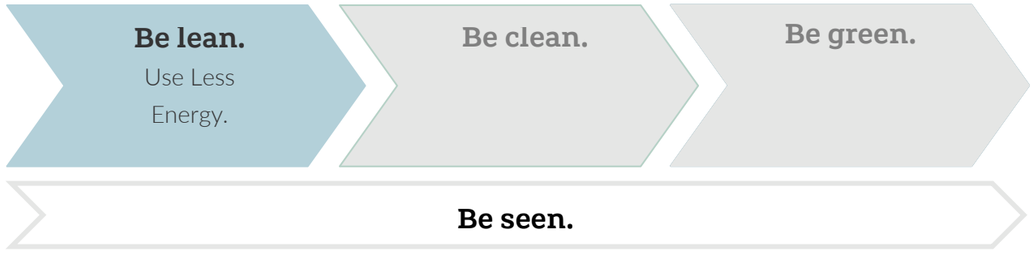


3.1 Passive design and energy efficiency features.

Passive design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.

These are the most robust and effective measures for reducing CO_2 emissions as the performance of the solutions, such as wall insulation, is unlikely to deteriorate significantly with time, or be subject to change by future property owners. In this sense, it is possible to have confidence that the benefits these measures will continue at a similar level for the duration of their installation.

Table 9: Proposed fabric performance.

Parameter	Value	
	New build	Refurbishment
Fabric Air Permeability ($m^3/m^2.h$ at 50Pa)	3.00	5.00
External Wall U-value (Existing) ($W/m^2.K$)	0.16	0.18
Curtain Wall U-value (Extension) ($W/m^2.K$) (including glazed element, framing and thermal bridging)	1.40	N/A
High-usage entrance door U-value ($W/m^2.K$)	2.50	2.50
Ground Floor U-value ($W/m^2.K$)	0.13	0.18
Roof U-value ($W/m^2.K$)	0.12	0.18
Glazing U-value ($W/m^2.K$) (glazed door / windows)	N/A	1.60
Rooflight U-value ($W/m^2.K$)	1.60	N/A
Personnel Door U-value (W/m^2K)	1.60	1.60
Glazing performance		
Vision Glazing g-value (Light Transmittance)	0.40 (71%)	0.50 (71%)
Roof light Glazing g-value (Light Transmittance)	0.40 (71%)	N/A

Table 10: Proposed system parameters

System parameters	
Ventilation	Mechanical ventilation with heat recovery Heat recovery efficiency: 74.7% - 90% dependant on space type System specific fan power: 1.60 W/(l/s)
Lighting	All low energy LED lighting Hotel Installed Power Density: 100 lm/W Theatre Installed Power Density: 100 lm/W Lighting Controls: Auto on-off with daylight dimming in perimeter areas.

Full simulation inputs depicting the Proposed Development at the be lean stage are provided in Appendix A.

The Part L 2021 results are in line with the GLA position that non-domestic buildings are likely to find the 15% carbon reduction challenging when assessed under Part L 2021, until such time as technology improves.

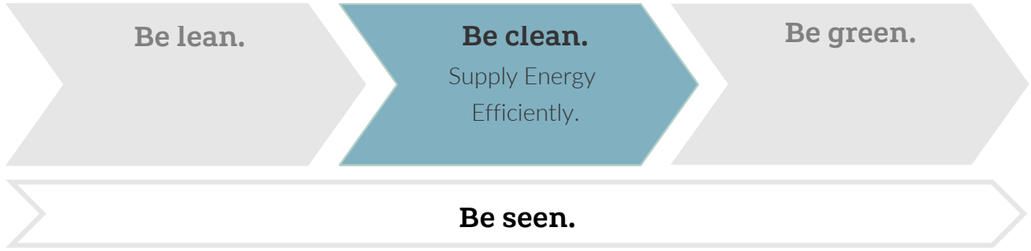
The GLA guidance states that in the intervening period, applicants should continue to aim to maximise carbon reductions from passive measure as far as possible. This has been demonstrably achieved at the Proposed Development, which has followed the energy hierarchy and exhausted all feasible and practical passive design measures.

Be lean summary.

New Build			
	Theatre Extension	Hotel Extension	Overall extension
Target: 15% carbon reduction	10.5% exceedance over baseline	9.0% exceedance over baseline	9.4% exceedance over baseline
Refurbishment			
Target: 15% carbon reduction	22.5% reduction over baseline		
Sitewide			
Target: 15% carbon reduction	**5.3% reduction over baseline**		
Appendix A details the target fabric and system performance parameters.			

4. Be clean.

This stage of the energy hierarchy includes consideration of connection to available district heat networks, or the use of on-site heat networks and decentralised energy production such as Combined Heat and Power (CHP) in order to provide energy and reducing consumption from the national grid and gas networks, through the generation of electricity, heating and cooling on-site.



4.1 Be clean: network and technologies.

The following sections detail considerations of the infrastructure and low-carbon energy supply measures that have been considered.

Combined heat and power (CHP)

Changes to the carbon factor of grid electricity have meant that previously favoured systems such as Combined Heat and Power (CHP) are becoming much less carbon efficient. In fact, CHP systems are now expected to lead to greater carbon emissions than conventional gas-fired boilers due to their lower efficiency.

Due to the decarbonisation of the electricity grid, alongside air quality concerns, CHP is not proposed.

Decentralised heat networks

Heat Network Priority Area (HNPA)

The majority of central London is identified as a Heat Network Priority Area, i.e., areas where heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers.

The proposed development is located within an area of moderate heat density[1]

Existing heat networks

The London Heat Map highlights there are no existing or proposed heat networks within the area surrounding the proposed development. The nearest heat network or proposed heat network is 1.7kms away.

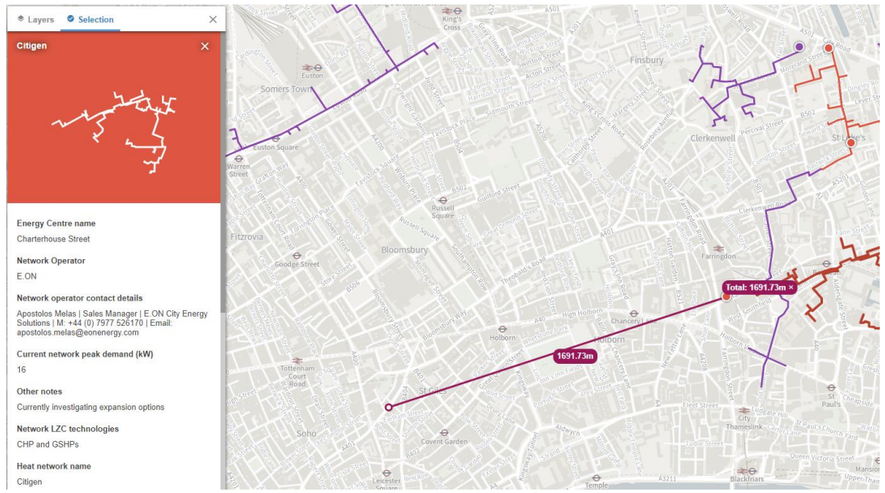


Figure 4: Extract from the London Heat Map

The Citigen network currently operates off CHP and GSHPs which would likely demonstrate an increase in emissions over the ASHP led strategy.

Safeguarded routes from the site boundary to the future location of heat exchanger equipment (facilitating connection to the building heating system) has been included in the design.

Full simulation inputs depicting the Proposed Development at the be clean stage are provided in Appendix A.

Decentralised heat networks summary

Table 11: Heat network summary

Development in a Heat Network Priority Area (HNPA)	Yes, moderate
District Heating Network connection	Not available
Borough energy officer and Heat Network Operator contacted	Not available
Development future proofed for DHN connection	See Appendix C
Drawings of communal system provided	See Appendix C

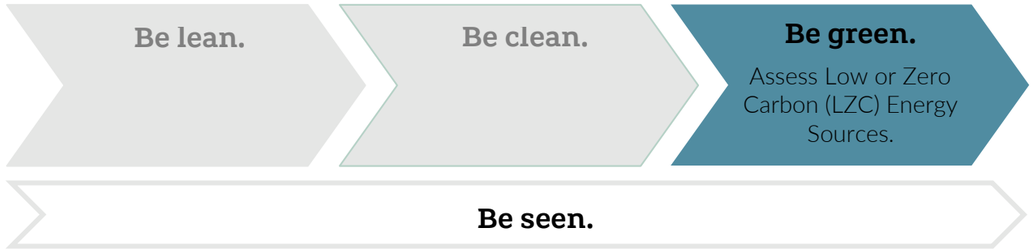
Be clean summary.

Target: DHN Connection	5.3% exceedance over baseline There are no existing or planned district energy networks within feasible vicinity of the site that would enable a connection to the Proposed Development, nor are there currently any feasible future connections planned

[1] London Heat Map (http://www.londonheatmap.org.uk)

5. Be green.

The final step of the energy hierarchy explores the feasibility of Low and Zero Carbon (LZC) technologies to allow for the production of renewable energy onsite in order to deliver further reduction in carbon emissions.



5.1 Low and zero carbon (LZC) technology assessment.

Renewable or zero carbon technologies harness energy from the environment and convert this to a useful form. Many renewable technologies are available, however, not all of these are commercially viable or suitable for city centre locations.

Discounted Technologies

Ground source heat pumps
Ground Source systems would require extensive below ground works to bury and install the system on site. Given the existing building present at the site, which will be retained, Ground Source Heat Pumps are not considered a feasible option, and are not proposed

Solar thermal
Available roof area is to prioritise solar PVs, since the electrical output from PV panels will be more suitable for implementation with the heat-pump led energy strategy and building energy usage.

Proposed Technologies

Photovoltaics
Solar irradiance analysis on the site has shown a good opportunity for the deployment of solar Photovoltaic technologies for onsite electricity generation.

Table 12: Solar PV specification

	Rooftop PV system	Vertical PV system
Panel Area	160 m^2	20 m^2
Orientation	160° clockwise from North	190° clockwise from North
Inclination	15° inclination from horizontal	90° inclination from horizontal
Module Efficiency	21%	
Array size	TBC kWp	
Predicted Annual output	31,300 kWh	
Layout drawing	See Appendix D	

Air source heat pumps
ASHP plant can be located at roof level and integrated into space heating and hot water systems (albeit with some degree of ancillary top-up heating to raise water temperatures). Implementing heat-pump technology brings the additional benefit of a shift towards combustion-free development, with the associated benefit to local air quality.

Table 13: Air source heat pump specification

	Air source heat pump	
	Theatre FOH and BOH	Hotel FOH and Guestrooms
Capacity	250 kW heating & 570kW Cooling	250 kW heating, 600 kW Cooling & 450 kW Hot Water
SCOP	3.31	3.78
SEER	5.52	4.09
Heating Flow / Return Temperature °C	50/45	50/45
Cooling Flow / Return Temperature °C	7/14	7/14
Manufacture's Specification & Efficiencies	Not yet confirmed	Not yet confirmed

Heat Fraction

Table 14: Heat fraction

	% Heat fraction (space heating and DHW)
ASHP	100%
Direct electric / POU water heaters	0%
District heat network	0%
Gas boiler	0%
Other	0%

Full simulation inputs depicting the Proposed Development at the be clean stage are provided in Appendix A.

The Part L 2021 results are in line with the GLA position that non-domestic buildings are likely to find the 35% carbon reduction challenging when assessed under Part L 2021, until such time as technology improves and costs decrease.

GLA guidance states that in the intervening period, applicants should continue to aim to maximise on-site carbon reductions as far as possible. This has been demonstrably achieved at the Proposed Development, which has followed the energy hierarchy and exhausted all feasible and practical passive and active design measures to maximise carbon reductions on-site, achieving significant carbon reduction.

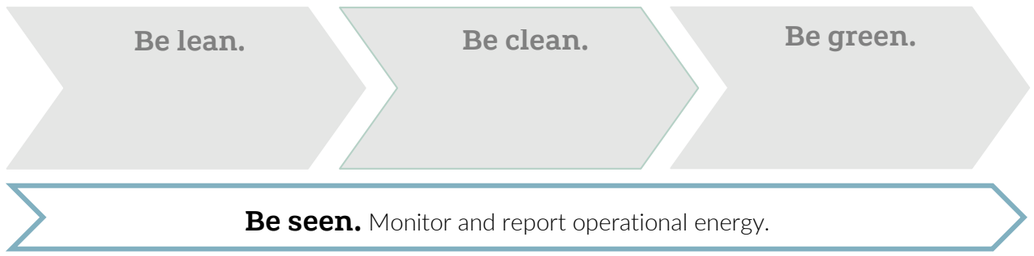
Be green summary.

New Build			
	Theatre Extension	Hotel Extension	Overall extension
Target: 35% carbon reduction	1.1% reduction over baseline	0.9% reduction over baseline	0.9% reduction over baseline
Refurbishment			
Target: 35% carbon reduction	24.7% reduction over baseline		
Sitewide			
Target: 35% carbon reduction	**11.9% reduction over baseline**		

Air source heat pumps will provide space heating, cooling, and hot water.
160 m^2 solar photovoltaic array proposed at roof level, with 20 m^2 of vertical panels.

Appendix A details the target fabric and system performance parameters.

6. Be seen.



6.1 Monitoring and Reporting.

Effective energy metering will be enabled by the provision of suitable infrastructure within the building's services systems.

Sustainability Monitoring and Reporting
YC Saville Theatre Ltd. are committed to reporting sustainability performance, methodology and data every year in a transparent way, following the GRI guidelines. An annual Sustainability Report is published which contains agglomerated data concerning the Energy, Water, Waste and Greenhouse Gases reports of their portfolio.

Development Monitoring and Reporting Plan
The Proposed Development would therefore fall under YC Saville Theatre Ltd's corporate sustainability monitoring and reporting regime. The developed strategy will allow for an exhaustive metering of all the various energy usage in the facility. This will enable Energy Intensity and Carbon Emissions to be monitored, and the data included within the Annual Sustainability Reports.

Electrical meters will be provided on the main central Air Source Heat Pump(s), providing data on plant energy consumption throughout the year.

Each area of high energy load will be sub-metered in order to monitor energy consumption in greater granularity and facilitate reporting. All the main sub-systems (i.e. small power, lighting etc) will be separately monitored and their energy usage separately accounted. Energy intensity and carbon emissions will be monitored and reported annually.

The applicant has also completed the planning stage of the GLA's be seen spreadsheet and at future stages will update the spreadsheet and follow the GLA's suggested be seen energy reporting protocols via the appropriate webs portals once these are available, at the appropriate stage.

6.2 Operational cost.

Operational costs for end users are an important consideration when appraising Energy Strategy options. Focussing solely on carbon emissions can lead to unintended consequences in the form of higher than expected occupant energy bills if capital and operational expenditure of the energy systems and networks are passed on to end users.

The Proposed Development is anticipated to achieve up to **11.9%** reduction in CO_2 emissions beyond the baseline prior to the consideration of any Low or Zero Carbon (LZC) technologies, i.e. via passive design and energy efficiency measures. The savings achieved through the Be Lean stage demonstrate an energy demand reduction that will result in savings for future occupants.

The savings achieved through the be lean stage demonstrate an energy demand reduction that will result in savings for future occupants.

Additionally, the following measures have been implemented or followed to protect occupants from rising energy costs:

- Followed quality standards to ensure optimum design such as CIBSE Code of Practice
- Commercial areas of the scheme will target BREEAM Man 05 Aftercare credit to ensure all systems are correctly commissioned and training undertaken for occupant.
- Inclusion of solar PV to reduce dependence in grid electricity.

The be seen spreadsheet will be updated at each stage of the design, construction and operation in line with GLA guidance.

Unregulated Energy
Unregulated energy includes small power electricity use (computers, plug in devices, washing machines, refrigeration) and catering energy consumption.

It is anticipated that the proportion of unregulated energy would gain in significance when compared to regulated energy as each revision of Building Regulations Part L comes into force and regulated energy is reduced.

It is therefore foreseeable that energy efficiency and the rising cost of energy would play an increasing role when future building users are deciding which appliances to purchase and the frequency of their use. However, it is not possible at present to quantify the extent of this potential reduction.

Given the uncertainty, measures to educate the future building users on how they can reduce their equipment energy use would be encouraged. This can be provided in the form of building user guides fit-out guides. The guidance measures detailed within these types of documents would consider:

- Use of A / A+ rated white goods
- Energy star rated computers and flat screen monitors, and voltage optimization and power factor correction.

Figure 5: Regulated Energy and Unregulated Emissions Summary.

Be seen summary.

Target: disclosure of the development's energy use	GLA's be seen webform submitted as part of this planning application. An updated "as built" be seen webform is to be submitted during RIBA Stage 6. The development will include the necessary metering, energy monitoring and data processes to facilitate the annual reporting requirements.

7. Summary.

This strategy has shown that the Proposed Development will result in a highly efficient, low-carbon scheme.

New, high efficiency servicing equipment and efficient façades will minimise the energy usage of the building. Using the Mayor's energy hierarchy, the strategy has been developed to ensure that the Proposed development are efficient and economical.

This strategy has been prepared to demonstrate that at the planning stage, the Applicant and design team have given due consideration to the principles of energy and sustainability, and how these could be implemented for the Proposed Development.

The carbon emissions from regulated energy uses at the proposed development have been compared with the GLA London Plan emissions targets.

7.1 The energy strategy.

The strategy has been developed using the 'be lean, clean and green' energy hierarchy which utilises a fabric first approach to maximise reduction in energy through passive design measures. A summary of the sitewide carbon reduction at each stage of the energy hierarchy is shown below.

Be lean.

Target: 15% carbon reduction	5.3% reduction over baseline Appendix A details the target fabric and system performance parameters.

Be clean.

Target: DHN Connection	5.3% reduction over baseline There are no existing or planned district energy networks within feasible vicinity of the site that would enable a connection to the Proposed Development, nor are there currently any feasible future connections planned.

Be green.

Target: 35% carbon reduction	11.9% reduction over baseline Air source heat pumps will provide space heating, cooling, and hot water for the hotel and theatre areas. 160 m^2 solar photovoltaic array proposed at roof level, with 20 m^2 of vertical panels. The restaurant is expected to connect to the ASHP system.

Be seen.

Target: disclosure of the development's energy use	GLA's be seen webform submitted as part of this planning application. An updated "as built" be seen webform is to be submitted during RIBA Stage 6. The development will include the necessary metering, energy monitoring and data processes to facilitate the annual reporting requirements.

Carbon offset payment.

Target: 100% reduction	£359,576

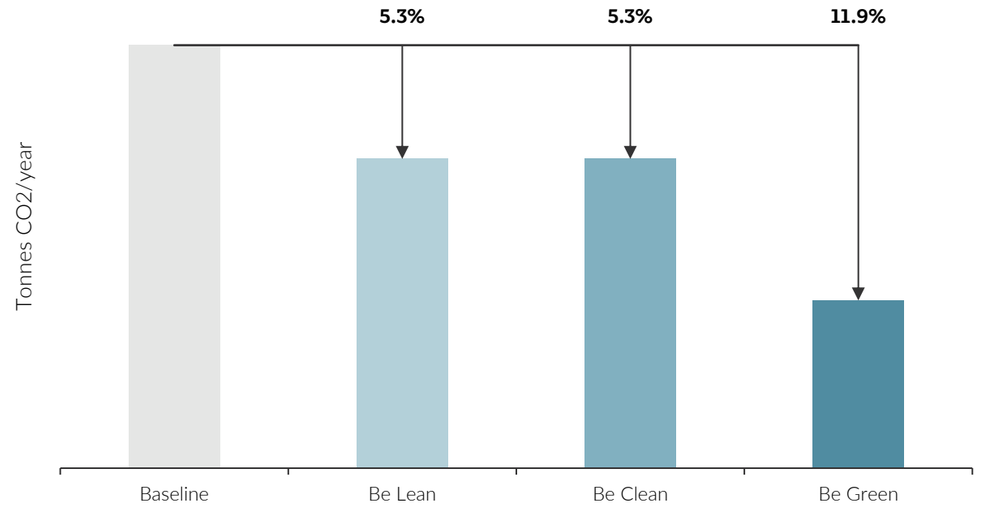


Figure 6: Carbon reduction summary- Sitewide.

The Part L 2021 results are in line with the GLA position that non-domestic buildings are likely to find the 35% carbon reduction challenging when assessed under Part L 2021, until such time as technology improves and costs decrease.

GLA guidance states that in the intervening period, applicants should continue to aim to maximise on-site carbon reductions as far as possible. This has been demonstrably achieved at the Proposed Development, which has followed the energy hierarchy and exhausted all feasible and practical passive and active design measures to maximise carbon reductions on-site, achieving significant carbon reduction.

7.2 Carbon offset payment.

Table 15: GLA reporting Carbon offset payment.

	Regulated carbon dioxide emission savings (tonnes CO_2/yr)	
	Regulated	Unregulated
Baseline	143.2	
After energy demand reduction (be lean)	133.7	
After heat network / CHP (be clean)	133.7	
After renewable energy (be green)	126.2	
	Regulated carbon dioxide savings	
	(tonnes CO_2/yr)	(%)
Savings from energy demand reduction	9.5	6.6%
Savings from heat network / CHP	0.0	0.0%
Savings from renewable energy	7.5	5.3%
Cumulative on-site savings	17.0	11.9%
Total target savings	143.171	100%
Annual surplus / shortfall	126	88.1%
Carbon offset payment rate (£/tCO_2) (30 year)	£2,850	
Total offset payment (30 year)	£359,576	

7.3 Energy use intensity and space heating demand.

Table 16: GLA reporting 1.1 Energy use intensity and space heating demand.

Building type	EUI kWh/m²/yr Excluding renewables	Space heating demand kWh/m²/yr Excluding renewables	Methodology
Hotel	181.51	12.00	TM54
Theatre	404.21	67.44	TM54
Notes			

7.4 Flexibility and peak energy demand.

Table 17: GLA reporting peak energy demand.

	Electrical*	Heat**	Comment
Estimate peak demand MW	1-1.5 MW estimated	1.5MW	Estimate of peak demand from initial load calculations. This will be reviewed with UKPN and refined at the next design stage.
Available capacity MW	TBC	0	We are currently reviewing with UKPN. Nearest heat network around 1.7km away from the site with no plans to bring a connection closer.
Flexibility*** potential MW	38,000 kWh/year	0	Approximately 40kWp solar PV array proposed.
Revised peak demand MW			
Predicted flexibility %			
Storage capacity kWh			
*Including heat provided by electricity **From district heating, gas or other sources ***Demand side flexibility refers to the ability of a system to reduce or increase energy consumption for a period of time in response			

Table 18: GLA reporting energy flexibility.

Flexibility	Included Y/N	Details
Renewable energy generation (load matching)	Yes	Solar PV array connected to the building electrical supplies
Gateway to enable automated demand response	No	Not included.
Smart systems integration (e.g. smart charge points for EV, gateway etc.)	No	Not applicable as no car parking within the development.
Other initiative		

Appendix A: Modelling inputs.

Glazing ratios.

Table 19: Glazing ratios.

Elevation	Total area m^2	Solid area m^2	Solid area %	Glazed area m^2	Glazed area %
North	957	458	48%	499	52%
East	763	417	55%	346	45%
South	619	574	93%	45	7%
West	781	436	56%	345	44%
Overall	3,120	1,885	60%	1,235	40%

Table 20: Fabric Performance.

Parameter	Value	
	New build	Refurbishment
Fabric Air Permeability (m^3/m^2.h at 50Pa)	3.00	5.00
External Wall U-value (Existing) (W/m^2.K)	0.16	0.18
Curtain Wall U-value (Extension) (W/m^2.K) (including glazed element, framing and thermal bridging)	1.40	N/A
High-usage entrance door U-value (W/m^2.K)	2.50	2.50
Ground Floor U-value (W/m^2.K)	0.13	0.18
Roof U-value (W/m^2.K)	0.12	0.18
Glazing U-value (W/m^2.K) (glazed door / windows)	N/A	1.60
Rooflight U-value (W/m^2.K)	1.60	N/A
Personnel Door U-value (W/m^2K)	1.60	1.60
Glazing performance		
Vision Glazing g-value (Light Transmittance)	0.40 (71%)	0.50 (71%)
Roof light Glazing g-value (Light Transmittance)	0.40 (71%)	N/A

A.1: Be lean.

Table 21: Summary of building services parameters (Be Lean).

Service	Theatre	Hotel
Heating	Heating – Generator: ASHP – SCOP: 2.64 (Notional efficiency) – Emitters: As in Be Green table.	Heating – Generator: ASHP – SCOP: 2.64 (Notional efficiency) – Emitters: As in Be Green table.
Domestic hot water	Theatre FOH, BOH, Restaurant – Generator: Electric point of use – SCOP: 1.00 – Cylinder store: 200 L – Storage losses: 0.93 kWh/24h Theatre Reheat Kitchen – Generator: ASHP – SCOP: 2.86 – Cylinder store: 500 L – Storage losses: 60mm jacket	Hotel Guestrooms – Generator: Centralised CO_2 heat pump – SCOP: 2.86 – Cylinder store: 33,000 L – Storage losses: 170 kWh/24h – Secondary circulation: 2400 m – Storage losses: 8 W/m Hotel FOH – Generator: Electric point of use – SCOP: 1.00 – Cylinder store: 400 L – Storage losses: 0.93 kWh/24h Pantry – Generator: ASHP – SCOP: 2.86 – Cylinder store: 500 L – Storage losses: 60mm jacket

A.2: Be clean.

N/A- Modelling inputs as per Be Lean

A.3: Be green.

Table 22: Summary of proposed building services parameters.

Service	Theatre	Hotel
Front of house	Heating – Generator: ASHP – SCOP: 3.31 – Emitters: Heating coils in terminal ductwork Cooling – Generator: ASHP – SEER: 5.52 – Emitters: Cooling coils in terminal ductwork Ventilation system – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.8 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 74.7%	Heating – Generator: ASHP – SCOP: 3.78 – Emitters: Induction Unit Cooling – Generator: ASHP – SEER: 4.09 – Emitters: Heating coils in terminal ductwork Ventilation system – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.80 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 90.0%
Back of house	Heating – Generator: ASHP – SCOP: 3.31 – Emitters: Cooling coils in terminal ductwork	Heating – Generator: ASHP – SCOP: 3.78 – Emitters: Fan coil units

Service	Theatre	Hotel
	Cooling – Generator: ASHP – SEER: 5.52 – Emitters: Cooling coils in terminal ductwork **Ventilation system** – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.80 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 74.7%	**Cooling** – Generator: ASHP – SEER: 4.09 – Emitters: Fan Coil Unit **Ventilation system** – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.50 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 85.0%
Restaurant	**Heating** – Generator: ASHP – SCOP: 3.31 – Emitters: Fan coil units **Cooling** – Generator: ASHP – SEER: 5.52 – Emitters: Fan coil units **Ventilation system** – Ventilation system type: MVHR – System level SFP: 0.47 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 80.5%	N/A
Theatre Reheat Kitchen	**Heating** – Generator: ASHP – SCOP: 3.31 – Emitters: Heating coils in terminal ductwork **Cooling** – Generator: ASHP – SEER: 5.52 – Emitters: Cooling coils in terminal ductwork **Ventilation system** – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.44 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 85%	N/A
Hotel guestroom		**Heating** – Generator: ASHP – SCOP: 3.78 – Emitters: Induction units **Cooling** – Generator: ASHP – SEER: 4.09

Service	Theatre	Hotel
		– Emitters: Induction units **Ventilation system** – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.80 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 90%
Plant	**Heating** – N/A **Cooling** – N/A **Ventilation system** – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.50 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 85%	**Heating** – N/A **Cooling** – N/A **Ventilation system** – Ventilation system type: Centralised balance supply & extract – System level SFP: 1.50 W/l/s – Heat recovery system: Rotary – Heat recovery efficiency: 85%
Domestic hot water	**Theatre FOH, BOH, Restaurant** – Generator: Electric point of use – SCOP: 1.00 – Cylinder store: 200 L – Storage losses: 0.93 kWh/24h **Theatre Reheat Kitchen** – Generator: ASHP – SCOP: 3.00 – Cylinder store: 500 L – Storage losses: 60mm jacket	**Hotel Guestrooms** – Generator: Centralised CO_2 heat pump – SCOP: 3.00 – Cylinder store: 33,000 L – Storage losses: 170 kWh/24h – Secondary circulation: 2400 m – Storage losses: 8 W/m **Hotel FOH** – Generator: Electric point of use – SCOP: 1.00 – Cylinder store: 400 L – Storage losses: 0.93 kWh/24h **Pantry** – Generator: ASHP – SCOP: 3.00 – Cylinder store: 500 L – Insulation: 60mm jacket
Lighting	**Lighting power density/efficacy** – General lighting efficacy/Power density: 100 lm/W	**Lighting power density/efficacy** – General lighting efficacy/Power density: 100 lm/W
Lighting controls	**Theatre FOH & BOH** – Lighting controls: Absence Control, dimming – Parasitic power: 0.1 **Restaurant** – Lighting controls: Daylight Control, dimming – Parasitic power: 0.1	**Hotel Guestrooms** – Lighting controls: Manual dimming – Parasitic power: 0.1 **Hotel FOH** – Lighting controls: Daylight and Absence Control – Parasitic power: 0.1 **Plant** – Lighting controls: Manual switching and Absence Control

Service	Theatre	Hotel
		– Parasitic power: 0.1 Hotel BOH – Lighting controls: Absence Control – Parasitic power: 0.1
Renewables	90 m^2 rooftop PV allocated	70 m^2 rooftop PV allocated to the hotel new build. 20 m^2 vertical PV allocated to the hotel new build. No PV has been allocated to the hotel refurbishment.

Existing Building baseline

The existing building baseline has been developed inline with the GLA energy assessment guidance. This has been used as the baseline for the assessment of the hotel refurbishment.

Element	Unit	Specification[1]
External Wall (cavity insulation)	W/m²K	0.55
External Wall (external or internal insulation)	W/m²K	0.30
Roof (flat roof)	W/m²K	0.18
Roof (pitched roof)	W/m²K	0.16
Floor	W/m²K	0.25
Glazing	W/m²K	1.40
Vision element	g-value	0.40
Air permeability	(m^3/h m^2 @ 50 Pa)	1. Less than 10 – only with an accredited air pressure test result 2. 10 – buildings > 500 m^2 built to 2002 Building Regulations (or later) 3. 15 – buildings <= 500 m^2 built to 2002 Building Regulations (or later) 4. 15 – Buildings built to 1995 Building Regulations 5. 25 – buildings built to Building Regulations pre 1995
Thermal Bridging	W/m²K	Default
HVAC System	Type	As per final building specification
Heating and Hot Water	Per cent	Efficiencies to match the applicable notional values for existing buildings (see tables 6.2, 6.4, 6.5 & 6.8 in Approved Document L2)
Cooling (air-condition)[2]	SEER	6. As per final building specification. Seasonal energy efficiency ratio (SEER) to match the applicable notional values for existing buildings (see table 6.9 in Approved Document L2)
Central ventilation SFP	W/l/s	Specific fan power to match the applicable notional values for existing buildings (see table 6.9 in Approved Document L2)
Terminal Unit SFP	W/l/s	Specific fan power to match the applicable notional values for existing buildings (see table 6.9 in Approved Document L2)
Heat Recovery	Per cent	70 per cent
Lighting	Lm/Watt	60

1. For instances where the existing condition of the building is of a higher performance, the actual energy performance of the building element should be used rather than the Notional Specification for Existing Buildings.
2. Only where present in actual building and the cooling hierarchy has been correctly followed

Figure 7;Existing building baseline specification (GLA Energy Assessment Guidance 2022).

Appendix B: District heating network connection.

B.1 – Safeguarded routes

TBC

B.2 – Communal energy system drawing – plantroom schematic and layout

TBC

Appendix C: Heat pump system datasheets and efficiency calculation.

Efficiencies are currently based on indicative rates, specific system datasheets are not available at present. These will be provided during the next stage of design development.

Appendix D: Solar photovoltaic layout.

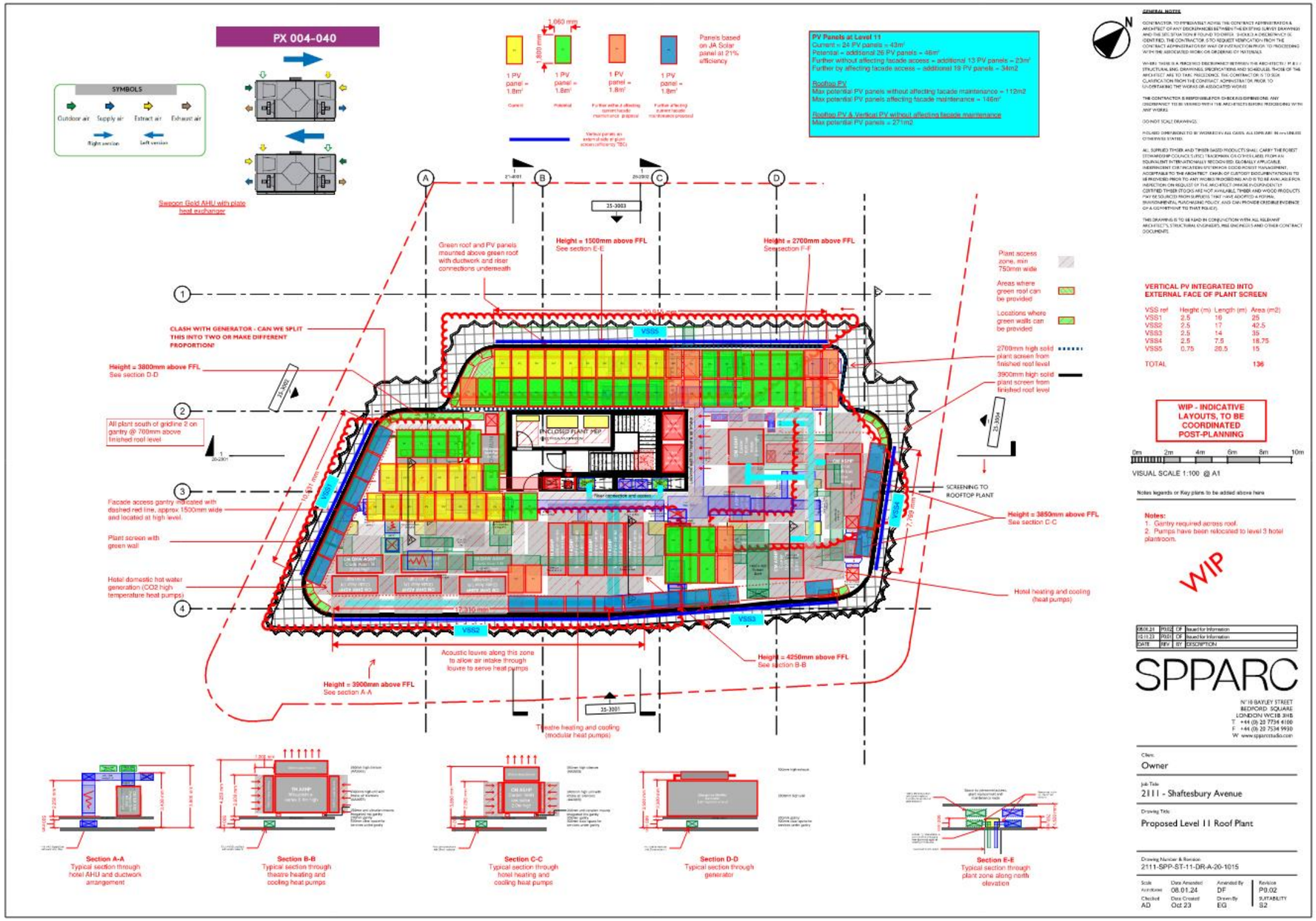


Figure 8: WIP Indicative PV markup at Level 11.

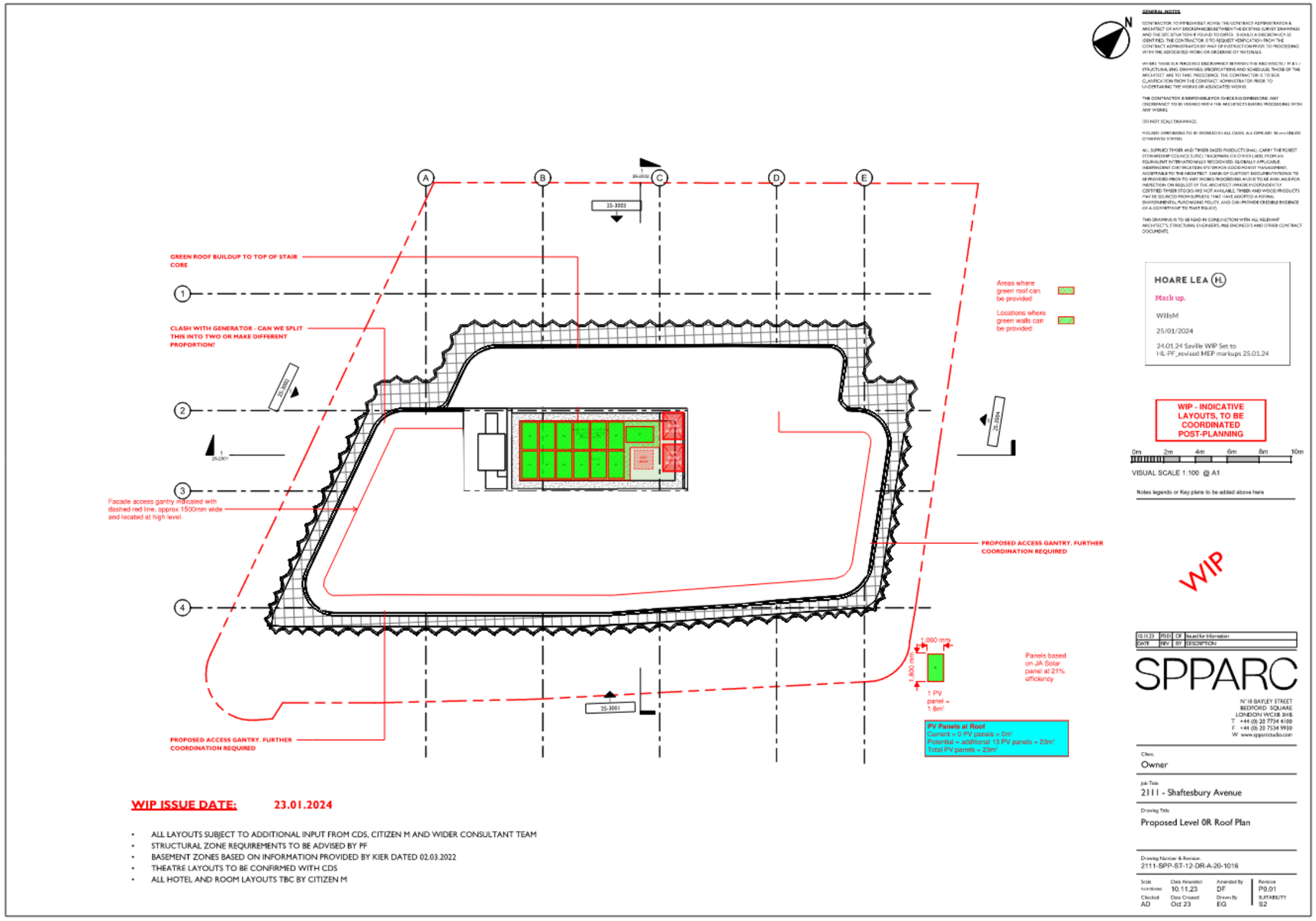


Figure 9: WIP Indicative PV markup on external roof plant.

Appendix E: BRUKLs.

New build – hotel.

Be Lean.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Hotel Extension - Be Lean As designed

Date: Tue Feb 27 13:10:11 2024

Administrative information

Building Details

Address: London, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Foundation area [m²]: 679.67

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	14.29	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	15.58	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	154.97	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	169.14	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	L00000FD:Surf[1]
Floors	0.18	0.13	0.13	L0000106:Surf[3]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	L0000106:Surf[5]
Windows** and roof windows	1.6	1.2	1.2	L00000FF:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	4205.4	4205.4
External area [m²]	3888.3	3888.3
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	2027.87	1891.12
Average U-value [W/m^2K]	0.52	0.49
Alpha value* [%]	17.42	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
100	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	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	11.14	9.45
Cooling	3.2	1.24
Auxiliary	16.33	18.55
Lighting	10.07	9.4
Hot water	73.65	66.14
Equipment*	16.22	16.22
TOTAL**	**114.39**	**104.78**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	137.26	115.22
Primary energy [kWh_{PE}/m^2]	169.14	154.98
Total emissions [kg/m^2]	15.58	14.29

Be Green.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Hotel Extension - Be Green — As designed

Date: Mon Feb 26 16:22:56 2024

Administrative information

Building Details
Address: London, Postcode

Certifier details
Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Certification tool
Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 679.67

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	14.29	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.16	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	154.97	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	153.77	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.16	L00000FD:Surf[1]
Floors	0.18	0.13	0.13	L0000106:Surf[3]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.12	0.12	L0000106:Surf[5]
Windows** and roof windows	1.6	1.2	1.2	L00000FF:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	-	-	No personnel doors in building
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] — $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m^2K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	4205.4	4205.4
External area [m^2]	3888.3	3888.3
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	2027.87	1891.12
Average U-value [W/m^2K]	0.52	0.49
Alpha value* [%]	17.42	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
100	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	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	7.78	9.45
Cooling	3.2	1.24
Auxiliary	16.33	18.55
Lighting	10.07	9.4
Hot water	70.21	66.14
Equipment*	16.22	16.22
TOTAL**	**107.59**	**104.78**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	3.5	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*3.5*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	137.26	115.22
Primary energy [kWh_{PE}/m^2]	153.77	154.98
Total emissions [kg/m^2]	14.16	14.29

New build – theatre.

Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Theatre - Be Lean — As designed

Date: Fri Feb 23 10:33:41 2024

Administrative information

Building Details

Address: London, Postcode

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 685.93

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2$annum	5.72	
Building CO_2 emission rate (BER), $kgCO_2/m^2$annum	6.32	
Target primary energy rate (TPER), kWh_{PE}/m^2annum	61.59	
Building primary energy rate (BPER), kWh_{PE}/m^2annum	68.15	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{p\text{-}Limit}$	$U_{p\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.18	RS000004:Surf[2]
Floors	0.18	0.13	0.18	RS000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	TH000007:Surf[1]
Windows** and roof windows	1.6	1.6	1.6	RS000006:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	RS000004:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{p\text{-}Limit}$ = Limiting area-weighted average U-values [W/(m²K)] — $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]
$U_{p\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m²K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m²]	3011.3	3011.3
External area [m²]	3485.7	3485.7
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	669.72	765.74
Average U-value [W/m²K]	0.19	0.22
Alpha value* [%]	18.93	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
100	**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	0.68	0.32
Cooling	5.78	6.52
Auxiliary	13.83	9.61
Lighting	10.88	11.47
Hot water	15.23	14.04
Equipment*	85.76	85.76
TOTAL**	**46.41**	**41.96**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	94.64	111.97
Primary energy [kWh_{PE}/m^2]	68.15	61.59
Total emissions [kg/m²]	6.32	5.72

Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Theatre - Be Green — As designed

Date: Fri Feb 23 12:05:52 2024

Administrative information

Building Details
Address: London, Postcode

Certifier details
Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Certification tool
Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 685.93

The CO_2 emission and primary energy rates of the building must not exceed the targets

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	5.72	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	5.66	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	61.59	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	60.58	
Do the building's emission and primary energy rates exceed the targets?	BER =< TER	BPER =< TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.16	0.18	RS000004:Surf[2]
Floors	0.18	0.13	0.18	RS000004:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	TH000007:Surf[1]
Windows** and roof windows	1.6	1.6	1.6	RS000006:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	RS000004:Surf[1]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m^2K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	3011.3	3011.3
External area [m^2]	3485.7	3485.7
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	669.72	765.74
Average U-value [W/m^2K]	0.19	0.22
Alpha value* [%]	18.93	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
	Hotels
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
100	**General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger Terminals
	Others: Emergency Services
	Others: Miscellaneous 24hr Activities
	Others: Car Parks 24 hrs
	Others: Stand Alone Utility Block

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

	Actual	Notional
Heating	0.54	0.32
Cooling	5.78	6.52
Auxiliary	13.83	9.61
Lighting	10.88	11.47
Hot water	15.72	14.04
Equipment*	85.76	85.76
TOTAL**	**46.76**	**41.96**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	5.5	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*5.5*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	94.64	111.97
Primary energy [kWh_{PE}/m^2]	60.58	61.59
Total emissions [kg/m^2]	5.66	5.72

Refurbishment – hotel.

Existing baseline

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Hotel Refurb - Existing Baseline Rev02 — As designed

Date: Wed Feb 21 13:02:14 2024

Administrative information

Building Details
Address: London, Postcode

Certifier details
Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Certification tool
Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Foundation area [m^2]: 622.71

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	12.37	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	22.99	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	134.98	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	250.59	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.3	0.3	RS000001:Surf[1]
Floors	0.18	0.25	0.25	RS000014:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	L0000099:Surf[0]
Windows** and roof windows	1.6	1.41	1.6	L00002B0:Surf[3]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	RS000001:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m^2K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	25

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2945.5	2945.5
External area [m^2]	1795.9	1795.9
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	25	3
Average conductance [W/K]	832.87	928.95
Average U-value [W/m^2K]	0.46	0.52
Alpha value* [%]	25.69	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
99	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
1	**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	5.15	2.07
Cooling	4.41	3.92
Auxiliary	18.14	13.36
Lighting	13.4	8.55
Hot water	128.75	63.65
Equipment*	64.47	64.47
TOTAL**	**169.86**	**91.55**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	104.19	86.06
Primary energy [kWh_{PE}/m^2]	250.59	134.98
Total emissions [kg/m^2]	22.99	12.37

Be Lean

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Hotel Refurb - Be Lean — As designed

Date: Tue Feb 27 11:44:00 2024

Administrative information

Building Details
Address: London, Postcode

Certification tool
Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Certifier details
Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Foundation area [m^2]: 575.11

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	11.46	
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.75	
Target primary energy rate (TPER), $kWh_{PE}/m^2.annum$	124.84	
Building primary energy rate (BPER), $kWh_{PE}/m^2.annum$	194.03	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.18	0.18	RS000001:Surf[1]
Floors	0.18	0.18	0.18	L00002B0:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	L0000099:Surf[0]
Windows** and roof windows	1.6	1.6	1.6	L000000B:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	RS000001:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] — $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m^2K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2875.6	2875.6
External area [m^2]	1509.6	1509.6
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	653.42	751.74
Average U-value [W/m^2K]	0.43	0.5
Alpha value* [%]	26.13	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
100	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	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	3.33	3.89
Cooling	8.01	3.7
Auxiliary	16.52	15.03
Lighting	11.03	9.45
Hot water	92.82	52.51
Equipment*	61.07	61.07
TOTAL**	**131.7**	**84.59**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	121.66	100.57
Primary energy [kWh_{PE}/m^2]	194.03	124.84
Total emissions [kg/m^2]	17.75	11.46

Be Green

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

Shaftesbury Hotel Refurb - Be Green As designed

Date: Tue Feb 27 12:09:10 2024

Administrative information

Building Details

Address: London, Postcode

Certification tool

Calculation engine: Apache
Calculation engine version: 7.0.20
Interface to calculation engine: IES Virtual Environment
Interface to calculation engine version: 7.0.20
BRUKL compliance module version: v6.1.e.1

Certifier details

Name: Name
Telephone number: Phone
Address: Street Address, City, Postcode

Foundation area [m^2]: 575.11

The CO_2 emission and primary energy rates of the building must not exceed the targets

The building does not comply with England Building Regulations Part L 2021

Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	11.46	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	17.24	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	124.84	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	188.53	
Do the building's emission and primary energy rates exceed the targets?	BER > TER	BPER > TPER

The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Fabric element	$U_{b\text{-}Limit}$	$U_{b\text{-}Calc}$	$U_{i\text{-}Calc}$	First surface with maximum value
Walls*	0.26	0.18	0.18	RS000001:Surf[1]
Floors	0.18	0.18	0.18	L00002B0:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.18	0.18	L0000099:Surf[0]
Windows** and roof windows	1.6	1.6	1.6	L000000B:Surf[0]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors^	1.6	1.6	1.6	RS000001:Surf[0]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

$U_{b\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$] $U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]
$U_{b\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
* 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. *** Values for rooflights refer to the horizontal position.
^ For fire doors, limiting U-value is 1.8 W/m^2K
NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
$m^3/(h.m^2)$ at 50 Pa	8	3

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	2875.6	2875.6
External area [m^2]	1509.6	1509.6
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	653.42	751.74
Average U-value [W/m^2K]	0.43	0.5
Alpha value* [%]	26.13	10

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

Building Use

% Area	Building Type
	Retail/Financial and Professional Services
	Restaurants and Cafes/Drinking Establishments/Takeaways
	Offices and Workshop Businesses
	General Industrial and Special Industrial Groups
	Storage or Distribution
100	**Hotels**
	Residential Institutions: Hospitals and Care Homes
	Residential Institutions: Residential Schools
	Residential Institutions: Universities and Colleges
	Secure Residential Institutions
	Residential Spaces
	Non-residential Institutions: Community/Day Centre
	Non-residential Institutions: Libraries, Museums, and Galleries
	Non-residential Institutions: Education
	Non-residential Institutions: Primary Health Care Building
	Non-residential Institutions: Crown and County Courts
	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	2.34	3.89
Cooling	8.01	3.7
Auxiliary	16.52	15.03
Lighting	11.03	9.45
Hot water	90.11	52.51
Equipment*	61.07	61.07
TOTAL**	**128.01**	**84.59**

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

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*0*	*0*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	121.66	100.57
Primary energy [kWh_{PE}/m^2]	188.53	124.84
Total emissions [kg/m^2]	17.24	11.46

Appendix F: TM54 assumptions.

Hotel.

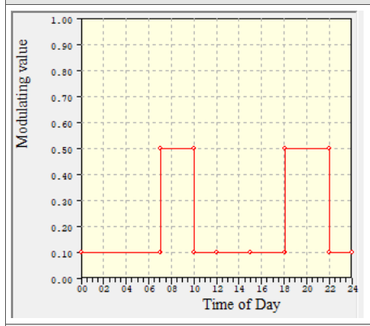
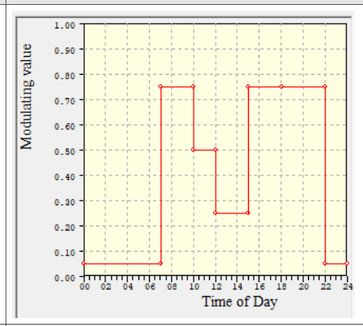
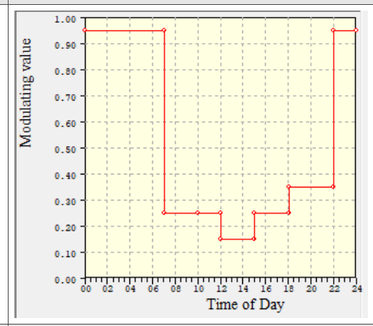
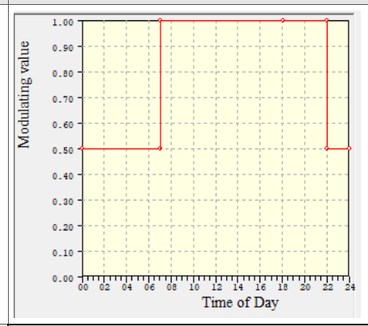
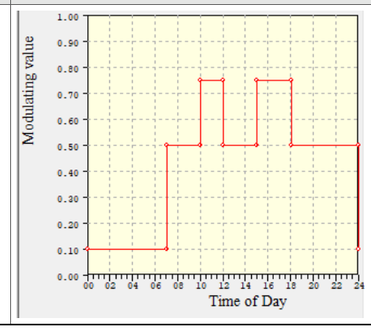
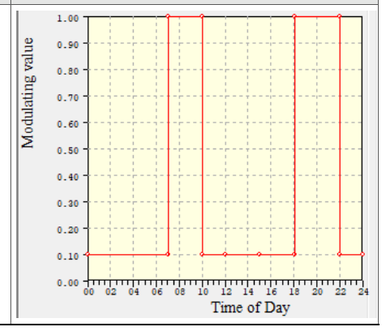
The assumptions made for the hotel portion of the TM54 have been informed by initial MEP design. System and fabric inputs are shown in Table 20 and Table 22. Table 23, Table 24, Table 25 and Table 26 below show detail of assumptions made around hotel usage and conditioning. These have been informed by Citizen M design standards. These inputs should be refined at the next design stage to ensure the results of the operational energy assessment reflect intended use accurately.

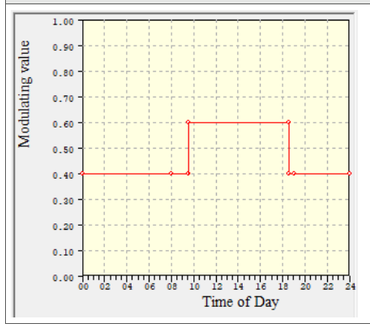
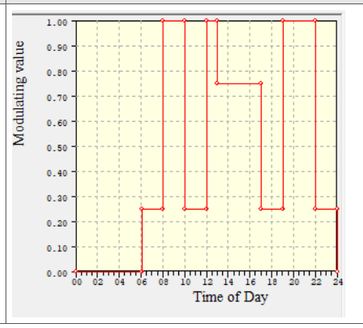
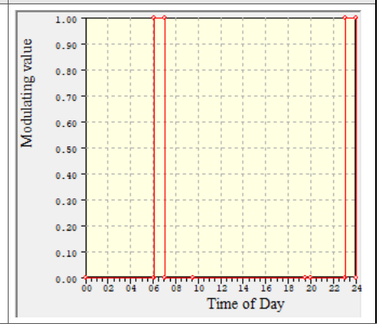
Internal Gains

Table 23: Hotel internal gains assumptions.

Template Name	Gain 1 Reference	Gain	Diversity	Usage profile	Gain 2 Reference	Gain	Profile	Gain 3 Reference	Gain	Profile
TM54 Staff	General Lighting Corridor	6 W/m2	1	BOH occupancy	People- Staff	8 people	BOH occupancy	-		
TM54- Bedroom	General Lighting Bed	150 W	1	Guest lighting and equipment	People-Bed	2 people	Guest occupancy	Miscellaneous Bed	150 W	Guest lighting and equipment
TM54 Changing	General Lighting WC	6 W/m2	1	BOH occupancy						
TM54 Ensuite	General Lighting Ensuite	4.5 W/m2	1	Guest lighting and equipment						
TM54 FF Lobby	General Lighting Corridor	6 W/m2	1	BOH occupancy						
TM54 FOH Circulation	FOH Circulation Lighting	6 W/m2	1	BOH occupancy						
TM54 Linen	General Lighting Store	6 W/m2	1	BOH occupancy						
TM54 Pantry	Pantry Circulation Lighting	6 W/m2	1	Pantry occupancy/lighting	People- Pantry	9 m2/person	Pantry occupancy/lighting	Pantry Equipment	20 W/m2	Pantry occupancy/lighting
TM54 Pantry Kitchen	Pantry Circulation Lighting	6 W/m2	1	Pantry occupancy/lighting	People- Pantry	9 m2/person	Pantry occupancy/lighting	Pantry Equipment	20 W/m2	Pantry occupancy/lighting
TM54 Plant	General Lighting Plant	6 W/m2	0.1	On continuously						
TM54 Reception	Reception Lighting	10 W/m2	1	FOH lighting and equipment	People Reception	3 m2/person	FOH occupancy	Reception Equipment	15 W/m2	FOH lighting and equipment
TM54 Server	General Lighting Plant	6 W/m2	0.1	On continuously	Server	3000 W	Server usage			
TM54 Stair	General Lighting Corridor	6 W/m2	1	BOH occupancy						
TM54 Store	General Lighting Store	6 W/m2	0.25	BOH occupancy						
TM54 WC	General Lighting WC	6 W/m2	1	BOH occupancy						

Profiles
Table 24: Occupancy, lighting and equipment profiles

BOH occupancy	Guest room lighting and equipment	Guest room occupancy	FOH lighting and equipment	FOH occupancy	Pantry occupancy lighting & equipment
					

Server Room Diversity	DHW usage	DHW Staff shower
		

Ventilation rates
Table 25: Hotel ventilation rate assumptions.

Template Name	AE 1 Type	Vent rate	AE 2 Type	AE 2 Reference	Vent rate
TM54 Staff	Infiltration	0.15 ach	Auxiliary Ventilation	Staff Vent	6 ach
TM54 Bedroom	Infiltration	0.15 ach	Auxiliary Ventilation	Bedroom Auxiliary ventilation	
TM54 Changing	Infiltration	0.15 ach	Auxiliary Ventilation	Changing room Vent	6 ach
TM54 Ensuite	Infiltration	0.15 ach	Auxiliary Ventilation	Bedroom Auxiliary ventilation	24 l/s
TM54 FF Lobby	Infiltration	0.15 ach			
TM54 FOH Circulation	Infiltration	0.15 ach			
TM54 Lift/riser/void	Infiltration	0.15 ach	-	-	
TM54 Linen	Infiltration	0.15 ach	Auxiliary Ventilation	Laundry Vent	3 ach

Template Name	AE 1 Type	Vent rate	AE 2 Type	AE 2 Reference	Vent rate
TM54 Pantry	Infiltration	0.15 ach	Auxiliary Ventilation	Pantry Vent	6 ach
TM54 Pantry Kitchen	Infiltration	0.15 ach	Auxiliary Ventilation	Kitchen Vent	6 ach
TM54 Plant	Infiltration	0.15 ach	Auxiliary Ventilation	Plant Vent	0.5 l/s/m2
TM54 Reception	Infiltration	0.15 ach	Auxiliary Ventilation	Reception FOH	5.50 l/s/person
TM54 Server	Infiltration	0.15 ach	Auxiliary Ventilation	Plant Vent	0.5 l/s/m2
TM54 Stair	Infiltration	0.15 ach	-	-	
TM54 Store	Infiltration	0.15 ach	-	-	
TM54 WC	Infiltration	0.15 ach	Auxiliary Ventilation	WC Auxiliary ventilation	50 l/s

Space conditioning
Table 26: Hotel space conditioning assumptions.

Template Name	Heating Profile	Heating Setpoint (°C)	Cooling Profile	Cooling Setpoint (°C)
TM54 Bedroom	on continuously	22	on continuously	24
TM54 Ensuite	on continuously	22	on continuously	24
TM54 Staff	on continuously	21	on continuously	24
TM54 FF Lobby	on continuously	21	off continuously	
TM54 Linen	on continuously	21	off continuously	
TM54 Pantry	on continuously	21	on continuously	24
TM54 Pantry Kitchen	on continuously	21	on continuously	24
TM54 Reception	on continuously	21	on continuously	24
TM54 Store	off continuously	19	off continuously	
TM54 Changing	on continuously	18	off continuously	
TM54 FOH Circulation	on continuously	18	off continuously	
TM54 Lift/riser/void	on continuously	18	off continuously	
TM54 Stair	off continuously	18	off continuously	
TM54 WC	on continuously	18	off continuously	
TM54 Plant	on continuously	15	off continuously	
TM54 Server	on continuously	15	on continuously	24

Theatre.

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