FORMER HAMPTON POLICE STASTION, 68 STATION ROAD, TW12 2AX

2518 - Energy Strategy Report, Hampton

A report prepared for and on behalf of:

Hampton Care Home Limited

HARNISS

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1.0 EXECUTIVE SUMMARY

1.1 This document details the intended energy and sustainability strategy for the construction of a registered care home compromising 75 care beds and 8 care suites (Use Class C2) together with associated access, car and cycle parking and landscaping located at Station Road, Hampton. This report has been prepared by Harniss Consulting on behalf of Hampton Care Home Limited.

1.2 The ethos for the design of the proposed development follows the recognised energy hierarchy to "Be Lean, Be Clean, Be Green", i.e. to minimise the building's energy usage before applying low carbon technologies/renewables to the design.

1.3 By following the energy hierarchy, the building wasn't found to be compliant with local planning requirements without additional renewable or low carbon technology. However, with the inclusion of Air Source Heat Pumps serving space heating and hot water generation, 295m^2 of photovoltaic array, monitoring outer-range-values for HVAC and lighting, efficient lighting, efficient SFPs and demand control for the ventilation speed in dayspaces and offices, the development demonstrates compliance against Part L2: 2021 and local planning requirements.

1.4 In-line the GLA London Plan 2021 the development now successfully demonstrates compliance with Building Regulations 2021 and surpassing this threshold by 35% (15% improvement from energy efficient measures) and needs to offset the residual carbon associated with the scheme through further on-site savings and/or offset payments. In-line with the GLA guidance this is based upon the 25.6tCO2e/yr for 30 years at £95/tCO2, therefore the cash in lieu contribution will be £73,090.

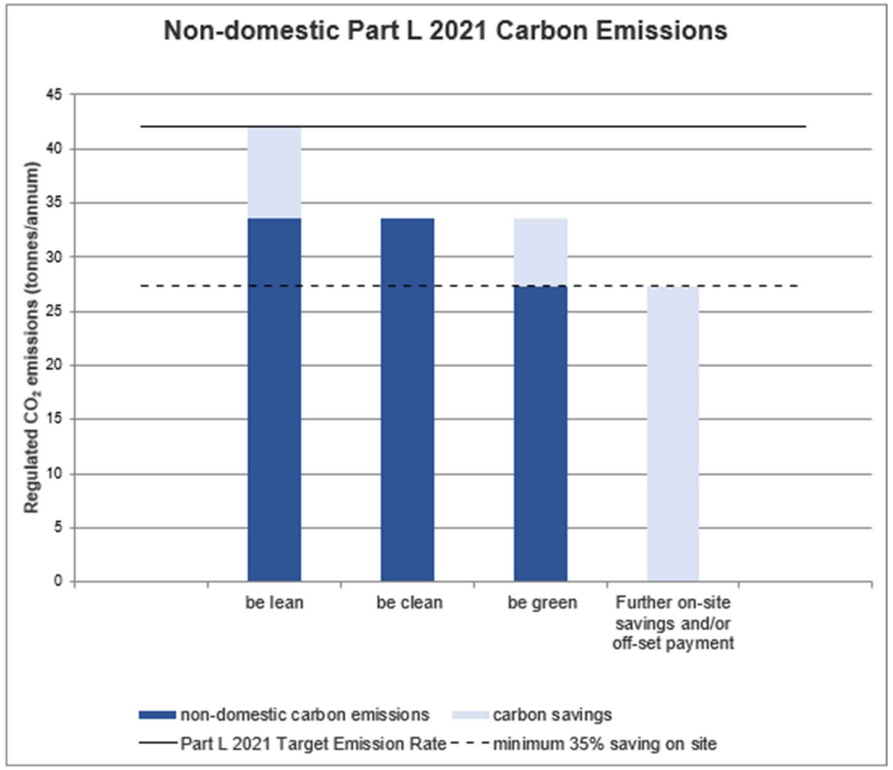


Figure 1 – Part L 2021 Carbon Emissions

Summary

The following summarises the key drivers of the energy strategy for the development:

- **Enhanced building fabric performance has been targeted through improved thermal performance and reduced air permeability.**
- **Energy efficient heating, domestic hot water, cooling, ventilation, and lighting systems throughout.**
- **Energy efficient controls for HVAC and lighting to minimise building in-use energy.**
- **An initial desktop study was undertaken to assess the most viable low zero carbon technologies for proposed implementation to achieve compliance.**
- **The inclusion of Air Source Heat Pumps in addition to photovoltaic array was found to be the most suitable option for low-carbon technology to be put into place on the care home.**

The conclusion of the conceptual design stage energy strategy is to provide the proposed care home with an Air Source Heat Pump serving space heating and hot water generation, 295m^2 of photovoltaic array, monitoring outer-range-values for HVAC and lighting, efficient lighting, efficient SFPs and demand control for the ventilation speed. This solution provides a route to compliance with Approved Document Part L2:2021 of the Building Regulations and the local planning requirements.

4,611 Trees

Grown for 10 years

469 Flights

From London to New York (per passenger)

25,153 Train journeys

From London to Paris (per passenger)

2.0 INTRODUCTION

2.1 The report has been prepared in accordance with Part L2: 2021 of the building regulations with the assessment showing compliance with all applicable criteria.

2.2 The strategy for the development takes into account the recognised energy hierarchy to "Be Lean, Be Clean, Be Green", i.e. to minimise the energy usage within each building before applying renewable technologies to the design.

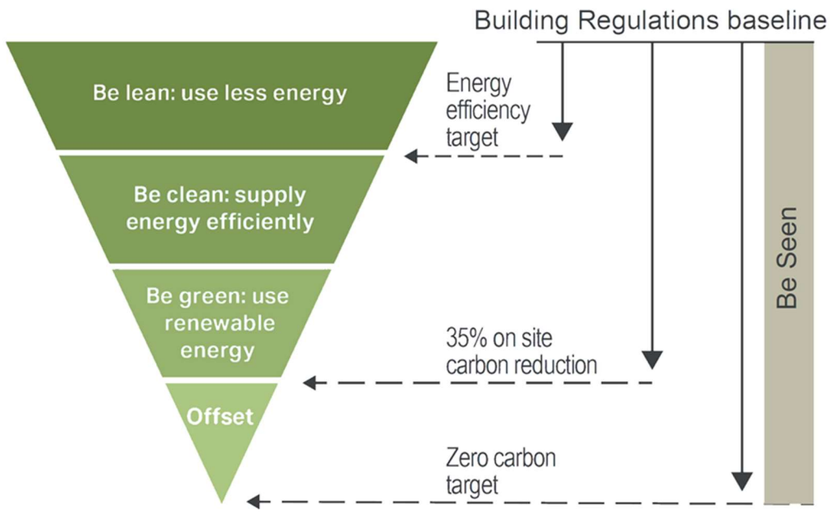


Figure 2 – Energy Hierarchy

2.3 Further work will be required at later stages in the detailed design process to ensure that the requirement to comply with the above targets and that all statutory guidelines or local planning enforcement requirements are met.

2.4 Based on the construction values outlined by the architect and working to a high efficiency building services specification the baseline building did not achieve compliance with AD Part L2 without renewable or LZC technology being applied.

3.0 THERMAL MODELLING

3.1 Analysis for the building has been undertaken utilising EDSL Tas software version 9.5.6. EDSL Tas is industry leading NCM accredited thermal modelling software which carries out dynamic hourly simulations of the anticipated energy usage and compares it against the notional benchmarks set under Approved Document Part L2 of the building regulations. The software was initially used to determine a baseline carbon emission using fabric performance values as discussed with the development team (as detailed in the body of the report) without contribution from additional renewable technologies.

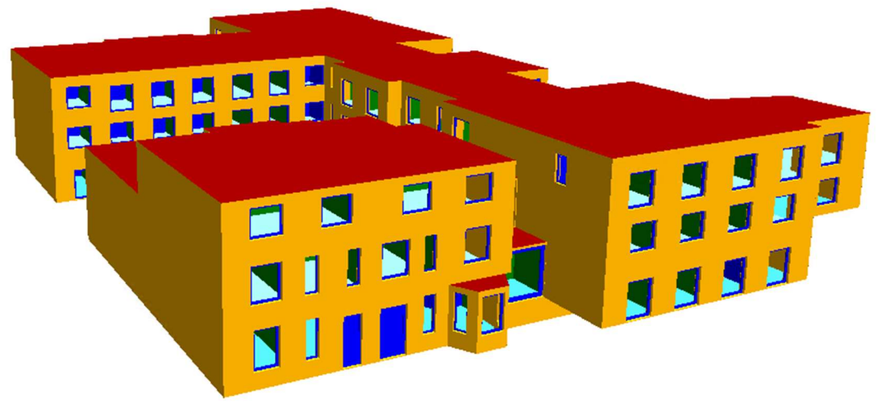


Figure 3 – EDSL TAS Model Screenshot

4.0 LOCAL PLANNING POLICIES

4.1 In Policy LP 22: Sustainable Design and Construction of the Hampton local plan 2018 states that:

'All non-residential buildings over 100sqm should achieve a 35% reduction. From 2019 all major non-residential buildings should achieve zero carbon standards in line with London Plan policy'

4.2 And in Policy SI 2: Minimising greenhouse gas emissions of the London Plan 2021, it states the following:

'A minimum on-site reduction of at least 35 per cent beyond Building Regulations152 is required for major development. … non-residential development should achieve 15 per cent through energy efficiency measures'

4.3 The proposed care home was able to comply with the 35% reduction in CO_2 emissions through the inclusion of Air Source Heat Pump (VRF heating) to serve space heating and hot water generation, 295m^2 of photovoltaic array, monitoring outer-range-values for HVAC and lighting, efficient lighting, highly efficient SFPs, a power factor correction of 0.95 and demand control for the ventilation speed in dayspaces and offices. In doing all of this, the care home was able to reduce the total CO_2 emissions by 35%, thus allowing it to comply with the Hampton Local Plan 2018, the London Local Plan 2021 and Part L2: 2021.

4.4 As the care home must be built in-line with the London Plan 2021 as noted in the Hampton Local Plan 2018, the care home was required to achieve a 15% reduction in CO_2 emissions per annum via energy efficient means, as well as the total 35% CO_2 reduction. By using an Air Source Heat Pump (VRF Heating) to serve both the space heating and hot water generation, monitoring outer-range-values for both the HVAC and lighting, efficient lighting, highly efficient SFPs, a power factor correction of 0.95 and demand control for ventilation speed in dayspaces and offices; the care home was able to surpass this requirement by achieving an 15% reduction in CO_2 emissions via energy efficient means.

5.0 DESCRIPTION OF DEVELOPMENT

5.1 The proposed development includes:

- Increase the number of acre beds from 66 to 75 and decrease the number of care suites from 22 to 8 – a reduction in population of the development from 93 people to 91 people;
- All Care beds to now be registered by Care Quality Commission ('CQC');
- Reduction in basement floorspace and removal of basement from below the existing former police station;
- Amendments to the existing former police station building;
- Infill extensions to ground floor and reconfiguration of internal layouts to accommodate inclusion of second stair core required for Building Regulation and fire safety purposes;
- Energy strategy enhancements including the replacement of gas boilers with air source heat pumps;
- Minor reduction in car parking spaces to accommodate electricity substation in accordance with energy strategy enhancements as well to accommodate infill extensions; and
- Provision of a garden room on the second-floor terrace.

5.2 Our assessment has been based on the following architectural AutoCAD drawings, produced by Carless Adams Architects:

- A-1028 011 G HAMPTON BASEMENT FLOOR PLAN
- A-1028 012 L HAMPTON GROUND FLOOR PLAN
- A-1028 013 F HAMPTON FIRST FLOOR PLAN
- A-1028 014 G HAMPTON SECOND FLOOR PLAN
- A-1028 020 K HAMPTON PROPOSED ELEVATIONS - SHEET 1
- A-1028 021 H HAMPTON PROPOSED ELEVATIONS - SHEET 2
- A-1028 022 C HAMPTON PROPOSED ELEVATIONS - SHEET 3
- A-1028 023 K HAMPTON PROPOSED ELEVATIONS - SHEET 4
- A-1028 024 C HAMPTON PROPOSED ELEVATIONS - SHEET 5
- A-1028 010 G HAMPTON SITE PLAN

Figure 4 – Careless Adams Architects GF Floor Plan

6.0 STRATEGY SOLUTION

6.1 The proposed development and the energy strategy detailed herein has low-energy use at its core with significant passive and energy efficient measure having been specified, these include:

- A significant improvement over limiting U-valves within Building Regulations. The thermal performance of the building envelope has been maximised to its fullest within the constraints of a traditional-build with 100mm cavity.
- Air permeability improved over the limiting value. The target will be to improve yet further on the air permeability during the construction phase but given the relatively small percentage of total energy that the heating system contributes to, any further gain will result in minimal actual reduction against the Target Emission Rate calculated under Approved Document Part L.
- Improved efficacy lighting specified which reduces primary energy usage.
- Automatic lighting controls used throughout, where appropriate for care i.e. proximity infrared used throughout in en-suites, bathrooms, stores, etc. timeclocks utilised for corridor night-time setback.
- External lighting schemes should demonstrate that they are the minimum necessary for security, safety or working purposes. Development should seek to minimise the loss of amenity from light glare and spillage, particularly that affecting residential areas, areas of nature conservation interest and the landscape qualities of countryside areas.

6.2 To this end, the proposed design promotes reducing the CO_2 emissions from delivered energy consumption by minimising operational energy demand through passive and best-practice measures. With these measures incorporated, then the addition of low carbon technologies and renewable energy system will have a greater impact – renewable energy sources should not be used as an alternative to a well-designed building.

6.3 A preliminary thermal energy model has been constructed of the care home EDSL Tas software version 9.5.6. The software was used to determine a baseline performance utilising the employer's requirements including the project specifications, room data sheets and good industry custom and practice.

6.4 The model was produced using assumed constructions as U-Values not agreed with Architect, which were:

Building Fabric Parameter	Value
Air permeability ($m^3/(m^2.h)$ @ 50Pa)	5.0
External Wall U-value ($W/m^2.K$)	0.19
Roof U-value ($W/m^2.K$)	0.13
Ground Floor U-value ($W/m^2.K$)	0.15
Glazing U-value ($W/m^2.K$)	1.0
Glazing G-value	0.4

Table 1 – Fabric Performance Details

6.5 As well as the U-values and design air permeability above, the following information summarises the key input information used for this analysis detailing the enhanced building services:

Weather File	London TRY
VRF heating system	
Heat Source	Heat Pump (electric): Air Source
Fuel Type	Grid Supplied Electricity
SCOP	4.5
Circulation Pump	Variable speed, pressure control across pump
System Controls	Central time control, Weather Compensation control
VRF Cooling System	
Heat Source	Heat Pump (electric): air source
Fuel Type	Grid Supplied Electricity
SEER	7
DHWS System	
Heat Source	Heat Pump (electric): Air Source
Fuel Type	Grid Supplied Electricity
Seasonal Efficiency	365%
Ventilation Systems	
Overall supply and extract SFP	1.1W/l/s
Min. heat recovery efficiency	80%
Overall extract SFP	0.2 W/l/s
Kitchen extract SFP	0.8W/l/s
Lighting	
Lumens / circuit Watt	As Specified in BRUKL

Table 2 – Service Strategy Inputs

6.6 The second stage of the recognised energy hierarchy of 'Be Lean, Be Clean, Be Green' is to exploit local energy resources such as secondary heat to reduce the developments carbon emissions. From reviewing online heat maps from the Department for Business, Energy, & Industrial Strategy there are no available heat networks to readily connect to in the local vicinity of the proposed development. Due to there being no local heat network that can be capitalised upon there are no associated carbon emission savings at this stage. However, this does not preclude a future heat network connection, should one become operational locally.

6.7 The below table provides a brief overview of available renewable and low/zero carbon technologies (LZC). The technical feasibility of installing each LZC technology at the proposed care home has been assessed in order to discount any unsuitable options at an early stage. A summary of the feasibility process is presented in the following table discusses the advantages and disadvantages that are specific to the project:

Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
Solar Photovoltaic	Photovoltaic panels convert solar radiation into electrical energy	Low maintenance. No moving parts. Easily integrated into building design.	Any overshadowing affects panel performance. Large area required for installation. Panels ideally inclined and facing southerly direction.	Yes
Solar Thermal	Solar thermal energy can contribute towards space heating and hot water requirements.	Low maintenance.	Must be sized for the building base load hot water requirements. Panels ideally inclined at around 30 degrees and facing southerly direction	Yes
Wind Turbine	Wind generation equipment operates on the basis of wind turning a propeller, which is used to drive an alternator to generate electricity. Small scale (1kW – 15kW) wind turbines can be pole or roof mounted.	Low maintenance/ On-going cost. Excess electricity can be exported to the grid.	Planning issues. Aesthetic impact. Background noise Space limitations on site. Minimum wind speed requirements. Wind survey to be undertaken to verify 'local' viability.	No
Biomass	Modern wood-fuel boilers are highly efficient, clean and almost carbon	Stable long-term running costs. Potential good CO_2 saving.	Large area needed for fuel delivery and storage. Reliable fuel supply chain required. Regular maintenance required Significant plant space required. Air pollution / Clean Air Act limits use.	No
Ground Source Heat Pump (GSHP)	GSHP systems tap into the earth's considerable energy store to provide both heating and cooling to buildings.	Minimal maintenance. Unobtrusive technology. Flexible installation options to meet available site footprint.	Large area required for horizontal pipes Full ground survey required to determine geology. More beneficial to the development if cooling is required.	No
			Integration with piled foundations must be done at an early stage. The lack of space to locate the underground pipework loops and the associated plant around the site.	
Air Source Heat Pump	Electric air source heat pumps extract thermal energy from the surrounding air and transfer it to the working fluid (air or water).	Efficient use of fuel. Relatively low capital costs.	Specialist maintenance. Some additional plant space required. External proximity to boundary and noise generation with units cycling. Impact of the required external plant and associated noise within the domestic setting can be a nuisance to residents.	Yes
Combined Heat and Power	A Combined Heat and Power (CHP) installation is effectively a mini on-site power plant providing both electrical power and thermal heat. CHP is strictly an energy efficiency measure rather than a renewable energy technology.	Potential high CO_2 saving available. Efficient use of fuel. Excess electricity can be exported to the grid	Maintenance intensive. Sufficient base thermal and electrical demand required. Additional plant space required. Noise and air quality constraints.	No
Earth Ducts	Passive pre-treatment of fresh air	Low cost Free energy	Requires significant air loads and riser space	No
Onsite Battery Storage	PV Battery Storage able to charge the battery during periods of low electrical load & discharging battery power at times of low/no solar radiation	Battery discharges power during periods of low solar radiation. Reduce electrical energy supply costs.	Specialist Maintenance Additional Plant space required Low Electrical Baseload, battery storage not economically viable	No

Table 3 – L2C Technology Feasibility

6.8 The development will utilise an Air Source Heat Pump serving the space heating (VRF) and hot water generation in addition to 295m^2 photovoltaic array unit to comply with Part L2:2021 Building regulations.

6.1 The grants available for the LZC technology proposed on this scheme, in this case ASHP and PV, are as follows:

RHI:

'The Renewable Heat Incentive (RHI), launched in November 2011, is a DECC initiative designed to provide support to renewable heat technologies in order to increase deployment and aid market development with the ultimate aim of reducing cost of installation. The RHI supports heat where that heat is used in a building for 'eligible purposes': heating a space, heating water, or for carrying out a process where the heat is used. Heat utilised to produce or process the renewable fuel, or used for electricity generation, does not qualify for RHI.'

Applications for the Renewable Heat Incentive (RHI) are now closed so this grant is no longer available.

GHNF:

'The Green Heat Network Fund (GHNF) is a capital grant fund that will support:

- *The commercialisation and construction of new low and zero carbon (LZC) heat networks (including the supply of cooling)*
- *The retrofitting and expansion of existing heat networks*

It aims to develop and grow the heat network marker and to address some of the challenges of decarbonising the UK's heat sector.'

6.2 The second stage of the recognised energy hierarchy of 'Be Lean, Be Clean, Be Green' is to exploit local energy resources such as secondary heat to reduce the developments carbon emissions. From reviewing online heat maps from the Department for Business, Energy, & Industrial Strategy there are no available heat networks to readily connect to in the local vicinity of the proposed development. Due to there being no local heat network that can be capitalised upon there are no associated carbon emission savings at this stage. However, this does not preclude a future heat network connection, should one become operational locally.

7.0 HEATING INFRASTRUCTURE

7.1 The second stage of the recognised energy hierarchy of 'Be Lean, Be Clean, Be Green' is to exploit local energy resources such as secondary heat to reduce the developments carbon emissions. From reviewing online heat maps from the Department for Business, Energy, & Industrial Strategy there are no available heat networks to readily connect to in the local vicinity of the proposed development. Due to there being no local heat network that can be capitalised upon there are no associated carbon emission savings at this stage. However, this does not preclude a future heat network connection, should one become operational locally.

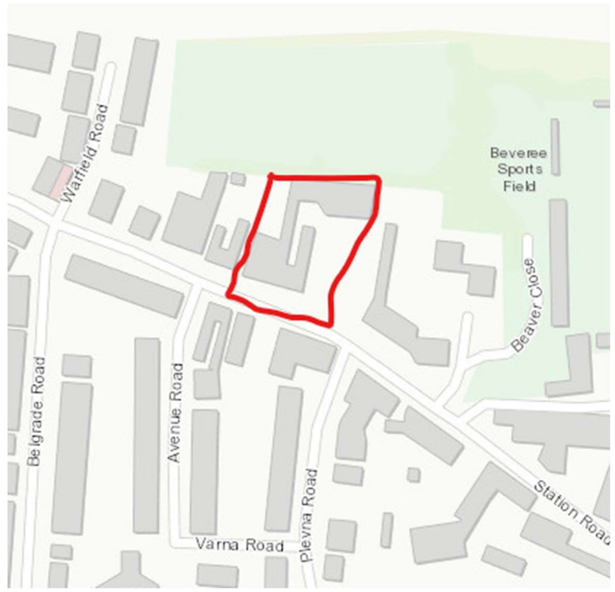


Figure 5: District Heating Network map as per the UK Development Map

8.0 HEAT PUMP

8.1 Heat pumps take a low-grade source of heat e.g. a lake or external air, and through a process similar to that of a domestic refrigerator, “upgrade” the heat for use in a heating system, or for domestic hot water generation.

8.2 Reverse-cycle heat pumps can also use the same process in reverse to provide cooling if required. For the purposes of this report, given the nature of the development and typical service strategy is assumed that any heat pumps installed will only operate in heating mode. Although there are several day spaces that require cooling, the typical servicing arrangement would suggest these are best fed from local plant rather than the introduction of multiple heat pump units, chilled pipework and equipment etc.

8.3 Air source heat pumps operate on the same principle as ground source heat pumps, but instead of using the Earth as a heat source, they extract heat from external air. Heat pumps that generate significant amounts of heat will require external pant areas.

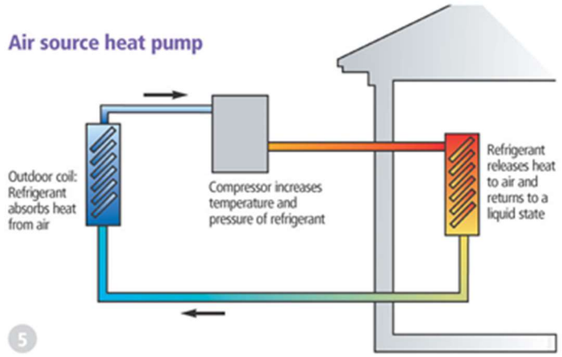


Figure 5 – Air Source Heat Pump

9.0 PHOTOVOLTAIC ARRAY (PV)

9.1 A PV system uses layers of semi-conductor material to produce electricity generated directly from sunlight. Several types of PV are available with varying costs and performance.

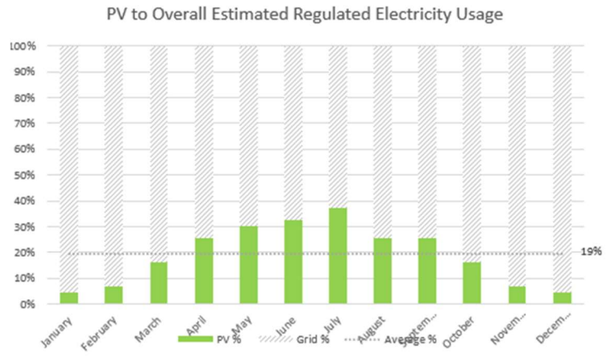
9.2 The efficiency ranges around 20% for high performance panels, based on peak output under ideal conditions. For panels to function effectively, they must be installed in an unshaded location, and correctly orientated based on the site latitude.

9.3 The PV panel system proposed requires a roof area of 295m^2. PV panels are mounted on a metal racking system which are typically angled at between 5 and 30 degrees to improve the energy capture, for maintenance the system requires access paths, provided with man safe system where required. Visual impact has to be taken into consideration, PV solar system installation will be prevented on sloping roof and therefore will be visible. The intermittency and unpredictability of solar energy due to weather is an element which can dictate that the system is not used at full potential. A further consideration is the additional structural provisions support the photovoltaic panels and metal racking system which for a system of this size is considerable.

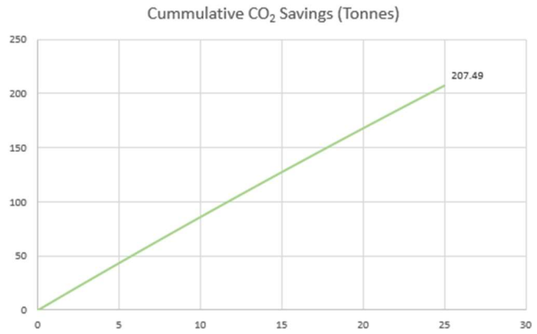
Figure 6 – Roof mounted PV panels

Figure 7 – Frame mounted PV on flat roof

9.4 Following calculation, the PV installation will generate an average of 19% of the building's electrical energy consumption, with a peak of 37% in July, reducing the impact of the proposed development on the local grid.



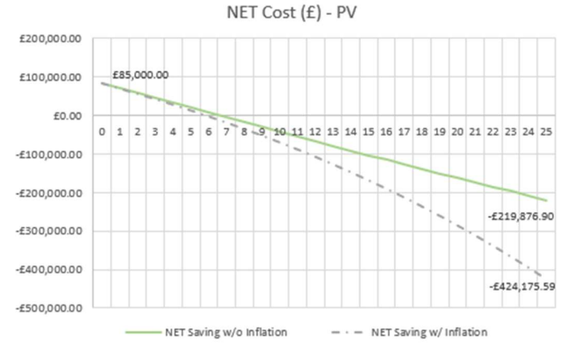
9.5 By generating the energy on site through photovoltaics the associated emissions will be 0.0kg/CO_2.m^2 compared to 0.1388kg/CO_2.m^2 for grid supplied electricity. Over the 25-year lifespan of the photovoltaic installation the cumulative CO_2 that would have otherwise been emitted is 207.49 Tonnes.



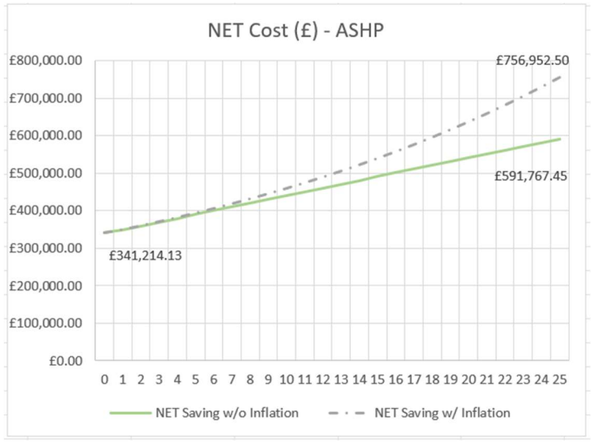
10.0 PAYBACK

10.1 In order to establish the life cycle cost for the renewable systems the report will need to establish costing for Energy Consumption, Energy Generation, Maintenance and Estimated Fuel Tariffs. Based on the current Tariffs known of the operator of 5p/kWh and 22p/kWh for gas and electricity, respectively, the following can be calculated.

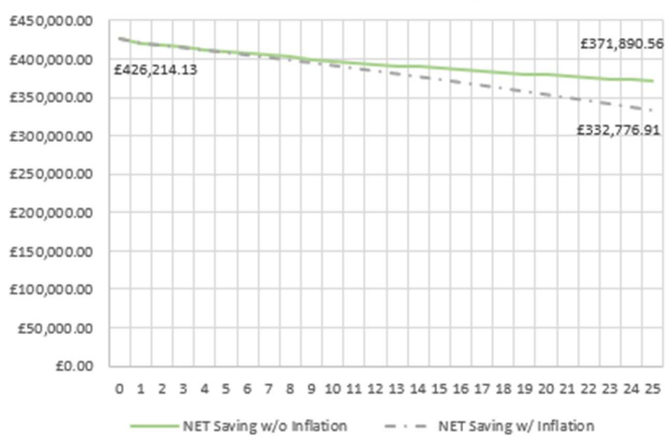
10.2 To achieve compliance with Approved Document L2: 2021 and local planning requirements 295m^2 photovoltaic panel array is required to be placed on the building. This is estimated at an installation cost of £85,000. Following the estimated electrical generation of the array based on the building location a payback period of 7 years has been calculated with a saving of £219,876.90 as over the 25-year life span of the installation. This can be seen as a reasonable worst case for the array with the above calculation accounting for a reduction in output of 0.5% per year and assuming no inflation in energy prices. Should the average inflation in energy prices of energy prices over the last 20-years (4%) be included in the calculation the saving over the installation lifespan increases to £424,175.59.



10.3 However, it should be noted that whilst the installation of a photovoltaic array will have a reduction in the operational running costs of the development the installation of an ASHP will be negative with an additional running cost to gas boilers of an estimated £591,767.45 (rising to an estimated £756,952.50 accounting for inflation).



10.4 Accounting for both the photovoltaic array and the ASHP the payback period for the LZC Technologies would be 196.2 years not accounting for inflation with a lifetime cost of £371,890.56.



11.0 RESULTS WITH LOW CARBON TECHNOLOGY (BE GREEN)

11.1 Through the above services strategy and the application of an Air Source Heat Pump serving space heating (VRF) and hot water generation, 295m^2 of photovoltaic array and monitoring outer-range-values for HVAC and lighting, efficient SFPs and demand control for the ventilation speed, the below emissions and primary energy ratings where achieved.

Target Emissions Rating (TER)	**9.16 kgCO$_2$/m^2.annum**
Building Emissions Rating (BER)	**5.94 kgCO$_2$/m^2.annum**
Target Primary Energy Rate (TPER)	**99.61 kWh/m^2.annum**
Building Primary Energy Rate (BPER)	**63.36 kWh/m^2.annum**

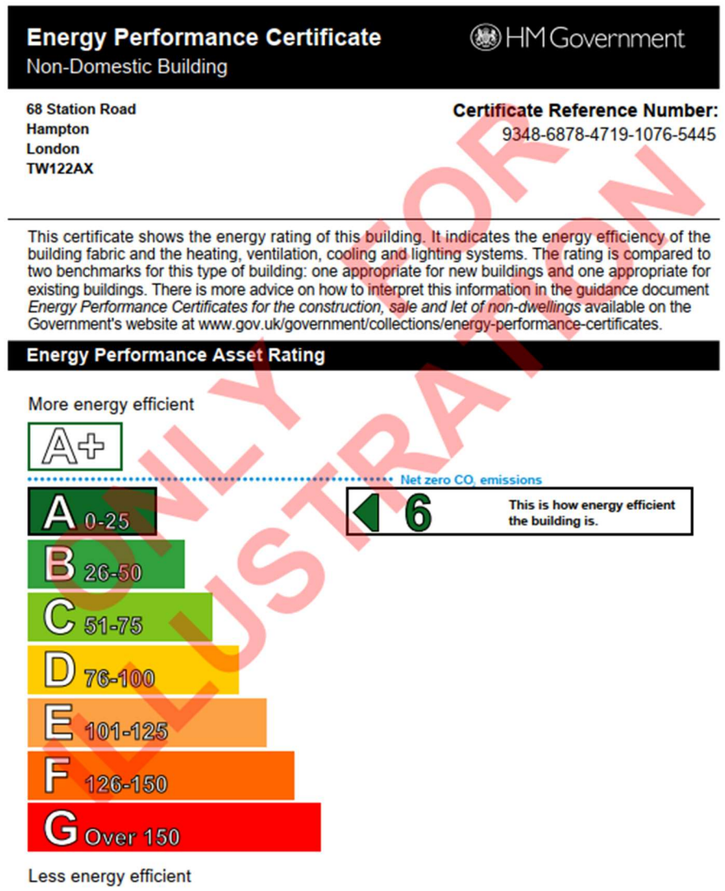


Figure 7 – EPC

12.0 CARBON OFFSET

12.1 In-line the GLA London Plan 2021 and local Planning policy the development now successfully demonstrating compliance with Building Regulations 2021 and surpassing this threshold by 35% (15% improvement from energy efficient measures) and needs to offset the residual carbon associated with the scheme through further on-site savings and/or offset payments. In-line with the GLA guidance this is based upon the 25.6tCO2e/yr for 30 years at £95/tCO2, therefore the cash in lieu contribution will be £73,090 See table below.

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO_2 per annum)	(%)
Be lean: savings from energy demand reduction	8.5	20%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	6.3	15%
Total Cumulative Savings	**14.8**	**35%**
Annual savings from off-set payment	27.3	-
	(Tonnes CO_2)	
Cumulative savings for off-set payment	**819**	-
Cash in-lieu contribution (£)	**77,806**	

APPENDIX A – BRUKL DOCUMENTATION

The following pages detail the predicted BRUKL output and Part L compliance information for the proposed care home building based on the solution as described elsewhere in this report.

This analysis demonstrates feasibility only. The contractor shall be responsible for developing a holistic solution in conjunction with the detailing architect to achieve compliance.

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2021

Project name

2518 - Cinnamon Hampton

As designed

Date: Fri Jul 19 14:26:23 2024

Administrative information

Building Details

Address: 68 Station Road, Hampton, London, TW122AX

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.6"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.6

BRUKL compliance module version: v6.1.e.0

Certifier details

Name:

Telephone number:

Address: , ,

Foundation area [m^2]: 1021.09

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	9.16	
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	5.94	
Target primary energy rate (TPER), kWh_{PE}/m^2.annum	99.61	
Building primary energy rate (BPER), kWh_{PE}/m^2.annum	63.36	
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	0.19	0.19	External Wall
Floors	0.18	0.15	0.15	Ground Floor
Pitched roofs	0.16	0.13	0.13	Roof
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	1.04	1.04	EW.02 - 1.81x2.25
Rooflights***	2.2	-	-	No rooflights in project
Personnel doors^	1.6	1.04	1.04	ED.04 - 1.545x2.73
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

$U_{a\text{-}Limit}$ = 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	5

Building services

For details on the standard values listed below, system-specific guidance, and additional regulatory requirements, refer to the Approved Documents.

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

1- VRF/Mech Vent (64 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	7	-	1.1	0.8
Standard value	2.5*	5	N/A	1.5^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. ^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- VRF/Nat Vent (95 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.5	7	-	-	-
Standard value	2.5*	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- VRF/Nat Vent (0-Comms 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Kitchen (0-Kitchen 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	-	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- Elec Panel/Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	-	-	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

6- No Heat/Extract (101 Zones)

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

7- VRF/Extract (6 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	7	-	-	-
Standard value	N/A	5	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- HWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	3.65	0
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

Zone-level mechanical ventilation, exhaust, and terminal units

ID	System type in the Approved Documents
A	Local supply or extract ventilation units
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal balanced supply and extract ventilation system
E	Local balanced supply and extract ventilation units
F	Other local ventilation units
G	Fan assisted terminal variable air volume units
H	Fan coil units
I	Kitchen extract with the fan remote from the zone and a grease filter
NB: Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.	

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
0-Corridor 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Staff Corridor 2	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Staff Corridor 3	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Lift Lobby 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Gym 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Kitchen 1	-	-	-	-	-	-	-	-	0.8	-	N/A
0-Cinema 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Hair and Beauty 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Kitchen Change 1	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Male Change 1	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Female Change 1	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Laundry 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Kitchen Cleaner 1	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Cleaner 1	0.2	-	-	-	-	-	-	-	-	-	N/A
0-WC 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 5	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 6	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 7	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 8	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 9	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 10	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 11	0.2	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
1-Ensuite 12	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 13	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 14	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 15	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 16	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 17	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Ensuite 18	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Corridor 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 2	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 3	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 4	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 5	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 6	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Suite Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Suite Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Suite Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Suite Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Corridor 7	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 8	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 9	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Corridor 10	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Lift Lobby 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Lift Lobby 2	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Lift Lobby 3	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Lift Lobby 4	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Welcoming/Lounging Area 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-WC 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-WC 2	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Spa 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Sluice 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Nurse Station 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Drugs 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Dining 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Cleaner 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 5	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 6	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 7	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 8	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 9	0.2	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
2-Ensuite 10	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 11	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 12	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 13	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 14	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 15	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 16	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 17	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 18	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 19	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 20	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 21	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 22	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 23	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 24	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 25	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 26	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 27	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 28	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 29	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 30	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 31	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Corridor 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 2	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 4	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 5	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 6	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 7	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 8	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 9	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Corridor 10	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Suite Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Suite Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Suite Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Suite Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Dining 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Lounge 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Lift Lobby 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Lift Lobby 2	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Lift Lobby 3	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Lift Lobby 4	-	-	-	1.1	-	-	-	-	-	-	N/A
2-WC 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-WC 2	0.2	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
2-Private Dining 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Hoist 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Cleaner 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Nurse Station 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Drugs 1	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Spa 1	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Sluice 1	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Corridor 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 2	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 3	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 4	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 5	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 6	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 7	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 8	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 9	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Corridor 10	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 5	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 6	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 7	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 8	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 9	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 10	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 11	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 12	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 13	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 14	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 15	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 16	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 17	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 18	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 19	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 20	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 21	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 22	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 23	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 24	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 25	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Ensuite 26	0.2	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard
3-WC 1	0.2	-	-	-	-	-	-	-	-	-	N/A
3-WC 2	0.2	-	-	-	-	-	-	-	-	-	N/A
3-WC 3	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Dining/Lounge 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Dining/Lounge 2	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Lift Lobby 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Lift Lobby 2	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Lift Lobby 3	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Lift Lobby 4	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Training 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Sluice 1	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Drugs 1	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Nurse Station 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Garden Room 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Spa 1	-	-	-	1.1	-	-	-	-	-	-	N/A
3-Hoist 1	0.2	-	-	-	-	-	-	-	-	-	N/A
3-Cleaner 1	0.2	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	General luminaire	Display light source	
Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
Standard value	95	80	0.3
0-Corridor 1	110	-	-
0-Staff Corridor 2	110	-	-
0-Staff Corridor 3	110	-	-
0-Lift Lobby 1	110	-	-
0-Gym 1	110	-	-
0-Kitchen 1	130	-	-
0-Cinema 1	110	-	-
0-Hair and Beauty 1	133	-	-
0-Maintenance Office 1	108	-	-
0-Store 1	110	-	-
0-Store 2	110	-	-
0-Store 3	110	-	-
0-Comms 1	130	-	-
0-Kitchen Change 1	108	-	-
0-Male Change 1	108	-	-
0-Female Change 1	108	-	-
0-Water Tank 1	130	-	-
0-Plant 1	130	-	-
0-Laundry 1	130	-	-
0-Stairs 1	133	-	-
0-Stairs 2	133	-	-
0-Kitchen Cleaner 1	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
0-Cleaner 1	110	-	-
0-Unpack 1	110	-	-
0-WC 1	133	-	-
1-Bedroom 1	110	-	-
1-Bedroom 2	110	-	-
1-Bedroom 3	110	-	-
1-Bedroom 4	110	-	-
1-Bedroom 5	110	-	-
1-Bedroom 6	110	-	-
1-Bedroom 7	110	-	-
1-Bedroom 8	110	-	-
1-Bedroom 9	110	-	-
1-Bedroom 10	110	-	-
1-Bedroom 11	110	-	-
1-Bedroom 12	110	-	-
1-Bedroom 13	110	-	-
1-Bedroom 14	110	-	-
1-Bedroom 15	110	-	-
1-Bedroom 16	110	-	-
1-Bedroom 17	110	-	-
1-Bedroom 18	110	-	-
1-Ensuite 1	110	-	-
1-Ensuite 2	110	-	-
1-Ensuite 3	110	-	-
1-Ensuite 4	110	-	-
1-Ensuite 5	110	-	-
1-Ensuite 6	110	-	-
1-Ensuite 7	110	-	-
1-Ensuite 8	110	-	-
1-Ensuite 9	110	-	-
1-Ensuite 10	110	-	-
1-Ensuite 11	110	-	-
1-Ensuite 12	110	-	-
1-Ensuite 13	110	-	-
1-Ensuite 14	110	-	-
1-Ensuite 15	110	-	-
1-Ensuite 16	110	-	-
1-Ensuite 17	110	-	-
1-Ensuite 18	110	-	-
1-Corridor 1	110	-	-
1-Corridor 2	110	-	-
1-Corridor 3	110	-	-
1-Corridor 4	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
1-Corridor 5	110	-	-
1-Corridor 6	110	-	-
1-Suite 1	110	-	-
1-Suite 2	110	-	-
1-Suite 3	110	-	-
1-Suite 4	110	-	-
1-Suite Bedroom 2	110	-	-
1-Suite Bedroom 3	110	-	-
1-Suite Bedroom 4	110	-	-
1-Suite Ensuite 1	110	-	-
1-Suite Ensuite 2	110	-	-
1-Suite Ensuite 3	110	-	-
1-Suite Ensuite 4	110	-	-
1-Corridor 7	110	-	-
1-Corridor 8	110	-	-
1-Corridor 9	110	-	-
1-Corridor 10	110	-	-
1-Stairs 1	133	-	-
1-Stairs 2	133	-	-
1-Stairs 3	133	-	-
1-Lift Lobby 1	110	-	-
1-Lift Lobby 2	110	-	-
1-Lift Lobby 3	110	-	-
1-Lift Lobby 4	110	-	-
1-Welcoming/Lounging Area 1	110	-	-
1-WC 1	133	-	-
1-WC 2	133	-	-
1-Admin 1	108	-	-
1-Entrance Lobby 1	100	-	-
1-Store 1	110	-	-
1-Store 2	110	-	-
1-Spa 1	133	-	-
1-Sluice 1	130	-	-
1-Nurse Station 1	108	-	-
1-Drugs 1	108	-	-
1-Dining 1	110	-	-
1-Linen 1	110	-	-
1-Linen 2	110	-	-
1-Cleaner 1	110	-	-
2-Bedroom 1	110	-	-
2-Bedroom 2	110	-	-
2-Bedroom 3	110	-	-
2-Bedroom 4	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
2-Bedroom 5	110	-	-
2-Bedroom 6	110	-	-
2-Bedroom 7	110	-	-
2-Bedroom 8	110	-	-
2-Bedroom 9	110	-	-
2-Bedroom 10	110	-	-
2-Bedroom 11	110	-	-
2-Bedroom 12	110	-	-
2-Bedroom 13	110	-	-
2-Bedroom 14	110	-	-
2-Bedroom 15	110	-	-
2-Bedroom 16	110	-	-
2-Bedroom 17	110	-	-
2-Bedroom 18	110	-	-
2-Bedroom 19	110	-	-
2-Bedroom 20	110	-	-
2-Bedroom 21	110	-	-
2-Bedroom 22	110	-	-
2-Bedroom 23	110	-	-
2-Bedroom 24	110	-	-
2-Bedroom 25	110	-	-
2-Bedroom 26	110	-	-
2-Bedroom 27	110	-	-
2-Bedroom 28	110	-	-
2-Bedroom 29	110	-	-
2-Bedroom 30	110	-	-
2-Bedroom 31	110	-	-
2-Ensuite 1	110	-	-
2-Ensuite 2	110	-	-
2-Ensuite 3	110	-	-
2-Ensuite 4	110	-	-
2-Ensuite 5	110	-	-
2-Ensuite 6	110	-	-
2-Ensuite 7	110	-	-
2-Ensuite 8	110	-	-
2-Ensuite 9	110	-	-
2-Ensuite 10	110	-	-
2-Ensuite 11	110	-	-
2-Ensuite 12	110	-	-
2-Ensuite 13	110	-	-
2-Ensuite 14	110	-	-
2-Ensuite 15	110	-	-
2-Ensuite 16	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
2-Ensuite 17	110	-	-
2-Ensuite 18	110	-	-
2-Ensuite 19	110	-	-
2-Ensuite 20	110	-	-
2-Ensuite 21	110	-	-
2-Ensuite 22	110	-	-
2-Ensuite 23	110	-	-
2-Ensuite 24	110	-	-
2-Ensuite 25	110	-	-
2-Ensuite 26	110	-	-
2-Ensuite 27	110	-	-
2-Ensuite 28	110	-	-
2-Ensuite 29	110	-	-
2-Ensuite 30	110	-	-
2-Ensuite 31	110	-	-
2-Corridor 1	110	-	-
2-Corridor 2	110	-	-
2-Corridor 4	110	-	-
2-Corridor 5	110	-	-
2-Corridor 6	110	-	-
2-Corridor 7	110	-	-
2-Corridor 8	110	-	-
2-Corridor 9	110	-	-
2-Corridor 10	110	-	-
2-Suite 1	110	-	-
2-Suite 2	110	-	-
2-Suite 3	110	-	-
2-Suite 4	110	-	-
2-Suite Bedroom 1	110	-	-
2-Suite Bedroom 2	110	-	-
2-Suite Bedroom 3	110	-	-
2-Suite Bedroom 4	110	-	-
2-Suite Ensuite 1	110	-	-
2-Suite Ensuite 2	110	-	-
2-Suite Ensuite 3	110	-	-
2-Suite Ensuite 4	110	-	-
2-Dining 1	110	-	-
2-Lounge 1	110	-	-
2-Stair 1	133	-	-
2-Stair 2	133	-	-
2-Stair 3	133	-	-
2-Lift Lobby 1	110	-	-
2-Lift Lobby 2	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
2-Lift Lobby 3	110	-	-
2-Lift Lobby 4	110	-	-
2-Store 1	110	-	-
2-Store 2	110	-	-
2-Store 3	110	-	-
2-WC 1	133	-	-
2-WC 2	133	-	-
2-Private Dining 1	110	-	-
2-Hoist 1	110	-	-
2-Cleaner 1	110	-	-
2-Nurse Station 1	108	-	-
2-Drugs 1	108	-	-
2-Spa 1	133	-	-
2-Sluice 1	130	-	-
2-Linen 1	110	-	-
3-Bedroom 1	110	-	-
3-Bedroom 2	110	-	-
3-Bedroom 3	110	-	-
3-Bedroom 4	110	-	-
3-Bedroom 5	110	-	-
3-Bedroom 6	110	-	-
3-Bedroom 7	110	-	-
3-Bedroom 8	110	-	-
3-Bedroom 9	110	-	-
3-Bedroom 10	110	-	-
3-Bedroom 11	110	-	-
3-Bedroom 12	110	-	-
3-Bedroom 13	110	-	-
3-Bedroom 14	110	-	-
3-Bedroom 15	110	-	-
3-Bedroom 16	110	-	-
3-Bedroom 17	110	-	-
3-Bedroom 18	110	-	-
3-Bedroom 19	110	-	-
3-Bedroom 20	110	-	-
3-Bedroom 21	110	-	-
3-Bedroom 22	110	-	-
3-Bedroom 23	110	-	-
3-Bedroom 24	110	-	-
3-Bedroom 25	110	-	-
3-Bedroom 26	110	-	-
3-Corridor 1	110	-	-
3-Corridor 2	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
3-Corridor 3	110	-	-
3-Corridor 4	110	-	-
3-Corridor 5	110	-	-
3-Corridor 6	110	-	-
3-Corridor 7	110	-	-
3-Corridor 8	110	-	-
3-Corridor 9	110	-	-
3-Corridor 10	110	-	-
3-Ensuite 1	110	-	-
3-Ensuite 2	110	-	-
3-Ensuite 3	110	-	-
3-Ensuite 4	110	-	-
3-Ensuite 5	110	-	-
3-Ensuite 6	110	-	-
3-Ensuite 7	110	-	-
3-Ensuite 8	110	-	-
3-Ensuite 9	110	-	-
3-Ensuite 10	110	-	-
3-Ensuite 11	110	-	-
3-Ensuite 12	110	-	-
3-Ensuite 13	110	-	-
3-Ensuite 14	110	-	-
3-Ensuite 15	110	-	-
3-Ensuite 16	110	-	-
3-Ensuite 17	110	-	-
3-Ensuite 18	110	-	-
3-Ensuite 19	110	-	-
3-Ensuite 20	110	-	-
3-Ensuite 21	110	-	-
3-Ensuite 22	110	-	-
3-Ensuite 23	110	-	-
3-Ensuite 24	110	-	-
3-Ensuite 25	110	-	-
3-Ensuite 26	110	-	-
3-WC 1	133	-	-
3-WC 2	133	-	-
3-WC 3	133	-	-
3-Dining/Lounge 1	110	-	-
3-Dining/Lounge 2	110	-	-
3-Lift Lobby 1	110	-	-
3-Lift Lobby 2	110	-	-
3-Lift Lobby 3	110	-	-
3-Lift Lobby 4	110	-	-

General lighting and display lighting	General luminaire	Display light source	
Zone name	**Efficacy [lm/W]**	**Efficacy [lm/W]**	**Power density [W/m²]**
Standard value	95	80	0.3
3-Stairs 1	133	-	-
3-Stairs 2	133	-	-
3-Stairs 3	133	-	-
3-Staffroom 1	108	-	-
3-Training 1	108	-	-
3-Managers 1	133	-	-
3-Sluice 1	130	-	-
3-Drugs 1	108	-	-
3-Nurse Station 1	108	-	-
3-Garden Room 1	110	-	-
3-Spa 1	133	-	-
3-Store 1	110	-	-
3-Store 2	110	-	-
3-Hoist 1	110	-	-
3-Cleaner 1	110	-	-

The spaces in the building should have appropriate passive control measures to limit solar gains in summer

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0-Corridor 1	N/A	N/A
0-Staff Corridor 2	N/A	N/A
0-Staff Corridor 3	N/A	N/A
0-Lift Lobby 1	N/A	N/A
0-Gym 1	N/A	N/A
0-Cinema 1	N/A	N/A
0-Hair and Beauty 1	N/A	N/A
0-Maintenance Office 1	N/A	N/A
0-Kitchen Change 1	N/A	N/A
0-Male Change 1	N/A	N/A
0-Female Change 1	N/A	N/A
0-Laundry 1	N/A	N/A
1-Bedroom 1	NO (-31%)	NO
1-Bedroom 2	NO (-38%)	NO
1-Bedroom 3	NO (-61%)	NO
1-Bedroom 4	NO (0%)	NO
1-Bedroom 5	NO (-17%)	NO
1-Bedroom 6	NO (-15%)	NO
1-Bedroom 7	NO (-13%)	NO
1-Bedroom 8	NO (-11%)	NO
1-Bedroom 9	NO (-12%)	NO
1-Bedroom 10	NO (-60%)	NO
1-Bedroom 11	NO (-45%)	NO
1-Bedroom 12	NO (-57%)	NO
1-Bedroom 13	NO (-58%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
1-Bedroom 14	NO (-45%)	NO
1-Bedroom 15	NO (-53%)	NO
1-Bedroom 16	NO (-66%)	NO
1-Bedroom 17	NO (-24%)	NO
1-Bedroom 18	NO (-24%)	NO
1-Corridor 1	N/A	N/A
1-Corridor 2	NO (-40%)	NO
1-Corridor 3	NO (-44%)	NO
1-Corridor 4	N/A	N/A
1-Corridor 5	N/A	N/A
1-Corridor 6	N/A	N/A
1-Suite 1	NO (-46%)	NO
1-Suite 2	NO (-27%)	NO
1-Suite 3	NO (-88%)	NO
1-Suite 4	NO (-49%)	NO
1-Suite Bedroom 2	NO (-73%)	NO
1-Suite Bedroom 3	NO (-39%)	NO
1-Suite Bedroom 4	NO (-49%)	NO
1-Corridor 7	N/A	N/A
1-Corridor 8	YES (+41%)	NO
1-Corridor 9	N/A	N/A
1-Corridor 10	N/A	N/A
1-Lift Lobby 1	N/A	N/A
1-Lift Lobby 2	YES (+21%)	NO
1-Lift Lobby 3	NO (-12%)	NO
1-Lift Lobby 4	N/A	N/A
1-Welcoming/Lounging Area 1	N/A	N/A
1-Admin 1	NO (-65%)	NO
1-Entrance Lobby 1	YES (+69%)	NO
1-Spa 1	N/A	N/A
1-Nurse Station 1	N/A	N/A
1-Drugs 1	N/A	N/A
1-Dining 1	NO (-76%)	NO
2-Bedroom 1	NO (-48%)	NO
2-Bedroom 2	NO (-42%)	NO
2-Bedroom 3	NO (-52%)	NO
2-Bedroom 4	NO (-52%)	NO
2-Bedroom 5	NO (-42%)	NO
2-Bedroom 6	NO (-26%)	NO
2-Bedroom 7	NO (-38%)	NO
2-Bedroom 8	NO (-37%)	NO
2-Bedroom 9	NO (-36%)	NO
2-Bedroom 10	NO (-36%)	NO
2-Bedroom 11	NO (-37%)	NO
2-Bedroom 12	NO (-71%)	NO
2-Bedroom 13	NO (-60%)	NO
2-Bedroom 14	NO (-69%)	NO
2-Bedroom 15	NO (-69%)	NO
2-Bedroom 16	NO (-60%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2-Bedroom 17	NO (-36%)	NO
2-Bedroom 18	NO (-51%)	NO
2-Bedroom 19	NO (-35%)	NO
2-Bedroom 20	NO (-40%)	NO
2-Bedroom 21	NO (-39%)	NO
2-Bedroom 22	NO (-40%)	NO
2-Bedroom 23	NO (-39%)	NO
2-Bedroom 24	NO (-40%)	NO
2-Bedroom 25	NO (-40%)	NO
2-Bedroom 26	NO (-39%)	NO
2-Bedroom 27	NO (-39%)	NO
2-Bedroom 28	NO (-39%)	NO
2-Bedroom 29	NO (-45%)	NO
2-Bedroom 30	NO (-46%)	NO
2-Bedroom 31	NO (-76%)	NO
2-Corridor 1	N/A	N/A
2-Corridor 2	N/A	N/A
2-Corridor 4	N/A	N/A
2-Corridor 5	N/A	N/A
2-Corridor 6	N/A	N/A
2-Corridor 7	N/A	N/A
2-Corridor 8	N/A	N/A
2-Corridor 9	N/A	N/A
2-Corridor 10	N/A	N/A
2-Suite 1	NO (-71%)	NO
2-Suite 2	NO (-55%)	NO
2-Suite 3	N/A	N/A
2-Suite 4	NO (-85%)	NO
2-Suite Bedroom 1	NO (-24%)	NO
2-Suite Bedroom 2	NO (-71%)	NO
2-Suite Bedroom 3	NO (-55%)	NO
2-Suite Bedroom 4	NO (-62%)	NO
2-Dining 1	NO (-75%)	NO
2-Lounge 1	NO (-53%)	NO
2-Lift Lobby 1	N/A	N/A
2-Lift Lobby 2	N/A	N/A
2-Lift Lobby 3	N/A	N/A
2-Lift Lobby 4	N/A	N/A
2-Private Dining 1	NO (-36%)	NO
2-Nurse Station 1	N/A	N/A
2-Drugs 1	N/A	N/A
2-Spa 1	N/A	N/A
3-Bedroom 1	NO (-27%)	NO
3-Bedroom 2	NO (-25%)	NO
3-Bedroom 3	NO (-41%)	NO
3-Bedroom 4	NO (-42%)	NO
3-Bedroom 5	NO (-39%)	NO
3-Bedroom 6	NO (-21%)	NO
3-Bedroom 7	NO (-22%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
3-Bedroom 8	NO (-23%)	NO
3-Bedroom 9	NO (-22%)	NO
3-Bedroom 10	NO (-22%)	NO
3-Bedroom 11	NO (-23%)	NO
3-Bedroom 12	NO (-71%)	NO
3-Bedroom 13	NO (-51%)	NO
3-Bedroom 14	NO (-61%)	NO
3-Bedroom 15	NO (-62%)	NO
3-Bedroom 16	NO (-51%)	NO
3-Bedroom 17	NO (-22%)	NO
3-Bedroom 18	NO (-30%)	NO
3-Bedroom 19	NO (-36%)	NO
3-Bedroom 20	NO (-40%)	NO
3-Bedroom 21	NO (-39%)	NO
3-Bedroom 22	NO (-76%)	NO
3-Bedroom 23	NO (-33%)	NO
3-Bedroom 24	NO (-34%)	NO
3-Bedroom 25	NO (-59%)	NO
3-Bedroom 26	NO (-55%)	NO
3-Corridor 1	N/A	N/A
3-Corridor 2	N/A	N/A
3-Corridor 3	N/A	N/A
3-Corridor 4	NO (-59%)	NO
3-Corridor 5	NO (-22%)	NO
3-Corridor 6	N/A	N/A
3-Corridor 7	N/A	N/A
3-Corridor 8	N/A	N/A
3-Corridor 9	N/A	N/A
3-Corridor 10	N/A	N/A
3-Dining/Lounge 1	NO (-71%)	NO
3-Dining/Lounge 2	NO (-55%)	NO
3-Lift Lobby 1	N/A	N/A
3-Lift Lobby 2	N/A	N/A
3-Lift Lobby 3	N/A	N/A
3-Lift Lobby 4	N/A	N/A
3-Staffroom 1	NO (-67%)	NO
3-Training 1	NO (-75%)	NO
3-Managers 1	N/A	N/A
3-Drugs 1	N/A	N/A
3-Nurse Station 1	N/A	N/A
3-Garden Room 1	NO (-55%)	NO
3-Spa 1	N/A	N/A

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m^2]	4221	4221
External area [m^2]	6305	6305
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	1474	2121
Average U-value [W/m^2K]	0.23	0.34
Alpha value* [%]	29.81	14.81

* 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
100	**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	4.49	7.49
Cooling	4.02	9.91
Auxiliary	12.13	10.76
Lighting	11.93	11.66
Hot water	24.06	31.69
Equipment*	88.92	88.92
TOTAL**	**56.63**	**71.51**

* 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	13.87	3.98
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
Displaced electricity	*13.87*	*3.98*

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	133.99	226.12
Primary energy [kWh_{PE}/m^2]	63.36	99.61
Total emissions [kg/m^2]	5.94	9.16

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	4.6	209.8	0.3	8.3	16.9	4.5	7	4.5	7
	Notional	6	309.8	0.6	19.6	16.1	2.64	4.4	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	17.4	48.1	1.1	1.9	3.5	4.5	7	4.5	7
	Notional	0.7	91.4	0.1	5.8	1.8	2.64	4.4	----	----
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	0	0	0	294.7	0	0	0	0
	Notional	0	0	0	0	147.7	0	0	----	----
[ST] Unflued radiant heater, [HS] Unflued radiant heater, [HFT] Electricity, [CFT] Electricity										
	Actual	167.8	0	49.1	0	0	0.95	0	1	0
	Notional	211.3	0	43.8	0	0	1.34	0	----	----
[ST] Central heating using water: radiators, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	72.9	0	21.3	0	10.7	0.95	0	1	0
	Notional	67.9	0	14.1	0	15.7	1.34	0	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
	Actual	0	92.1	0	3.7	3.3	0	7	0	7
	Notional	0	119.6	0	7.6	29.8	0	4.4	----	----

Key to terms

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