JENKS ASSOCIATES LIMITED
Building Services Consulting Engineers

LONDON EUSTON PIX – EXTENSION

Sustainable Energy Strategy Report

SESR – PL5-SESR (25/06/2019)

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PL2				
PL3	25.06.19	CMH	AJK	Inclusion of water harvesting information
PL4	10.07.19	CMH	AJK	Inclusion of latest drawings
PL5	24.07.19	CMH	AJK	Inclusion of latest drawings and descriptions

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1. INTRODUCTION

This Sustainable Energy Strategy/Report has been developed by Jenks Associates Limited, Building Services Consultants, for the erection of a two (2) storey Roof top Extension and a seven (7) storey Annexe Extension to the existing Hotel, together with alterations to the external appearance, new access plant, car parking and associates works at the London Euston Premier Inn, 1 Duke's Road, London, WC1H 9PJ.

Therefore, the proposed building will be subject to Part L 2013 England Building Regulations for compliance.

A thermal model will be completed prior to construction using IES Virtual Environment with an 'As Designed' BRUKL compliance document issued prior to start on site, an 'As-Built' BRUKL compliance document issued on completion for the building via Jenks Associates Limited Accreditation body (CIBSE).

This will be carried out by Mr Andrew John Kay (Accredited Energy Assessor Number LCEA 006823).

The Part L weather location will be 'London'.

This Strategy/Report should be read in conjunction with the drawings (dated 18 July 2019) and report issued by CHQ Architects Limited.

The proposed Extensions will have the following room type arrangements:

Seven Storey Rear Extension

Lower Ground Floor Level

- Four (4) 3.1m Shower Rooms
- Store
- Lift and Lift Lobby
- Circulation space and Fire Escape Stairs

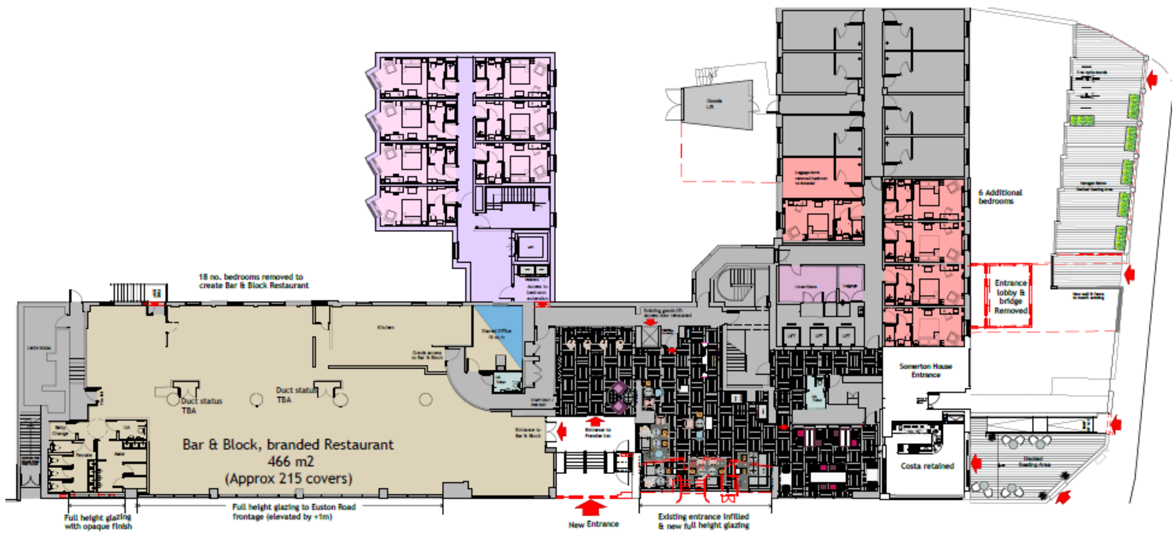
Fig 1 Proposed Extension Plan CHQ Architects drawing number CHQ.11690-PL06 – 1 of 3 (Lower Ground Floor extract)

Proposed Lower Ground Floor Plan

<u>Ground Floor</u>

- Seven (7) 3.1m Shower Rooms
- Circulation Space and Fire Escape Stairs
- Lift and Lift Lobby

Fig 2 Proposed Extension Plan – CHQ Architects drawing number CHQ.11690-PL06 – 1 of 3 (Ground Floor extract)



Proposed Ground Floor Plan

First Floor to Fourth Floors

- Seven (7) 3.1m Shower Rooms
- One (1) existing Bedroom removed to create link to new Extension
- One (1) existing Bedroom converted to form one (1) AB Bedroom and Linen Store
- Room converted to one (1) AB Bedroom
- Circulation Space and Fire Escape Stairs
- Lift and Lift Lobby

Fig 3 Proposed Extension Plan – CHQ Architects drawing number CHQ.11690-PL06 2 of 3 (First to Fourth Floor extract)

Proposed First to Fourth Floor Plans

Fifth Floor

- Seven (7) 3.1m Shower Rooms
- One (1) existing Bedroom removed to create link to new Extension
- One (1) existing Bedroom removed to create vertical circulation core to Sixth/Seventh Floors
- Room converted to one (1) AB Bedroom
- Circulation Space and Fire Escape Stairs
- Lift and Lift Lobby

Fig 4 Proposed Extension Plan – CHQ Architects drawing number CHQ.11690-PL06 2 of 3 (Fifth Floor extract)

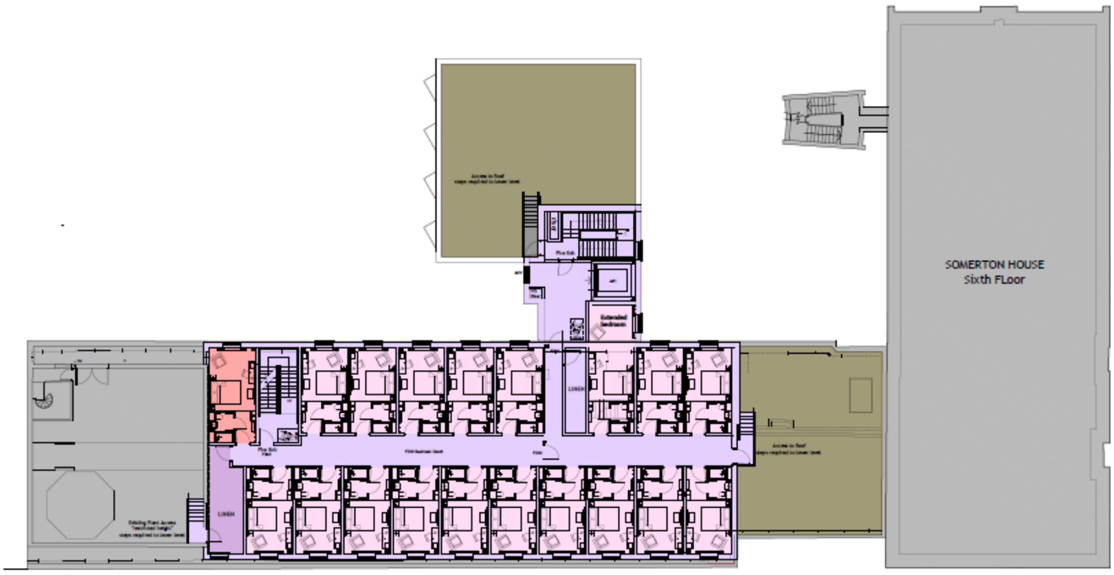
Proposed Fifth Floor Plan

Two Storey Roof Extension

Sixth Floor

- Nineteen (19) 3.1m Shower Rooms (one (1) extended)
- Linen Rooms
- Lift/Lift Lobby
- Circulation Spaces and Fire Escape Stairs

Fig 5 Five Storey Extension Plan – CHQ Architects drawing number CHQ.11690-PL06 3 of 3 (Sixth Floor extract)

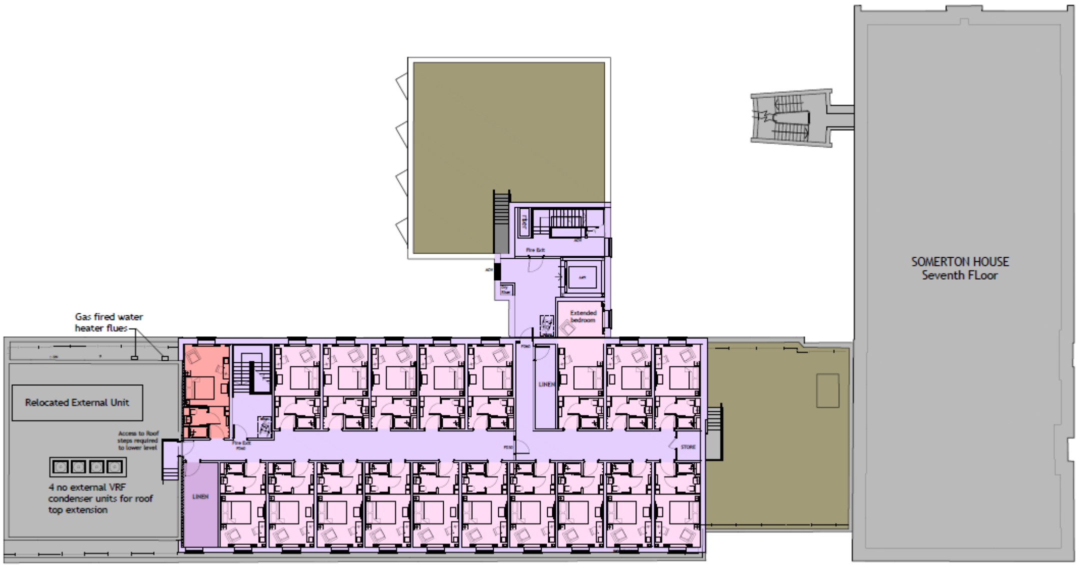


Proposed Sixth Floor Plan

Seventh Floor

- Nineteen (19) 3.1m Shower Rooms (one (1) extended)
- Linen Rooms
- Lift/Lift Lobby
- Circulation Spaces and Fire Escape Stairs

Fig 6 Proposed Extension Plan – CHQ Architects drawing number CHQ.11690-PL06 3 of 3 (Seventh Floor extract)



Proposed Seventh Floor Plan

For planning purposes, the proposed building will be Class C1 usage (Hotel).

This Report will provide details of the energy saving/low carbon technologies which will be incorporated into the overall design for the project.

2. SITE IMPROVEMENT MEASURES

In line with the recommended hierarchical approach to energy and carbon savings, the following improvement measures are aimed to be included for the whole site:

Be Lean – use less energy
Energy efficiency measures that have beneficial impacts on the initial demands for energy; i.e. building fabric, air-tightness, lighting.

Be Clean – supply energy more efficiently
Efficient energy consuming plant and equipment, with a preference for centralised or communal energy provision.

Be Green – use renewable energy
Renewable and low carbon technologies to offset the remaining demands for energy.

The following Model energy efficiency measures are implemented on every Premier Inn Extension project to reduce the overall energy use for the development and to reflect the Be Lean and Be Clean measures:

- Building 'U' values improved beyond the minimum standards imposed by Building Regulations 2013.

  For the Premier Inn, the following 'U' values will be applicable

Walls	0.15W/m^2K
Floor	0.15W/m^2K
Roof	0.10W/m^2K
Windows	1.00W/m^2K

- Thermal bridge interfaces all constructed to accredited details
- Building air permeability of 5m^3/m^2h @50Pa or lower
- All lighting installed to be based on LED lamps, or low energy high frequency fluorescent where necessary
- All Premier Inn Hotel Bedroom lighting circuits shall be occupancy controlled
- Lighting to corridors and ancillary areas shall be controlled via occupancy sensors
- Mechanical ventilation and heat recovery
- Natural Ventilation to circulation areas
- Use of highest efficiency and best energy rating white goods
- Inverter control to all pumps and fan motors where appropriate

3.1 LOW CARBON AND RENEWABLE ENERGY TECHNOLOGY REVIEW

An initial options viability assessment has been carried out using the CIBSE RESET software to ascertain which technologies would be most feasible to use to achieve compliance with Part L 2013.

A summary of these results and additional selection commentary is provided below for all systems.

3.2 SOLAR THERMAL HOT WATER

Solar thermal hot water is a reliable renewable technology; however, the traditional alternative of domestic water heating from a gas hot water generator is very efficient and relatively low cost, and because of this reason, solar thermal systems are rarely financially viable.

This option has been not considered for the following reasons:

The location of hot water storage is within the ground floor Plantroom and not near to potential locations for solar thermal panels.

The financial investment in such a system is not viable considering the savings generated.

3.3 PHOTOVOLTAICS

The use of a photovoltaic array is not the most feasible technology due to the lack of roof in a direct south facing orientation.

There are buildability issues with the implications of the weight of a photovoltaic array (including support frame and ballast) on the lightweight construction of the two storey roof-top extension on the top of the existing building and space/shading issues on the rear extension in the car park due to lack of room on the new roof for a large array and shading from surrounding existing buildings.

3.4 GROUND WATER COOLING

This option has not been considered further as there is insufficient clear ground space to provide cooling loop.
An open loop system requiring reduced space could potentially be installed but it is unlikely that permission will be given for ground water extraction and the costs of such a system will be prohibitive.

3.5 GROUND SOURCE HEAT PUMPS

This option has not been considered further as there is insufficient clear ground space to provide cooling loops of sufficient capacity, either horizontal or vertical due to the restricted site and attenuation tanks below external landscaped areas, however air source heat pumps could be a feasible technology so will be considered for further for detailed feasibility.

3.6 SMALL SCALE WIND

This option has not been considered further, as the size of turbines required to offset 10% of the building’s carbon emissions would result in noise and visibility issues.

3.7 BIOMASS

This option has not been considered further, as there is no potential for wood pellets to be delivered to the site from a local source and there is limited space adjacent to the proposed mechanical plant room for an adequate storage facility and easy deliveries.

3.8 COMBINED HEAT AND POWER (CHP)

Combined heat and Power is a feasible technology but will not be considered for financial feasibility for the following reasons:

There is limited space within the Plantroom for a CHP.

3.9 WATER HARVESTING (EXTRACT FROM SIMPSON ASSOCIATES SURFACE WATER DRAINAGE STATEMENT)

1. SURFACE WATER DRAINAGE STRATEGY

Surface Water Runoff Destination

The NPPF Planning Practice Guidance advises that Sustainable Drainage Systems (SUDS) should be used to control surface water runoff close to where it falls as well as to mimic natural drainage as closely as possible with surface runoff discharged as high up the following hierarchy of drainage options as reasonably practical.

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer.

The methods of disposal are summarised in *Table 1* below with an assessment of each method's suitability also provided.

Table 1 – Surface Water Runoff Destination Assessment

Surface Water Runoff Destination	Assessment
Into the ground (infiltration)	Infiltration drainage techniques have been assessed to be inappropriate for the development due to there being insufficient space for positioning of soakaways a minimum of 5m from buildings as required by building regulations
To a surface water body	Given that no surface water bodies are located nearby to the site it is assessed to not be a viable option for surface water disposal.
To a surface water sewer, highway drain, or another drainage system.	The existing on-site drainage comprises separate surface water and foul water systems. Given the absence of alternative destination within the hierarchy for surface water disposal it is assessed to be appropriate to discharge surface water runoff to the existing on-site surface water drain.

To a combined sewer.	It has been established that it would be appropriate to discharge surface water runoff into the existing private surface water drain. Therefore, it is not necessary to consider the discharge of surface water runoff to a combined sewer

Based on the assessment in *Table 1*, it is considered appropriate to discharge surface water runoff into the existing on-site surface water drainage network.

Runoff Management

Surface water runoff from new development should be managed in accordance with the suggested procedures set out in the March 2015 DEFRA Report "*Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems*."

The site is considered to be brownfield in nature. For developments on brownfield sites Policy S3 of the DEFRA report advises that the peak runoff rate from the development to any highway drainage, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event. Policy S5 of the DEFRA report advises that where reasonably practicable, for brownfield sites, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should not exceed the runoff volume from the development site prior to redevelopment for that event.

Greenfield runoff rates and volumes have been calculated using the IH124 method of calculation, using the Source Control Facility in the MicroDrainage Software Package. The results are included in *Appendix B* and are based on a measured drained area of 0.053Ha. The calculated rates and volumes for a variety of storm events up to the 1 in 100 year return period are summarised in *Table 2* below.

Pre-development Runoff Rates

Table 2 – Pre-Development Runoff Rates

Return Period	Greenfield Runoff Rate (l/s)	Greenfield Runoff Volume (m^3)	Brownfield Runoff Rate (l/s)	Brownfield Runoff Volume (m^3)
1 year	0.2	3.1	8.7	9.7
30 year	0.4	7.4	21.3	21.4
100 year	0.6	10.3	27.6	24.8

Table 2 also shows the total brownfield runoff rates and volumes discharged from the sites existing drainage network, which have been established using the source control facility in the MicroDrainage software Package by XP

Solutions. The design results are included in *Appendix C*.

Sustainable Urban Drainage Systems (SUDS)

It is proposed to discharge surface water runoff from the development to the existing on-site surface water drainage network, with flows limited to match greenfield runoff rates calculated in *Table 2* as closely as possible and with excess runoff stored and attenuated on site.

Given the limited scale of proposed development, the greenfield runoff rates are not practical to achieve and it is therefore proposed to provide a Hydrobrake flow control device with a minimum orifice dimeter of 75mm to reduce the risk of blockage.

Within the drainage strategy it is necessary to consider the use of SUDS, which encompass a wide range of drainage techniques intended to minimise the rate of discharge, volume and environmental impact of runoff and include; grey water harvesting; soakaways / infiltration systems; infiltration trenches and filter drains; swales and basins; ponds and wetlands; below ground storage tanks. *Table 3* below provides an assessment of each methods suitability.

Table 3 – SUDS Assessment	
Grey Water Harvesting	The Water Recycling Manager at Waterscan has been contacted to obtain a specification for a grey water harvesting system, however due to the limited scale of the scheme there is no system available that would be able to efficiently treat such low volumes of water. It is understood that the existing hotel does not have a grey water system, and clearly it would not be feasible to retrospectively install one given that the hotel must remain operational. It is therefore concluded that grey water harvesting will not be viable for the proposed development.
Soakaway/Infiltration Systems/Infiltration Trenches	Infiltration drainage techniques are assessed to be inappropriate for the development due to there being no space for such infiltration drainage techniques to be appropriately positioned with sufficient clearance to buildings.
Swales, basins, ponds, wetlands and below ground storage tanks.	Given the nature of the development, which comprises of a hotel building in a city centre environment, the building has been designed to maximise the available land with its scale and massing chosen so that they are appropriate to the site and its context. Areas of soft landscaping are thus limited, with the building occupying a majority of the site, and no areas available for swales, basins, ponds and wetlands. On this basis, the use of a below ground storage tank is considered the most appropriate technique for additional attenuation and storage of surface water runoff.

Table 3 has established that the use of a below ground storage tank would be the most appropriate form of SUDS to match greenfield rates as closely as possible. The proposed location for below ground storage tank has been shown on the drainage strategy drawing included in *Appendix A*.

Hydraulic Analysis

The source control facility in the MicroDrainage software package by has been used to design the surface water drainage system, which would serve a drained area of 780m2. The design results for a variety of storm events up to and including the 1 in 100 year storm return period with 40% allowance for increase in peak rainfall intensity over the lifetime of the development are included in *Appendix D*. The design results confirm that the surface water drainage network would store and attenuate surface water flows for all analysed storm events with no surface water flooding identified.

2.10 *Table 4* below compares the maximum rate of discharge / volume analysed for each storm event to the greenfield runoff rates / volumes identified in *Table 2*.

Table 4 – Comparison of Discharge Rates and Volumes

Return Period	Greenfield		Brownfield		Post Development	
	Peak Runoff Rate (l/s)	6 hour Runoff Rate (m^3)	Peak Runoff Rate (l/s)	6 hour Runoff Rate (m^3)	Peak Runoff Rate (l/s)	6 hour Runoff Rate (m^3)
1 year	0.2	3.1	8.7	9.7	2.2	9.1
30 year	0.4	7.4	21.3	21.4	2.5	21.4
100 year	0.6	10.3	27.6	24.8	2.5	27.8
100 year + 40%	N/A		38.2	38.9	2.5	38.9

The Hydrobrake flow control devices have been sized to a minimum practical orifice diameter of 70mm, resulting in a peak discharge rate of 2.5 l/s. The above table therefore confirms that the surface water drainage scheme would comply with Policy with Policy S3 of the DEFRA Report as the peak runoff rate from the development for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event would be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event and would also not exceed the rate of discharge from the development site prior to redevelopment for that event.

Table 4 shows that the surface water drainage scheme would discharge at a greater volume than the equivalent pre-development volume for the 1 in 100-year 6-hour rainfall event with 40% allowance for climate change. However, Policy S6 of the DEFRA Report advises that where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body, the runoff volume must be discharged at a rate that does not adversely affect flood risk. Surface water runoff from the development has been limited as far as practicable and at a significantly reduced rate compared to the existing scenario. On this basis it is considered that the runoff volume would be discharged at a rate that does not adversely affect flood risk.

4. CONCLUSIONS/RECOMMENDATIONS

The site specific Premier Inn Extension Thermal Model/Part L 2013 calculations have given the following results:

Both Extensions Constructed Simultaneously

Notional Building/Target CO_2 Emissions Rate (TER) = 71.50kgCO_2/m^2 annum

Actual Building CO_2 Emissions Rate (BER) = 59.50kgCO_2/m^2 annum

Proposed Extension Floor Area = 2,080.10m^2

Notional Building Annual CO_2 Emissions = 148,727.15kgCO_2

Actual Building Annual CO_2 Emissions = 123,765.95kgCO_2

This results in a carbon emissions saving of 16.80% above the requirements of Part L 2013 England Building Regulations.

Energy Consumption by End Use (kWh/m²)		
	Actual	Notional
Heating	4.32	17.39
Cooling	4.49	8.77
Auxiliary	8.94	4.97
Lighting	12.50	12.10
Hot Water	204.82	229.86
TOTAL	**235.07**	**273.09**

Notional Building Annual Energy Consumption = 568,054.51kWh

Actual Building Annual Energy Consumption = 488,969.11kWh

This results in an energy consumption saving of 13.90% above the requirements of Part L 2013 England Building Regulations.

Roof Extension Only

Notional Building/Target CO_2 Emissions Rate (TER) = 72.10kgCO_2/m^2 annum

Actual Building CO_2 Emissions Rate (BER) = 61.70kgCO_2/m^2 annum

Proposed Extension Floor Area = 1,024.50m^2

Notional Building Annual CO_2 Emissions = 73,866.45kgCO_2

Actual Building Annual CO_2 Emissions = 63,211.65kgCO_2

This results in a carbon emissions saving of 14.40% above the requirements of Part L 2013 England Building Regulations.

Energy Consumption by End Use (kWh/m²)		
	Actual	Notional
Heating	3.81	14.30
Cooling	5.34	8.32
Auxiliary	9.53	5.27
Lighting	11.85	12.50
Hot Water	213.92	239.25
TOTAL	**244.45**	**279.64**

Notional Building Annual Energy Consumption = 286,491.18kWh

Actual Building Annual Energy Consumption = 250,439.03kWh

This results in an energy consumption saving of 12.60% above the requirements of Part L 2013 England Building Regulations.

Rear Extension Only

Notional Building/Target CO_2 Emissions Rate (TER) = 70.90kgCO_2/m² annum

Actual Building CO_2 Emissions Rate (BER) = 57.90kgCO_2/m² annum

Proposed Extension Floor Area = 1,055.60m²

Notional Building Annual CO_2 Emissions = 74,842.04kgCO_2

Actual Building Annual CO_2 Emissions = 61,119.24kgCO_2

This results in a carbon emissions saving of 18.30% above the requirements of Part L 2013 England Building Regulations.

Energy Consumption by End Use (kWh/m²)		
	Actual	Notional
Heating	4.81	20.40
Cooling	3.65	9.20
Auxiliary	8.78	4.67
Lighting	13.14	11.71
Hot Water	197.10	220.74
TOTAL	**227.48**	**266.72**

Notional Building Annual Energy Consumption = 281,549.63kWh

Actual Building Annual Energy Consumption = 240,127.88kWh

These results are due to the site improvement measures detailed in Section Two of this Report.

The Bedrooms in the existing Premier Inn have air conditioning so the new Extension will match this but with multi-split VRF air conditioning installation with the following efficiencies:

Coefficient of Performance (CoP) = 4.55 (nominal)

Energy Efficiency Ratio (EER) = 4.23 (nominal)

However, the proposed Extension will need to comply with the London Plan Policy 5.2 which requires non-domestic buildings between 2016 – 2019 to meet reductions over 2013 Building Regulations as per Building Regulations' requirements.

This will need to provide a 35% improvement in carbon dioxide emissions reduction, as a minimum improvement, over the requirements of the 2013 Building Regulations.

Given the high hot water consumption of the proposed Premier Inn, we would propose to select a heat pump (heating only) as our low carbon technology.

This would be a Mitsubishi 'ECODAN' Model CAHV-P500YA-HPB and would carry out the domestic hot water services cold feed pre-heat from approximately 10°C to 45°C, with the final heating to 60°C via an Andrews Water Heaters 'MAXXFLO' Model CWH 120/300 gas fired hot water generator.

The heat pump has an ErP rating of A+ and an SCoP of 3.54.

The incorporation of this low carbon technology results in the following:

Both Extensions Constructed Simultaneously

Notional Building/Target CO_2 Emissions Rate (TER) = 61.10kgCO_2/m^2 annum

Actual Building CO_2 Emissions Rate (BER) = 47.00kgCO_2/m^2 annum

Proposed Extension Floor Area = 2,080.10m^2

Notional Building Annual CO_2 Emissions = 127,094.11kgCO_2

Actual Building Annual CO_2 Emissions = 97,764.70kgCO_2

This results in a carbon emissions saving of 23.10% above the requirements of Part L 2013 England Building Regulations.

Energy Consumption by End Use (kWh/m²)		
	Actual	Notional
Heating	4.32	17.39
Cooling	4.49	8.77
Auxiliary	8.94	4.97
Lighting	12.50	12.10
Hot Water	62.73	77.47
TOTAL	**92.97**	**120.70**

Notional Building Annual Energy Consumption = 251,068.07kWh

Actual Building Annual Energy Consumption = 193,386.90kWh

This results in an energy consumption saving of 23.00% above the requirements of Part L 2013 England Building Regulations.

When compared with the Target Emissions Rate of the proposed Extensions without the LZC technology selected the carbon emissions saving is 34.30%.

This result is very close to the required 35% saving required and due to the fact that this is a relatively small Extension to a large existing building, we would not proposed any further expensive LZC technologies for the additional 0.7% required.

Roof Extension Only

Notional Building/Target CO_2 Emissions Rate (TER) = 61.10kgCO_2/m² annum

Actual Building CO_2 Emissions Rate (BER) = 48.60kgCO_2/m² annum

Proposed Extension Floor Area = 1,024.50m²

Notional Building Annual CO_2 Emissions = 62,699.40kgCO_2

Actual Building Annual CO_2 Emissions = 49,790.70kgCO_2

This results in a carbon emissions saving of 20.60% above the requirements of Part L 2013 England Building Regulations.

Energy Consumption by End Use (kWh/m²)		
	Actual	Notional
Heating	3.81	14.30
Cooling	5.34	8.32
Auxiliary	9.53	5.27
Lighting	11.85	12.50
Hot Water	65.61	80.64
TOTAL	**96.05**	**121.03**

Notional Building Annual Energy Consumption = 123,995.24kWh

Actual Building Annual Energy Consumption = 98,403.33kWh

This results in an energy consumption saving of 20.60% above the requirements of Part L 2013 England Building Regulations.

When compared with the Target Emissions Rate of the proposed Extensions without the LZC technology selected the carbon emissions saving is 32.60%.

This result is very close to the required 35% saving required and due to the fact that this is a relatively small Extension to a large existing building, we would not proposed any further expensive LZC technologies for the additional 2.4% required.

Rear Extension Only

Notional Building/Target CO_2 Emissions Rate (TER) = 60.90kgCO_2/m² annum

Actual Building CO_2 Emissions Rate (BER) = 45.90kgCO_2/m² annum

Proposed Extension Floor Area = 1,055.60m²

Notional Building Annual CO_2 Emissions = 64,286.04kgCO_2

Actual Building Annual CO_2 Emissions = 48,452.04kgCO_2

This results in a carbon emissions saving of 24.60% above the requirements of Part

L 2013 England Building Regulations.

Energy Consumption by End Use (kWh/m²)		
	Actual	Notional
Heating	4.81	20.40
Cooling	3.65	9.20
Auxiliary	8.78	4.67
Lighting	13.14	11.71
Hot Water	60.36	74.40
TOTAL	**90.74**	**120.38**

Notional Building Annual Energy Consumption = 127,073.13kWh

Actual Building Annual Energy Consumption = 95,785.14kWh

This results in an energy consumption saving of 24.60% above the requirements of Part L 2013 England Building Regulations.

When compared with the Target Emissions Rate of the proposed Extensions without the LZC technology selected the carbon emissions saving is 35.30%.

This particular result is above the required 35% saving for compliance.

Recommendations

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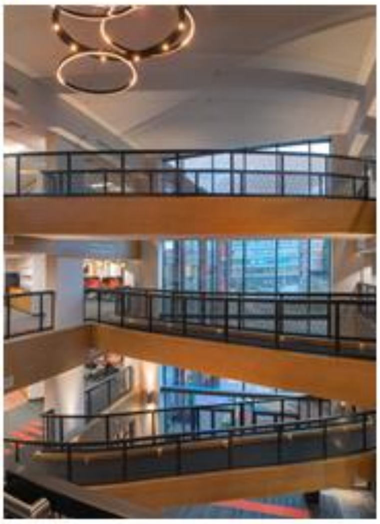

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