PROPOSED CARE HOME & CARE APARTMENTS, HAMPTON

FOR

HAMPTON CARE HOME LTD

ENERGY STRATEGY REPORT

REVISION P3
August 2019

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Revision	Date Issued	Description	Prepared	Approved
P1	31/07/2019	Planning Issue (Draft)	LS	SG
P2	28/08/2019	Planning Issue	LS	SG
P3	02/09/2019	Bed/Suite Numbers Updated	LS	SG

1 Contents

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3 Introduction

This document details the intended energy strategy for the proposed care home development on Station road, Hampton.

The report has been prepared in accordance with the local planning policies and the building has been assessed to comply with Part L2A 2013.

The report takes into account the recognised energy hierarchy to “Be Lean, Be Clean, Be Green”, i.e. to minimise the building’s energy usage before applying renewable technologies to the design.

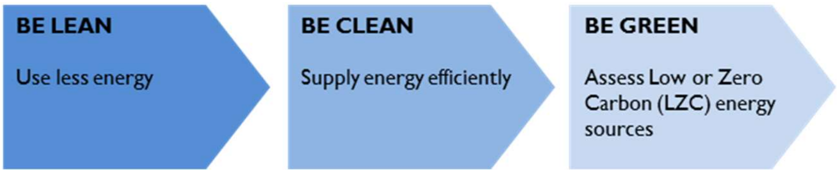

Figure 1 - Energy Hierarchy

Further work will be required at later stages in the 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 as the detailed design progresses.

Analysis for the Proposed Care Home has been undertaken utilising EDSL Tas Version 9.4.3.

In order to achieve compliance with Part L2A of the building regulations and any planning policies, it was necessary to investigate appropriate LZC technologies to reduce the energy consumption and CO_2 emissions 35% below the baseline level. A site wide strategy will need to be developed to meet the requirements of building regulations and the local planning requirements. Within the Care Home and Care Suites, an analysis of a CHP installation together with photovoltaic panels showed this would be appropriate to meet these targets. Though other technologies would be feasible, CHP and photovoltaic panels are ideally suited to developments such as this due to the steady thermal and electrical baseloads.

4 Description of the Development

The proposed development consists of a new Care Home & Care Suites located in Hampton. The development consists of care bedrooms, care suites, day spaces, offices, café/foyer, plantroom, kitchen, laundry and main reception area.

Figure 2 – Site Plan

The assessment has been based on the following PRC Architects layout drawings, plus supporting elevations and sectional drawings:

- 11045_PL-011_A Lower Ground
- 11045_PL-012_A Ground Floor Layout
- 11045_PL-013_A First Floor Layout
- 11045_PL-014_A Second Floor Layout
- 11045_PL-015_A Third Floor Layout
- 11045_PL-016_ A Roof Plan
- 11045_PL-020_A Elevations Sheet 1
- 11045_PL-021_A Elevations Sheet 2
- 11045_PL-022_A Elevations Sheet 2
- 11045_PL-023_A Elevations Sheet 2
- 11045_PL-028_A Site Block Plan

5 Energy Use in the Built Environment

In line with the hierarchy of intervention, it is essential to ensure that an efficient building and building services systems have been designed and proposed prior to the consideration of LZC technologies. Design measures that should be considered, include but are not limited to:

- Good insulation of walls, roofs and floors to reduce heat losses (but not at the expense of summertime overheating).
- Maximisation of potential for natural ventilation (where ambient noise levels and room function permit).
- Minimisation of requirements for mechanical cooling, by the application of good ventilation techniques.
- Reduction in electrical power usage via specification of efficient lighting controls, high efficiency luminaires and optimisation of daylighting through careful façade and building design.
- Specification of high efficiency plant/equipment.
- Minimising uncontrolled infiltration by robust construction details.
- Use of low energy ICT equipment.

To this end, the proposed design should promote reduced CO_2 emissions from delivered energy consumption by minimising operational energy demand through passive and best-practice measures. If these measures are incorporated then the addition of a renewable energy system will have a greater impact – renewable energy sources should not be used as an alternative to a well-designed building. The energy usage figures within this report have been based on reasonable but not unrealistic assumptions in line with good industry custom and practice at the present time. The building fabric performance specification has been agreed with the wider design team and has been incorporated within the tender design documentation.

6 Building Services Design

In line with the second stage of the recognised energy hierarchy of intervention to "Be Lean, Be Clean, Be Green", the building services for the development should be designed with energy efficiency at the forefront, with plant and systems selected to have efficiencies in excess of those required by legislation to maximise carbon reduction. A summary of the proposed servicing strategy is provided below.

Heating shall be provided by gas fired boilers supplemented by a small-scale CHP (see later in the report for details), serving the buildings domestic hot water load via LTHW fed calorifiers and the buildings space heating system throughout the building, complete with weather compensated and local thermostatic control. The boilers shall be sized to satisfy the peak heating and hot water demand of the building, simultaneously.

Where natural ventilation cannot be achieved, mechanical ventilation shall be provided by a series of high efficiency heat recovery units serving day spaces, corridors and ancillary areas.

Extract ventilation to en-suites, WC's, kitchenettes, sluice rooms, bathrooms, etc., shall be provided in accordance with the employer's requirements and MEP performance specification, via ceiling mounted extract fans ducted to the nearest external facade. The systems will provide continuous extract with a 'boost' activated upon presence detection.

Cooling systems shall be provided to reception/café, activity/training rooms, the communications room and medical/drug stores. The Contractor shall develop the proposals and may use individual heat pump systems or utilise VRV/VRF systems to serve multiple indoor units from a single external unit. Units shall be heating and cooling type in all spaces. The communications room and drugs stores shall be fed from a separate DX system.

Electrical services shall generally be as per the specification and room data sheets, with LED lighting incorporated throughout in-line with the luminaire schedule.

Note that if option 1 is the preferred route to compliance there will not be a requirement for a CHP installation, see further on in the report for more details.

6.1 NOx Emissions

All gas-fired plant will comply with the following IAQM benchmarks:

1. All gas-fired boilers to meet a minimum standard of <40mgNOx/kWh
2. All gas-fired CHP plant to meet a minimum emissions standard of:

- Spark ignition engine - <250mgNOx/Nm^3
- Compression ignition engine - <400mgNOx/Nm^3
- Gas turbine - <50mgNOx/Nm^3

7 Compliance with Part L/Planning Requirements

A thermal energy model has been constructed of the building utilising EDSL Tas 9.4.3. The software was used to determine a baseline performance based upon the specification and room data sheets and good industry custom and practice.

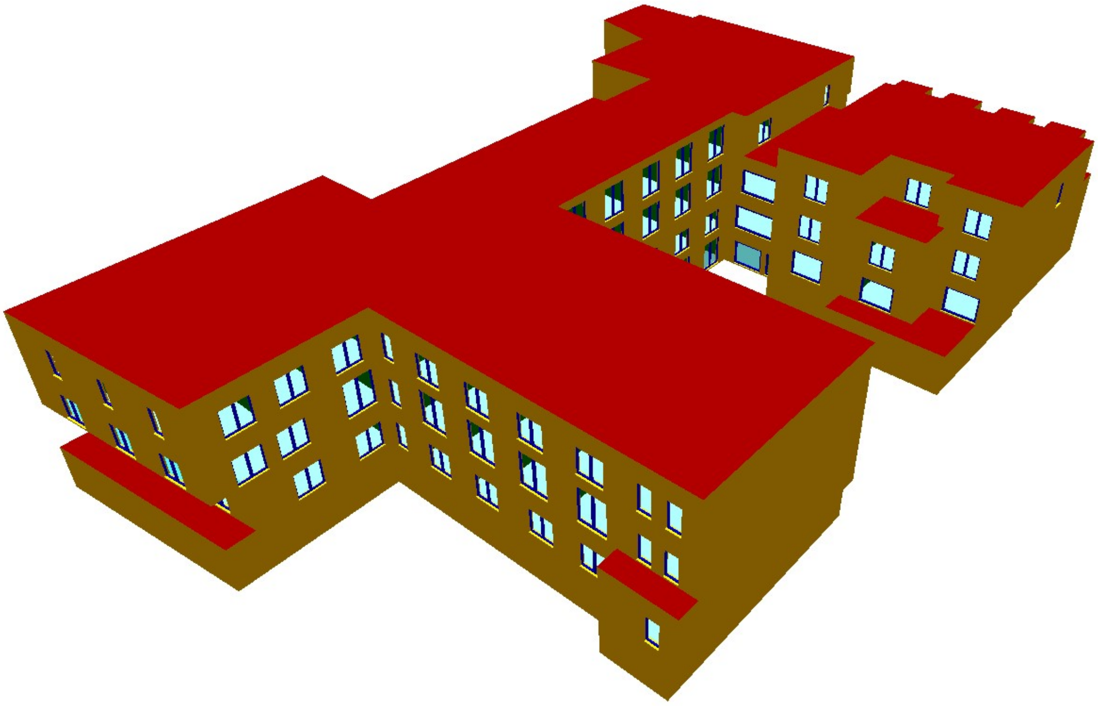

Figure 3 – EDSL Tas 3D Energy Model

Detailed specific constructions were not available or determined at the time the model was produced, however target u-values were agreed with the architect prior to commencement, based on what is realistically achievable given the project constraints. These were as follows:

- External Walls 0.20 W/m²K
- Ground Floor 0.16 W/m²K
- Exposed Roofs 0.15 W/m²K
- Windows/Doors 1.4 W/m²K
- Windows/Doors 0.42 G-Value

Glazing was presumed as Pilkington Suncool 70/40 6mm outer pane and a 6mm Pilkington Optifloat clean inner pane, with 16mm 90% argon filled cavity resulting with a G-Value of 0.42.

This glazing specification was found to be compliant with criterion 3 of AD Part L.

Equally, uncontrolled ventilation losses should be controlled and the new buildings constructed to meet stringent air permeability targets. Whilst Part L minimum requirements are 10m³/m²/hr at 50Pa, the notional buildings used for analysis utilises a lower rate (3m³/m²/hr at 50Pa) therefore it would be advantageous for the project to target a better air permeability. A rate of 5m³/m²/hr at 50Pa has been assumed for the purpose of this analysis.

As the design progresses, the detailing architect will need to advise anticipated g-values, u-values and air permeability that will likely be achieved for this development, which should be factored into the on-going energy assessment/compliance calculations and the M&E services design undertaken by design and build contractor.

7.1 Planning Policies

The London Borough of Richmond upon Thames policy DM SD1 contained within the development management plan and the London Plan (2015) requires developments to reduce CO_2 emissions by 35% beyond Building Regulations 2013.

7.2 Summary of Key Input Data

As well as the u-values and design air permeability previously indicated, the following information summarises the key input information assumed for this analysis:

Weather File
The NCM London weather file has been utilised for this analysis and is considered to accurately represent the weather for the proposed location based on the BRE SBEM Weather Locations Lookup tool.

HVAC Systems
Low surface temperature heating will be utilised; however, heat pump cassette units have been assumed in the day rooms, drugs rooms and comms rooms. The following parameters have been assumed in the analysis:

Heating & Hot Water:

Heat Source:	LTHW boiler
Fuel Type:	Natural gas
Seasonal Efficiency:	97 %
Circulation pump:	Variable Speed, pressure control across pump
System Controls:	Central time control, Weather compensation control

Heat Pump Systems:

Heat source:	Heat pump (electric): air source
Fuel type:	Electricity
SEER:	4.0
Nominal EER:	4.0

Mechanical extract is provided to en-suites, bathrooms, WCs etc.

Mechanical extract SFP	0. W/l/s

Heat recovery ventilation is provided to day spaces, corridors etc.

Overall supply and extract SFP	1.2 W/l/s
Minimum heat recovery efficiency	80%
Controls	Speed controlled via CO2 sensor.

Kitchen Ventilation

Overall supply and extract SFP	1.0 W/l/s

Lighting
Whilst a full lighting design is yet to be undertaken. However, an efficacy of 110 lumens per circuit watt has been presumed in-line with the Cinnamon lighting specification, with a maintenance factor

of 0.85. These parameters have been presumed based on our typical experience for the provision of lighting in similar buildings, including the use of LED lighting/lamps as appropriate, and should be easily achieved or bettered during the detailed design.

All input data is to be reviewed and developed by the Design and Build Contractor as the detailed design progresses. The above is provided for information only, and is typical of other similar developments in order to provide a realistic route to compliance for the purposes of informing the tender process.

7.3 Baseline Results

The baseline figures were determined as follows:

TER	39.8 kg.CO_2/m² per annum
Revised TER (35% Reduction)	25.9 kg.CO_2/m² per annum
BER	34.2 kg.CO_2/m² per annum

As the revised TER is less than the BER, it was determined that the baseline building did not achieve compliance with a 35% reduction against Part L2A 2013 with no additional renewable or Low and Zero Carbon (LZC) technology.

Note that improvements to the building fabric to reduce the primary energy usage ('Be Lean') and improvements to the efficiency of the equipment ('Be Clean') have already been implemented by way of the following:

1. Lighting efficacy improved to 110 lumens/cw.
2. Lighting design lux levels reduced to notional figures (Bedrooms: 125, Ensuites: 125, Corridors: 100, Nurse Station: 350, Stores: 150, Offices: 350, Stairs: 100, Dayrooms: 125, Assisted Bathroom: 125, Kitchen: 300).
3. Absence detection on functional lighting in the following areas set to 30 minutes:
   - Corridors
   - Day rooms
   - All staff areas
   - Stairwells
4. Mechanical heat recovery ventilation units to have CO_2 sensors to modulate the fan speed on CO_2 concentration.
5. SFP's reduced (Extract fans: 0.2, MVHR's: 1.2).
6. No improvement in u-values, proposed u-values currently exceed notional values.

7.4 Renewable and Low Carbon Technologies

This section provides a brief overview of available renewable and low/zero carbon technologies, and discusses the advantages and disadvantages that are specific to the project. A tabulated summary of the technologies is provided at the end of this section.

7.4.1 Photovoltaic System (PV)

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.

The efficiency ranges from approximately 14% to 20% for high performance panels, based on peak output under ideal conditions. For the panels to function effectively, they must be installed in an unshaded location, and correctly orientated based on the site latitude.

PV panels are mounted on a metal racking system which are angled at 20-30 degrees to improve the energy capture, for maintenance the system requires access paths, provided with man safe system. Visual impact has to be taken in consideration, PV solar system installation will be prevented on a 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 to support the photovoltaic panels and metal racking system which for a system of this size is considerable.

Figure 4 – Photovoltaic Panels

7.4.2 Solar Thermal

Solar thermal panels convert solar radiation into thermal energy which can be used to supplement conventional heat generation methods such as gas boilers. There are 2 main types of system, evacuated tube collectors and flat plate collectors. Evacuated tube collectors can have efficiencies of up to 60%, and flat plate collectors of around 50%.

Similar to photovoltaic panels, the positioning of the panels requires careful consideration, however several manufactures of evacuated tube panels can lay their panels onto flat roofs without the requirement for A-frames as the tubes themselves can be set to the correct angle.
The Renewable Heat Incentive (the mechanical equivalent of the recently introduced electrical Feed-in-Tariff) currently provides a rebate mechanism providing 8.9 p/kWh of heat generated from solar thermal for 20 years following installation.

Figure 5 - Evacuated tube solar thermal panels

7.4.3 Wind Turbines

Wind turbines convert the kinetic energy contained in wind into electricity. To ensure that they operate economically, most manufacturers recommend an average wind speed of 6ms-1. The average wind speed for the site is approximately 5 m/s and whilst this is likely to be suitable for a reasonable yield, the nature of the development and close proximity to local residences is also likely to cause planning issues. Factors such as nearby obstacles (buildings, trees and planting), potential shadow flicker on the development and surrounding residential properties, noise etc. would suggest that this is not a suitable technology for consideration on this development.

Figure 6 - Micro-Wind Turbine (multiple required for reasonable yield)

7.4.4 Biomass

Biomass boilers can be used as an alternative to conventional gas boilers. Biomass, usually wood chips or pellets, are burned instead of gas. A conventional gas back-up boiler will typically still be provided to ensure the building demands are met in the event of mechanical failure or a problem with fuel supply. Biomass fuel is deemed low carbon as the fuel absorbs CO_2 whilst growing, and hence burning the fuel is merely releasing this carbon back into the atmosphere. It is not zero carbon; however, as there are carbon emissions associated with the farming, processing and transportation of the biomass.

There are two main types of solid biofuel; wood chips and wood pellets. Wood chips are cheaper to buy as they require less processing; however, wood pellets have a higher energy density (in terms of kWh per m^3 of fuel), and a more predictable moisture content because of its processed nature. However, this processing produces a higher costing fuel, but the regular size of wood pellets means that boilers operating on pellets are less prone to jamming and problems associated with delivery of fuel from the store.

Biomass boilers require storage for the fuel – the size of store depends on the size of boiler, and the required length of storage which is often determined by the frequency of deliveries and minimum delivery volumes. A 6-week frequency of delivery is a typical value for storage calculations. Based on the urban nature of the site and the aesthetic impact of locating a fuel store and delivery area, the management and availability of supply and the potential impact of discharging particulates in an urban area, it is not proposed to consider biomass for this development.

Figure 7 - Wood Pellet Fuel & Wood Chip Fuel

7.4.5 Heat Pumps

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

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 servicing strategy it is assumed that any heat pumps installed will only operate in heating mode. Although there are several day spaces that will 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 water pipework and equipment etc.

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 plant areas, and may have noise issues associated with the large quantities of air that will be circulated.

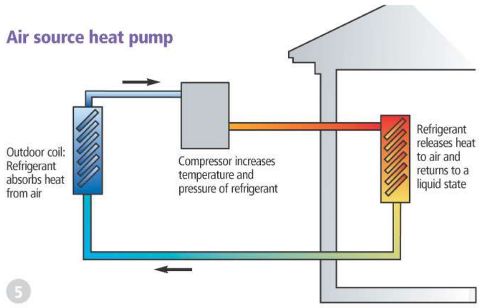

Figure 8 - Air Source Heat Pump

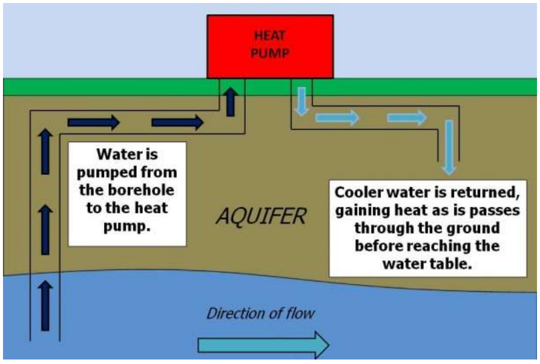

Figure 9 - Open Water Loop

7.4.6 Ground Source Heat Pumps:

Ground Source heat pumps utilise the constant temperatures encountered underground as a heat source or sink to provide low energy heating or cooling. Because of the relatively low temperatures generated the systems operate best when coupled to an underfloor heating system.

The renewable heat incentive currently allows 3.4p/kWh of heat generated from a ground source heat pump for 20 years following installation.

There are several variants – the indoor heat pump machinery remains the same however the heat source can be one of the following:

- Open Loop Borehole

A borehole is dug to an underground water source such as an aquifer. Water is drawn through the heat pump where heat is extracted or added, and then reinjected into another borehole.
This is highly dependent on-site geology, and abstraction rights are required from the Environment Agency to extract water from the ground. The Environment Agency are also keen to ensure that there is a net balance of energy into and out of the ground over the course of a year, so there is no net heat gain or loss, which requires that the system is used for both heating and cooling over the course of a year. On the basis that we have no information regarding underground water courses and the need for a balance of heating and cooling (the development will be predominantly heating only), these will not be considered further as part of this report.

- Vertical Closed Loop

Flow and return pipework is installed vertically, either in specifically drilled boreholes or, if the building structure permits, as part of the foundations. If the pipes can be integrated with in the piles of the building, this may be a reasonably cost-effective method, however damage to the pipes during the remainder of the construction process may be a risk. If a large amount of heating or cooling is required, the lengths of coils will be significant. As the heat is collected from a relatively small area, an adequate flow of water is required, either from rainwater or groundwater to replenish the heat extracted. Ideally, if used for heating in winter, the system would be used for cooling in summer so the system is in balance. Again, as the development will be predominantly heating only, such technologies are unlikely to be suitable.

- Horizontal Closed Loop

This operates on the same principle as a vertical system; however, the coils are laid horizontally at a shallow depth. Large areas would be required to gain significant sources of heat; however, this can be beneficial if large amounts of earth are to be moved on site.

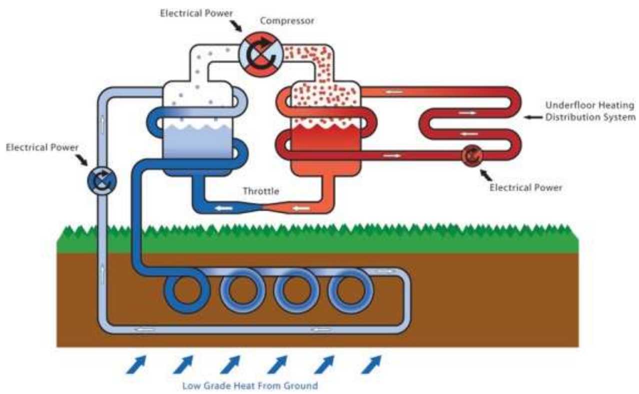

Figure 10 - Ground Source Heat Pump

The system spatial requirements are also not inconsiderable with a need for a dedicated space for 5No heat pumps, system pumps, buffer tank(s) and a total of 43No. 100m deep bore holes.

7.4.7 Combined Heat and Power (CHP)

Combined heat and power (CHP) systems comprise a generator to provide electricity, and a system to convert waste heat from the generator to useful heating energy. Most small-scale CHP units are powered by natural gas so typically not classed as renewable energy, however, the technology is classed as low carbon technology and, as such, can be used to comply with local planning policy and BREEAM. CHP can contribute significantly to carbon improvement targets; the generation of on-site electricity is regarded favourably as it is more efficient that using grid electricity with its associated transmission and generation losses.

Most CHP units use an automotive engine as the source of energy, so there is a maintenance requirement associated with their use.

There are now small-scale CHP units that can be run from liquid biofuel. These units generate heat and electricity with very low carbon emissions; however, a reliable source of fuel would have to be sourced to make this a viable proposition for the development.

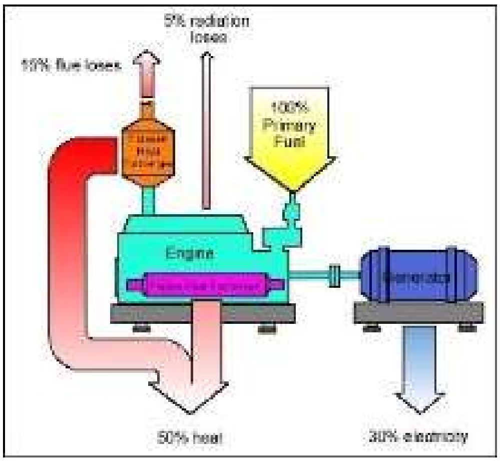

Figure 11 - CHP

7.4.8 Earth Ducts

Earth ducts allow the incoming air to be pre-heated by the earth in winter, and pre-cooled in summer. Pipes are laid into the ground under the site, and air is drawn through them. The constant temperature of the earth then transfers heat into the air in winter and absorbs heat in summer reducing the energy required to heat and cool the air mechanically. Typically, these would require significant trench work and riser space to be provided to the air handling plant for use as the incoming air route.

Due to the typical servicing strategy (which tends to favour local ventilation) and limited riser space, these have not been proposed for consideration as part of this report.

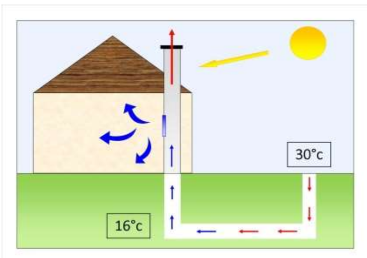

Figure 12 - Earth Tube

7.4.9 Summary

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:

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 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. Integration with piled foundations must be done at an early stage.	Yes
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.	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	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. Some additional plant space required.	Yes

Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
	renewable energy technology.			
Earth Ducts	Passive pre=treatment of fresh air	Low cost Free energy	Requires significant air loads and riser space	No

Table 1 - Summary of Renewable and Low Carbon Technology Energy Options

With careful consideration of the suitable technologies and known servicing strategies of the Client, our recommendation would be to utilise a small-scale CHP together with photovoltaic panels.

7.5 Part L2A & Planning Policy Compliance Results

The London Borough of Richmond upon Thames policy DM SD1 contained within the development management plan and the London Plan (2015) requires developments to reduce CO_2 emissions by 35% beyond Building Regulations 2013.

The following table sets out the calculation outputs following the Energy Hierarchy: -

Assessment Description	TER	BER	Pass/Fail (35%)	% Pass
Baseline calculation, standard cinnamon specification with no improvements and no renewable technology.	39.8	39.9	Fail	-0.25%
Be Lean: Use less energy & **Be Clean: Supply energy efficiently** Lighting efficacy improved to 110 lumens/cw. Lighting design lux levels reduced down to notional figures (Bedrooms: 125, Ensuites: 125, Corridors: 100, Nurse Station: 350, Stores: 150, Offices: 350, Stairs: 100, Dayrooms: 125, Assisted Bathroom: 125, Kitchen: 300). Absence detection in the following areas set to 30 minutes: - Corridors - Day rooms - All staff areas - Stairwells Mechanical heat recovery ventilation units to have CO_2 sensors to modulate the fan speed on CO_2 concentration. SFP's reduced (Extract fans: 0.2, MVHR's: 1.2) No improvement in u-values, proposed u-values currently exceed notional values.	39.8	34.2	Fail	14.07%
Be Green: Use renewable technology Combined heat and power unit securing 35% of the buildings overall thermal energy demand. Based on initial calculations this equates to a 25kWe (50kWth) peak output CHP.	39.8	25.4	Pass	36.18%

7.6 Life Cycle Costing

In order to fully establish the life cycle cost for systems the report will need to establish costing for Energy Consumption, Energy Generation, Maintenance and Estimated Fuel Tariffs.

For the basis of this study the following estimated fuel costs shall be used:

Fuel:	**Cost (£/kWh)*:**
Electricity	£0.124
Gas	£0.035

*p*Figures are based on a fair to good tariffs as current during 2018.*

The CHP has been sized to account for around 35% of the thermal requirements of the building which is calculated to be 338,111kWh/Annum. In a CHP unit heat is generated with an efficiency of around 60% whereas heat generated by a boiler will be around 95%. This will result in the following cost difference:

Heat Generator	**Heat Energy Required (kWh)**	**Generator Efficiency (%)**	**Total Energy Consumed (kWh)**	**Fuel Cost (£)** *Gas*
Boiler	338,111kWh	95%	355,906kWh	£12,456
CHP	338,111kWh	60%	563,518kWh	£19,723
			Cost Difference (£) =	**£7,267**

Although the CHP generates heat energy less efficiently than the boilers, it also provides electrical energy at the same time. The BRUKL document shows that the electrical energy production by the CHP unit will be around 169,055kWh/Annum when accounting for the above heat requirements.

This will result in the following savings:

Electricity Generator	**Elec Energy (kWh)**	**Fuel Cost (£)** *Elec*
Grid	169,055kWh	£20,962
CHP (50% On-site Usage)	84,527kWh	£10,481
	Cost Difference (£) =	**£10,481**

**The fuel cost has already been taken in the Gas Fuel cost comparison.*
To fully understand the actual cost difference the total Gas and Electricity fuel costs must be combined and compared.

Heat & Electricity Generator	Cost for Gas Consumption (£)	Cost for Electricity Consumption (£)	Total Fuel Cost (£)
Boiler & Grid Electricity	£12,456	£20,962	£33,418
CHP	£19,723	£10,481	£30,204
		Cost Difference (£) =	**£3,214**

**The fuel cost has already been taken in the Gas Fuel cost comparison.*

Annual maintenance costs on such a unit has been estimated to be around £1,675.

Taking the maintenance costs away from the annual fuel savings leaves us with a total annual saving of £1,539.

The life cycle cost of this CHP unit can now be calculated.

Based on a commercially available CHP unit sized for the project the purchase cost of the unit would be around £40,000 (including installation and commissioning etc).

The total payback time for this unit can be seen below:

Cost of CHP Unit incl. Installation/Commissioning etc. (£)	Total Annual Savings after Maintenance (£)	Years to Payback *(Unit Cost/Savings)*
£40,000	£1,539	Under 26 years

A typical CHP unit of this capacity and theoretical operational profile would have a design life of around 20 years. Taking this into account we can see the total cost over the full design life of the CHP unit:

Cost of CHP Unit incl. Installation/Commissioning etc. (£)	Total Annual Savings after Maintenance x 20 years (£)	Total Savings over 20 years (£)
£40,000	£30,780	-£9,220

The Life Cycle Cost of the proposed CHP unit will result in estimated total cost of £9,220.

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. It should be noted that detailed constructions were not available at the time of analysis. 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 2013

Project name

Cinnamon Hampton

As designed

Date: Tue Jul 30 11:40:24 2019

Administrative information

Building Details

Address: ,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.4.3"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.4.3

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name:

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	39.8
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	39.8
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	25.6
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.2	0.2	External Wall
Floor	0.25	0.16	0.16	Ground Floor
Roof	0.25	0.15	0.15	Roof
Windows***, roof windows, and rooflights	2.2	1.4	1.4	2.5 x 2.0
Personnel doors	2.2	-	-	No personal doors in project
Vehicle access & similar large doors	1.5	-	-	No vehicle doors in project
High usage entrance doors	3.5	-	-	No high usage entrance doors in project

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

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

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

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	<0.9

1- AC Extract Only (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	4	-	-	-
Standard value	N/A	2.6	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

2- AC Supply & Extract (7 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	4	-	1.2	0.8
Standard value	N/A	2.6	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

3- Kitchen Supply & Extract (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	-	-	1	-
Standard value	N/A	N/A	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

4- Rads & Extract Only (119 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.97	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

5- Rads & Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.97	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

6- Rads Supply & Extract (24 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.97	-	-	1.2	0.8
Standard value	0.91*	N/A	N/A	1.5^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

1- HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.97	0
Standard value	0.9*	N/A
* Standard shown is for gas boilers >30 kW output. For boilers <=30 kW output, limiting efficiency is 0.73.		

1- Heating Circuit

	CHPQA quality index	CHP electrical efficiency
This building	147	0.31
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 5	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 6	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 7	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 8	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 9	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 10	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 11	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 12	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 13	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 14	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 15	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 16	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 17	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 18	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 19	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 20	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 21	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 22	0.2	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
Ensuite 23	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 24	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 25	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 26	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 27	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 28	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 29	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 30	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 31	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 32	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 33	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 34	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 35	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 36	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 37	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 38	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 39	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 40	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 41	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 42	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 43	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 44	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 45	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 46	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 47	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 48	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 49	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 50	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 51	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 52	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 53	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 54	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 55	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 56	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 57	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 58	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 59	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 60	0.2	-	-	-	-	-	-	-	-	-	N/A
Corridor 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 2	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 3	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 4	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 5	-	-	-	1.2	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Corridor 6	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 7	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 8	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 9	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 10	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 11	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 12	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 13	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 14	-	-	-	1.2	-	-	-	-	-	-	N/A
Corridor 15	-	-	-	1.2	-	-	-	-	-	-	N/A
Nurse Station 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Nurse Station 2	-	-	-	1.2	-	-	-	-	-	-	N/A
Nurse Station 3	-	-	-	1.2	-	-	-	-	-	-	N/A
Store Vented 1	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 2	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 3	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 4	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 5	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 6	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 7	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 8	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 9	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 10	0.2	-	-	-	-	-	-	-	-	-	N/A
Store Vented 11	0.2	-	-	-	-	-	-	-	-	-	N/A
Reception & Cafe 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Hairdressing 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Living/Dining Dayroom 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Living/Dining Dayroom 2	-	-	-	1.2	-	-	-	-	-	-	N/A
Living/Dining Dayroom 3	-	-	-	1.2	-	-	-	-	-	-	N/A
Living/Dining Dayroom 4	-	-	-	1.2	-	-	-	-	-	-	N/A
Living/Dining Dayroom 5	-	-	-	1.2	-	-	-	-	-	-	N/A
Living/Dining Dayroom 6	-	-	-	1.2	-	-	-	-	-	-	N/A
WCs 1	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 2	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 3	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 4	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 5	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 6	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 7	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 8	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 9	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 10	0.2	-	-	-	-	-	-	-	-	-	N/A
WCs 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	1.9	1.6	0.5	1.1	0.5	1	**Zone**	**Standard**
Asst Bathroom 1	0.2	-	-	-	-	-	-	-	-	-	N/A
Asst Bathroom 2	0.2	-	-	-	-	-	-	-	-	-	N/A
Asst Bathroom 3	0.2	-	-	-	-	-	-	-	-	-	N/A
Asst Bathroom 4	0.2	-	-	-	-	-	-	-	-	-	N/A
Drugs Store 1	0.2	-	-	-	-	-	-	-	-	-	N/A
Drugs Store 2	0.2	-	-	-	-	-	-	-	-	-	N/A
Drugs Store 3	0.2	-	-	-	-	-	-	-	-	-	N/A
Kitchen 1	-	-	-	-	-	-	-	-	1	-	N/A
Kitchen 2	-	-	-	-	-	-	-	-	1	-	N/A
Kitchen 3	-	-	-	-	-	-	-	-	1	-	N/A
Kitchen 4	-	-	-	-	-	-	-	-	1	-	N/A
Laundry 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Changing Room 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Changing Room 2	-	-	-	1.2	-	-	-	-	-	-	N/A
Staff Room 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Multi-Purpose Rm 1	-	-	-	1.2	-	-	-	-	-	-	N/A
Ensuite 61	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 62	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 63	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 64	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 65	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 66	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 67	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 68	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 69	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 70	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 71	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 72	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 73	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 74	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 75	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 76	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 77	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 78	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 79	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 80	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 81	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 82	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 83	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 84	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 85	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 86	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 87	0.2	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Ensuite 88	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 89	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 90	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 91	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 92	0.2	-	-	-	-	-	-	-	-	-	N/A
Ensuite 93	0.2	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Care Bedroom 1	-	110	-	34
Care Bedroom 2	-	110	-	33
Care Bedroom 3	-	110	-	33
Care Bedroom 4	-	110	-	32
Care Bedroom 5	-	110	-	33
Care Bedroom 6	-	110	-	32
Care Bedroom 7	-	110	-	33
Care Bedroom 8	-	110	-	33
Care Bedroom 9	-	110	-	33
Care Bedroom 10	-	110	-	33
Care Bedroom 11	-	110	-	32
Care Bedroom 12	-	110	-	32
Care Bedroom 13	-	110	-	33
Care Bedroom 14	-	110	-	33
Care Bedroom 15	-	110	-	33
Care Bedroom 16	-	110	-	33
Care Bedroom 17	-	110	-	33
Care Bedroom 18	-	110	-	46
Care Bedroom 19	-	110	-	39
Care Bedroom 20	-	110	-	32
Care Bedroom 21	-	110	-	33
Care Bedroom 22	-	110	-	32
Care Bedroom 23	-	110	-	33
Care Bedroom 24	-	110	-	32
Care Bedroom 25	-	110	-	33
Care Bedroom 26	-	110	-	33
Care Bedroom 27	-	110	-	33
Care Bedroom 28	-	110	-	33
Care Bedroom 29	-	110	-	32
Care Bedroom 30	-	110	-	37
Care Bedroom 31	-	110	-	33
Care Bedroom 32	-	110	-	33
Care Bedroom 33	-	110	-	33

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Care Bedroom 34	-	110	-	33
Care Bedroom 35	-	110	-	33
Care Bedroom 36	-	110	-	39
Care Bedroom 37	-	110	-	32
Care Bedroom 38	-	110	-	33
Care Bedroom 39	-	110	-	32
Care Bedroom 40	-	110	-	33
Care Bedroom 41	-	110	-	32
Care Bedroom 42	-	110	-	33
Care Bedroom 43	-	110	-	33
Care Bedroom 44	-	110	-	33
Care Bedroom 45	-	110	-	33
Care Bedroom 46	-	110	-	32
Care Bedroom 47	-	110	-	32
Care Bedroom 48	-	110	-	34
Care Bedroom 49	-	110	-	34
Care Bedroom 50	-	110	-	34
Care Bedroom 51	-	110	-	34
Care Bedroom 52	-	110	-	33
Care Bedroom 53	-	110	-	34
Care Bedroom 54	-	110	-	33
Care Bedroom 55	-	110	-	33
Care Bedroom 56	-	110	-	33
Care Bedroom 57	-	110	-	33
Care Bedroom 58	-	110	-	33
Care Bedroom 59	-	110	-	33
Care Bedroom 60	-	110	-	34
Ensuite 1	-	110	-	13
Ensuite 2	-	110	-	13
Ensuite 3	-	110	-	12
Ensuite 4	-	110	-	12
Ensuite 5	-	110	-	13
Ensuite 6	-	110	-	13
Ensuite 7	-	110	-	12
Ensuite 8	-	110	-	12
Ensuite 9	-	110	-	13
Ensuite 10	-	110	-	13
Ensuite 11	-	110	-	12
Ensuite 12	-	110	-	12
Ensuite 13	-	110	-	12
Ensuite 14	-	110	-	12
Ensuite 15	-	110	-	12
Ensuite 16	-	110	-	12

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Ensuite 17	-	110	-	12
Ensuite 18	-	110	-	13
Ensuite 19	-	110	-	12
Ensuite 20	-	110	-	13
Ensuite 21	-	110	-	12
Ensuite 22	-	110	-	12
Ensuite 23	-	110	-	13
Ensuite 24	-	110	-	13
Ensuite 25	-	110	-	12
Ensuite 26	-	110	-	12
Ensuite 27	-	110	-	13
Ensuite 28	-	110	-	13
Ensuite 29	-	110	-	12
Ensuite 30	-	110	-	12
Ensuite 31	-	110	-	12
Ensuite 32	-	110	-	12
Ensuite 33	-	110	-	12
Ensuite 34	-	110	-	12
Ensuite 35	-	110	-	13
Ensuite 36	-	110	-	13
Ensuite 37	-	110	-	14
Ensuite 38	-	110	-	12
Ensuite 39	-	110	-	13
Ensuite 40	-	110	-	12
Ensuite 41	-	110	-	12
Ensuite 42	-	110	-	13
Ensuite 43	-	110	-	13
Ensuite 44	-	110	-	12
Ensuite 45	-	110	-	12
Ensuite 46	-	110	-	13
Ensuite 47	-	110	-	13
Ensuite 48	-	110	-	12
Ensuite 49	-	110	-	12
Ensuite 50	-	110	-	12
Ensuite 51	-	110	-	12
Ensuite 52	-	110	-	12
Ensuite 53	-	110	-	12
Ensuite 54	-	110	-	12
Ensuite 55	-	110	-	12
Ensuite 56	-	110	-	12
Ensuite 57	-	110	-	12
Ensuite 58	-	110	-	12
Ensuite 59	-	110	-	12

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Ensuite 60	-	110	-	12
Corridor 1	-	110	-	245
Corridor 2	-	110	-	20
Corridor 3	-	110	-	147
Corridor 4	-	110	-	61
Corridor 5	-	110	-	56
Corridor 6	-	110	-	133
Corridor 7	-	110	-	137
Corridor 8	-	110	-	10
Corridor 9	-	110	-	130
Corridor 10	-	110	-	21
Corridor 11	-	110	-	117
Corridor 12	-	110	-	18
Corridor 13	-	110	-	13
Corridor 14	-	110	-	31
Corridor 15	-	110	-	25
Plantroom 1	110	-	-	97
Plantroom 2	110	-	-	39
Nurse Station 1	110	-	-	81
Nurse Station 2	110	-	-	62
Nurse Station 3	110	-	-	62
Store Vented 1	110	-	-	26
Store Vented 2	110	-	-	16
Store Vented 3	110	-	-	10
Store Vented 4	110	-	-	16
Store Vented 5	110	-	-	6
Store Vented 6	110	-	-	16
Store Vented 7	110	-	-	6
Store Vented 8	110	-	-	18
Store Vented 9	110	-	-	16
Store Vented 10	110	-	-	17
Store Vented 11	110	-	-	6
Store Not Vented 1	110	-	-	20
Store Not Vented 2	110	-	-	24
Store Not Vented 3	110	-	-	33
Store Not Vented 4	110	-	-	17
Store Not Vented 5	110	-	-	12
Store Not Vented 6	110	-	-	16
Store Not Vented 7	110	-	-	13
Store Not Vented 8	110	-	-	13
Store Not Vented 9	110	-	-	17
Store Not Vented 10	110	-	-	4
Store Not Vented 11	110	-	-	5

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Store Not Vented 12	110	-	-	14
Store Not Vented 13	110	-	-	14
Store Not Vented 14	110	-	-	6
Store Not Vented 15	110	-	-	9
Store Not Vented 16	110	-	-	12
Store Not Vented 17	110	-	-	14
Store Not Vented 18	110	-	-	8
Riser 1	110	-	-	14
Riser 2	110	-	-	13
Riser 3	110	-	-	10
Riser 4	110	-	-	10
Riser 5	110	-	-	13
Riser 6	110	-	-	10
Riser 7	110	-	-	10
Riser 8	110	-	-	16
Riser 9	110	-	-	17
Lift 1	110	-	-	18
Lift 2	110	-	-	15
Lift 3	110	-	-	15
Lift 4	110	-	-	16
Lift 5	110	-	-	15
Lift 6	110	-	-	16
Lift 7	110	-	-	15
Lift 8	110	-	-	15
Lift 9	110	-	-	15
Lift 10	110	-	-	15
Lift 11	110	-	-	19
Lift 12	110	-	-	15
Lift 13	110	-	-	16
Lift 14	110	-	-	15
Lift 15	110	-	-	19
Lift 16	110	-	-	15
Lift 17	110	-	-	15
Lift 18	110	-	-	14
Office (Nat Vent) 1	110	-	-	99
Office (Nat Vent) 2	110	-	-	107
Reception & Cafe 1	-	110	60	940
Hairdressing 1	110	-	-	100
Stairs 1	-	110	-	24
Stairs 2	-	110	-	31
Stairs 3	-	110	-	36
Stairs 4	-	110	-	24
Stairs 5	-	110	-	38

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Stairs 6	-	110	-	28
Stairs 7	-	110	-	31
Stairs 8	-	110	-	24
Stairs 9	-	110	-	28
Stairs 10	-	110	-	26
Stairs 11	-	110	-	24
Stairs 12	-	110	-	30
Stairs 13	-	110	-	49
Living/Dining Dayroom 1	-	110	-	255
Living/Dining Dayroom 2	-	110	-	145
Living/Dining Dayroom 3	-	110	-	17
Living/Dining Dayroom 4	-	110	-	132
Living/Dining Dayroom 5	-	110	-	165
Living/Dining Dayroom 6	-	110	-	114
Apartment Living Room 1	-	110	-	55
Apartment Living Room 2	-	110	-	42
Apartment Living Room 3	-	110	-	45
Apartment Living Room 4	-	110	-	55
Apartment Living Room 5	-	110	-	44
Apartment Living Room 6	-	110	-	39
Apartment Living Room 7	-	110	-	41
Apartment Living Room 8	-	110	-	36
Apartment Living Room 9	-	110	-	36
Apartment Living Room 10	-	110	-	38
Apartment Living Room 11	-	110	-	37
Apartment Living Room 12	-	110	-	42
Apartment Living Room 13	-	110	-	37
Apartment Living Room 14	-	110	-	27
Apartment Living Room 15	-	110	-	36
Apartment Living Room 16	-	110	-	37
Apartment Living Room 17	-	110	-	37
Apartment Living Room 18	-	110	-	41
Apartment Living Room 19	-	110	-	59
Apartment Living Room 20	-	110	-	38
Apartment Bedroom 1	-	110	-	31
Apartment Bedroom 2	-	110	-	34
Apartment Bedroom 3	-	110	-	36
Apartment Bedroom 4	-	110	-	30
Apartment Bedroom 5	-	110	-	35
Apartment Bedroom 6	-	110	-	34
Apartment Bedroom 7	-	110	-	24
Apartment Bedroom 8	-	110	-	30
Apartment Bedroom 9	-	110	-	28

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Apartment Bedroom 10	-	110	-	29
Apartment Bedroom 11	-	110	-	29
Apartment Bedroom 12	-	110	-	29
Apartment Bedroom 13	-	110	-	32
Apartment Bedroom 14	-	110	-	31
Apartment Bedroom 15	-	110	-	37
Apartment Bedroom 16	-	110	-	28
Apartment Bedroom 17	-	110	-	29
Apartment Bedroom 18	-	110	-	29
Apartment Bedroom 19	-	110	-	27
Apartment Bedroom 20	-	110	-	47
WCs 1	-	110	-	19
WCs 2	-	110	-	20
WCs 3	-	110	-	22
WCs 4	-	110	-	19
WCs 5	-	110	-	29
WCs 6	-	110	-	19
WCs 7	-	110	-	19
WCs 8	-	110	-	19
WCs 9	-	110	-	20
WCs 10	-	110	-	20
WCs 11	-	110	-	21
Asst Bathroom 1	-	110	-	30
Asst Bathroom 2	-	110	-	29
Asst Bathroom 3	-	110	-	29
Asst Bathroom 4	-	110	-	28
Drugs Store 1	110	-	-	21
Drugs Store 2	110	-	-	17
Drugs Store 3	110	-	-	17
Kitchen 1	-	110	-	383
Kitchen 2	-	110	-	32
Kitchen 3	-	110	-	32
Kitchen 4	-	110	-	28
Laundry 1	-	110	-	210
Changing Room 1	-	110	-	19
Changing Room 2	-	110	-	24
Staff Room 1	-	110	-	37
Multi-Purpose Rm 1	-	110	-	67
Apartment Hallway 1	-	110	-	17
Apartment Hallway 2	-	110	-	12
Apartment Hallway 3	-	110	-	20
Apartment Hallway 4	-	110	-	11
Apartment Hallway 5	-	110	-	26

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Apartment Hallway 6	-	110	-	17
Apartment Hallway 7	-	110	-	22
Apartment Hallway 8	-	110	-	12
Apartment Hallway 9	-	110	-	17
Apartment Hallway 10	-	110	-	18
Apartment Hallway 11	-	110	-	21
Apartment Hallway 12	-	110	-	24
Apartment Hallway 13	-	110	-	12
Apartment Hallway 14	-	110	-	12
Apartment Hallway 15	-	110	-	12
Apartment Hallway 16	-	110	-	13
Apartment Hallway 17	-	110	-	20
Apartment Hallway 18	-	110	-	12
Apartment Hallway 19	-	110	-	12
Apartment Hallway 20	-	110	-	12
Care Bedroom 61	-	110	-	34
Care Bedroom 62	-	110	-	33
Care Bedroom 63	-	110	-	52
Care Bedroom 64	-	110	-	35
Care Bedroom 65	-	110	-	43
Care Bedroom 66	-	110	-	42
Care Bedroom 67	-	110	-	41
Ensuite 61	-	110	-	12
Ensuite 62	-	110	-	12
Ensuite 63	-	110	-	12
Ensuite 64	-	110	-	12
Ensuite 65	-	110	-	12
Ensuite 66	-	110	-	12
Ensuite 67	-	110	-	12
Ensuite 68	-	110	-	12
Ensuite 69	-	110	-	13
Ensuite 70	-	110	-	14
Ensuite 71	-	110	-	13
Ensuite 72	-	110	-	13
Ensuite 73	-	110	-	12
Ensuite 74	-	110	-	12
Ensuite 75	-	110	-	13
Ensuite 76	-	110	-	12
Ensuite 77	-	110	-	14
Ensuite 78	-	110	-	13
Ensuite 79	-	110	-	13
Ensuite 80	-	110	-	12
Ensuite 81	-	110	-	12

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Ensuite 82	-	110	-	12
Ensuite 83	-	110	-	12
Ensuite 84	-	110	-	13
Ensuite 85	-	110	-	13
Ensuite 86	-	110	-	12
Ensuite 87	-	110	-	12
Ensuite 88	-	110	-	12
Ensuite 89	-	110	-	12
Apartment Bedroom 21	-	110	-	39
Apartment Bedroom 22	-	110	-	39
Apartment Bedroom 23	-	110	-	37
Apartment Bedroom 24	-	110	-	33
Apartment Bedroom 25	-	110	-	33
Apartment Bedroom 26	-	110	-	28
Apartment Bedroom 27	-	110	-	38
Apartment Bedroom 28	-	110	-	38
Apartment Bedroom 29	-	110	-	52
Apartment Living Room 21	-	110	-	29
Apartment Living Room 22	-	110	-	46
Apartment Living Room 23	-	110	-	34
Apartment Living Room 24	-	110	-	54
Ensuite 90	-	110	-	13
Ensuite 91	-	110	-	13
Apartment Hallway 21	-	110	-	12
Apartment Hallway 22	-	110	-	11
Apartment Hallway 23	-	110	-	5
Apartment Hallway 24	-	110	-	12
Apartment Hallway 25	-	110	-	14
Apartment Living Room 25	-	110	-	45
Apartment Living Room 26	-	110	-	38
Ensuite 92	-	110	-	12
Ensuite 93	-	110	-	13

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Care Bedroom 1	NO (-76%)	NO
Care Bedroom 2	NO (-51%)	NO
Care Bedroom 3	N/A	N/A
Care Bedroom 4	N/A	N/A
Care Bedroom 5	NO (-51%)	NO
Care Bedroom 6	NO (-52%)	NO
Care Bedroom 7	N/A	N/A
Care Bedroom 8	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Care Bedroom 9	NO (-55%)	NO
Care Bedroom 10	N/A	N/A
Care Bedroom 11	N/A	N/A
Care Bedroom 12	N/A	N/A
Care Bedroom 13	NO (-49%)	NO
Care Bedroom 14	NO (-54%)	NO
Care Bedroom 15	NO (-58%)	NO
Care Bedroom 16	NO (-64%)	NO
Care Bedroom 17	NO (-65%)	NO
Care Bedroom 18	NO (-66%)	NO
Care Bedroom 19	NO (-85%)	NO
Care Bedroom 20	NO (-67%)	NO
Care Bedroom 21	NO (-76%)	NO
Care Bedroom 22	NO (-77%)	NO
Care Bedroom 23	NO (-67%)	NO
Care Bedroom 24	NO (-67%)	NO
Care Bedroom 25	NO (-78%)	NO
Care Bedroom 26	NO (-78%)	NO
Care Bedroom 27	NO (-69%)	NO
Care Bedroom 28	NO (-72%)	NO
Care Bedroom 29	NO (-82%)	NO
Care Bedroom 30	NO (-74%)	NO
Care Bedroom 31	NO (-65%)	NO
Care Bedroom 32	NO (-68%)	NO
Care Bedroom 33	NO (-70%)	NO
Care Bedroom 34	NO (-74%)	NO
Care Bedroom 35	NO (-77%)	NO
Care Bedroom 36	NO (-78%)	NO
Care Bedroom 37	NO (-50%)	NO
Care Bedroom 38	NO (-65%)	NO
Care Bedroom 39	NO (-66%)	NO
Care Bedroom 40	NO (-51%)	NO
Care Bedroom 41	NO (-51%)	NO
Care Bedroom 42	NO (-67%)	NO
Care Bedroom 43	NO (-68%)	NO
Care Bedroom 44	NO (-52%)	NO
Care Bedroom 45	NO (-72%)	NO
Care Bedroom 46	NO (-82%)	NO
Care Bedroom 47	NO (-62%)	NO
Care Bedroom 48	NO (-64%)	NO
Care Bedroom 49	NO (-64%)	NO
Care Bedroom 50	NO (-63%)	NO
Care Bedroom 51	NO (-64%)	NO
Care Bedroom 52	NO (-63%)	NO
Care Bedroom 53	NO (-64%)	NO
Care Bedroom 54	NO (-48%)	NO
Care Bedroom 55	NO (-51%)	NO
Care Bedroom 56	NO (-63%)	NO
Care Bedroom 57	NO (-63%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Care Bedroom 58	NO (-53%)	NO
Care Bedroom 59	NO (-59%)	NO
Care Bedroom 60	NO (-64%)	NO
Nurse Station 1	N/A	N/A
Nurse Station 2	N/A	N/A
Nurse Station 3	N/A	N/A
Office (Nat Vent) 1	NO (-82%)	NO
Office (Nat Vent) 2	NO (-86%)	NO
Reception & Cafe 1	NO (-62%)	NO
Hairdressing 1	NO (-67%)	NO
Living/Dining Dayroom 1	NO (-97%)	NO
Living/Dining Dayroom 2	N/A	N/A
Living/Dining Dayroom 3	N/A	N/A
Living/Dining Dayroom 4	NO (-81%)	NO
Living/Dining Dayroom 5	NO (-75%)	NO
Living/Dining Dayroom 6	NO (-52%)	NO
Apartment Living Room 1	NO (-81%)	NO
Apartment Living Room 2	NO (-73%)	NO
Apartment Living Room 3	NO (-84%)	NO
Apartment Living Room 4	NO (-88%)	NO
Apartment Living Room 5	NO (-93%)	NO
Apartment Living Room 6	NO (-55%)	NO
Apartment Living Room 7	NO (-82%)	NO
Apartment Living Room 8	NO (-76%)	NO
Apartment Living Room 9	NO (-78%)	NO
Apartment Living Room 10	NO (-50%)	NO
Apartment Living Room 11	NO (-71%)	NO
Apartment Living Room 12	NO (-71%)	NO
Apartment Living Room 13	NO (-82%)	NO
Apartment Living Room 14	NO (-61%)	NO
Apartment Living Room 15	NO (-63%)	NO
Apartment Living Room 16	NO (-51%)	NO
Apartment Living Room 17	NO (-53%)	NO
Apartment Living Room 18	NO (-83%)	NO
Apartment Living Room 19	NO (-95%)	NO
Apartment Living Room 20	NO (-78%)	NO
Apartment Bedroom 1	NO (-55%)	NO
Apartment Bedroom 2	NO (-81%)	NO
Apartment Bedroom 3	NO (-86%)	NO
Apartment Bedroom 4	NO (-76%)	NO
Apartment Bedroom 5	NO (-80%)	NO
Apartment Bedroom 6	NO (-87%)	NO
Apartment Bedroom 7	NO (-78%)	NO
Apartment Bedroom 8	NO (-51%)	NO
Apartment Bedroom 9	NO (-76%)	NO
Apartment Bedroom 10	NO (-51%)	NO
Apartment Bedroom 11	NO (-77%)	NO
Apartment Bedroom 12	NO (-51%)	NO
Apartment Bedroom 13	NO (-82%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Apartment Bedroom 14	NO (-68%)	NO
Apartment Bedroom 15	NO (-79%)	NO
Apartment Bedroom 16	NO (-67%)	NO
Apartment Bedroom 17	NO (-49%)	NO
Apartment Bedroom 18	NO (-51%)	NO
Apartment Bedroom 19	NO (-54%)	NO
Apartment Bedroom 20	NO (-86%)	NO
Drugs Store 1	N/A	N/A
Drugs Store 2	N/A	N/A
Drugs Store 3	N/A	N/A
Staff Room 1	N/A	N/A
Multi-Purpose Rm 1	NO (-81%)	NO
Care Bedroom 61	NO (-65%)	NO
Care Bedroom 62	NO (-64%)	NO
Care Bedroom 63	NO (-90%)	NO
Care Bedroom 64	NO (-72%)	NO
Care Bedroom 65	NO (-68%)	NO
Care Bedroom 66	NO (-67%)	NO
Care Bedroom 67	NO (-82%)	NO
Apartment Bedroom 21	NO (-67%)	NO
Apartment Bedroom 22	NO (-81%)	NO
Apartment Bedroom 23	NO (-87%)	NO
Apartment Bedroom 24	NO (-91%)	NO
Apartment Bedroom 25	NO (-86%)	NO
Apartment Bedroom 26	NO (-74%)	NO
Apartment Bedroom 27	NO (-51%)	NO
Apartment Bedroom 28	NO (-51%)	NO
Apartment Bedroom 29	NO (-91%)	NO
Apartment Living Room 21	NO (-73%)	NO
Apartment Living Room 22	NO (-67%)	NO
Apartment Living Room 23	NO (-71%)	NO
Apartment Living Room 24	NO (-78%)	NO
Apartment Living Room 25	NO (-50%)	NO
Apartment Living Room 26	NO (-52%)	NO

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	5128	5128
External area [m^2]	6855	6855
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	5	3
Average conductance [W/K]	1983	3140
Average U-value [W/m^{2}K]	0.29	0.46
Alpha value* [%]	14.59	14.59

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

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
100	**C2 Residential Institutions: Hospitals and Care Homes**
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

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

	Actual	Notional
Heating	11.49	16.61
Cooling	4.29	4.55
Auxiliary	7.14	7.87
Lighting	10.79	15.82
Hot water	136.76	101.55
Equipment*	61.64	61.64
TOTAL**	**135.88**	**146.4**

* 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	34.6	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	100.22	113.69
Primary energy* [kWh/m^2]	142.91	228.72
Total emissions [kg/m^2]	25.6	39.8

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0	324.6	0	22.5	1.1	0	4	0	4
	Notional	0	379.3	0	29.3	5.2	0	3.6	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0	468.8	0	32.6	13.9	0	4	0	4
	Notional	0	469.4	0	36.2	17.3	2.43	3.6	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0	0	0	0	31.4	0	0	0	0
	Notional	0	0	0	0	33.2	0	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	82.2	0	24.8	0	8.5	0.92	0	0.97	0
	Notional	137.5	0	46.7	0	11.2	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	53.5	0	16.1	0	3.2	0.92	0	0.97	0
	Notional	63.1	0	21.4	0	1.9	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	6.1	0	1.8	0	12.2	0.92	0	0.97	0
	Notional	22.9	0	7.8	0	18.4	0.82	0	----	----

Key to terms

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

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	**U_{i-Typ}**	**U_{i-Min}**	**Surface where the minimum value occurs***
Wall	0.23	0.2	External Wall
Floor	0.2	0.16	Ground Floor
Roof	0.15	0.15	Roof
Windows, roof windows, and rooflights	1.5	1.4	0.9 x 1.8
Personnel doors	1.5	-	No personal doors in project
Vehicle access & similar large doors	1.5	-	No vehicle doors in project
High usage entrance doors	1.5	-	No high usage entrance doors in project

U_{i-Typ} = Typical individual element U-values [W/(m²K)]

U_{i-Min} = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	**Typical value**	**This building**
$m^3/(h.m^2)$ at 50 Pa	5	5