ENERGY STRATEGY REPORT

FOR

PROPOSED CARE HOME, HOTEL FELIX, CAMBRIDGE

ON BEHALF OF

DOC No: 1761-REP-ES-01

REVISION P1
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Contents

1.0 Executive Summary

This document details the intended energy strategy for the proposed 80-bed Care Home at Whitehouse Lane, Cambridge, prepared by Harniss Consulting Ltd.

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 renewable technologies to the design.

In order to achieve compliance with Building Regulations AD Part L2A and South Cambridgeshire planning policy, it was necessary to investigate appropriate LZC technologies to reduce the energy consumption and CO2 emissions.

South Cambridgeshire planning policy CC/3 states that:
Proposals for new dwellings and new non-residential buildings of 1,000m2 or more will be required to reduce carbon emissions by a minimum of 10% (to be calculated by reference to a baseline for the anticipated carbon emissions for the property as defined by Building Regulations) through the use of on-site renewable energy and low carbon technologies.

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 renewable technologies to the design.

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

- Enhanced building fabric performance has been targeted through improved thermal performance and reduced air permeability;
- Energy efficient heating, cooling, ventilation, domestic hot water and lighting systems have been targeted throughout;
- Energy efficient controls for HVAC and lighting to minimise building in-use energy.
- Following initial assessment with implementation of the enhanced building fabric and energy efficient systems, it was found that compliance with AD Part L was not achieved without the addition of renewable technology;
- An initial desk-top study was undertaken to assess the most viable low zero carbon technologies for proposed implementation to achieve compliance with AD Part L2A:2013 and the local planning policy.
- A Combined Heat and Power (CHP) unit was found to be the most feasible sources of low zero carbon technology on this project based on the findings of section 7, whole life cost, spatial considerations and impact to the local population/building aesthetics;

This report shows that specification of a small-scale CHP unit satisfies the requirements of the South Cambridgeshire Policy CC/3 of delivering a 10% reduction in carbon dioxide emissions, from a baseline, in this case the Building Regulations Part L2A 2013 TER.

2.0 Introduction

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

In order to achieve compliance with Building Regulations AD Part L2A and South Cambridgeshire planning policy, it shall be necessary to investigate appropriate LZC technologies to reduce the energy consumption and CO2 emissions.

This report shall show how the development can satisfies the requirements of the South Cambridgeshire Policy CC/3 of delivering a 10% reduction in carbon dioxide emissions, from a baseline, in this case the Building Regulations Part L2A 2013 TER.

Analysis for the building has been undertaken utilising EDSL Tas software version 9.5.0. The software was used to determine a baseline output using fabric performance values as discussed with the development team (as detailed in the body of the report) without contribution from additional renewable technologies.

The Care Home 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.

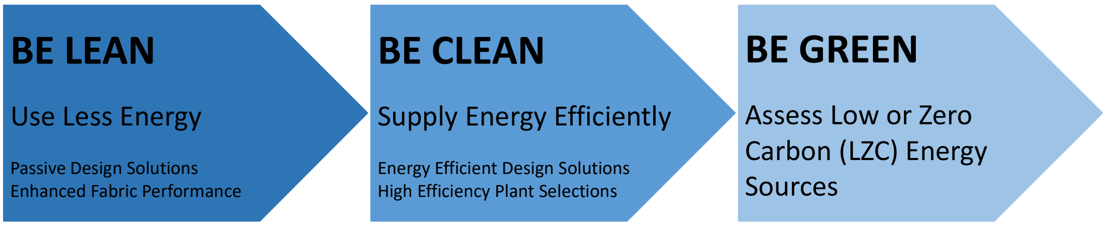


Figure 1: Energy Hierarchy

This report will show how this Energy Hierarchy is used to ultimately provide a compliant solution that ensures energy efficiency is achieved, not only within the building services systems and low carbon/renewable technology, but also within the building fabric performance.

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.

3.0 Description of the Development

The proposed development consists of the demolition of the existing building and construction of a new care home located along Whitehouse Lane, Cambridge. The development consists of 80 ensuite bedrooms, day spaces, stores, offices, café/lounges, plantroom (housing the boilers and hot water generating plant etc.), kitchen, laundry and main reception area.

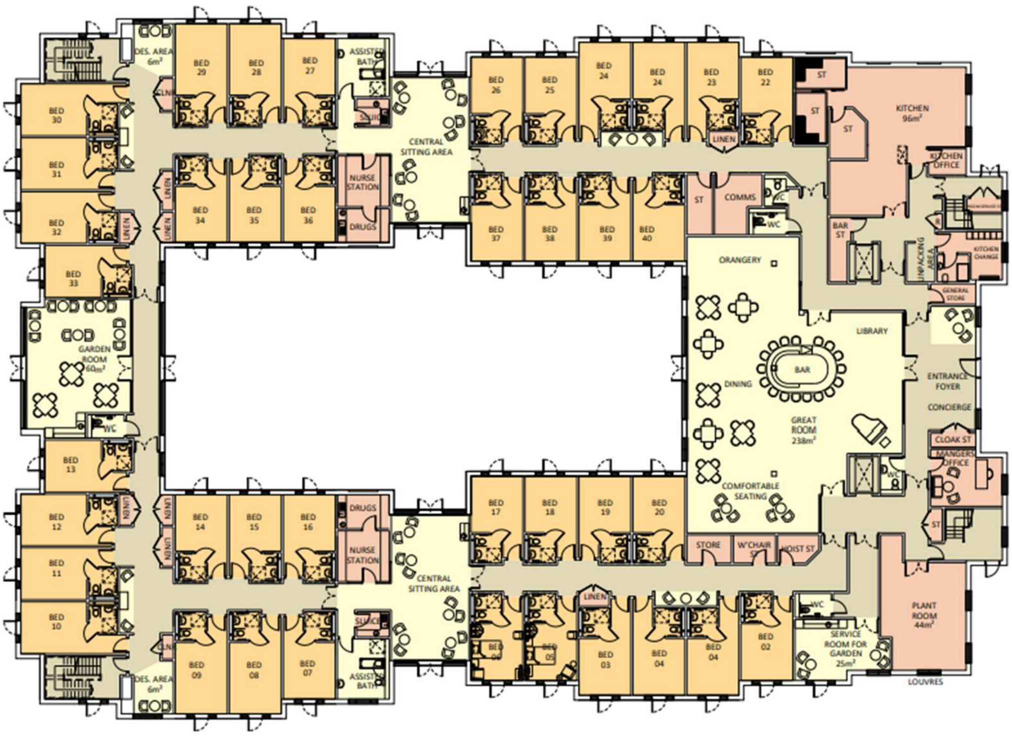


Figure 4: Proposed GF Plan

The assessment has been based on the following architectural layout drawings, produced by Carless Adams Architects:

- A-846 04 - Site Plan
- A-846 11 - Floor Plan
- A-846 12 - Floor Plans
- A-846 21 - Elevations
- A-846 22 - Elevations

4.0 Compliance with Part L/Planning Requirements

A preliminary energy model has been constructed of the care home with EDSL Tas software version 9.5.0. The software was used to determine a baseline performance utilising the employer's requirements including the project specifications, room data sheets and also good industry custom and practice.

Detailed specific constructions were not available at the time the model was produced, but the figures outlined below reflect the information provisionally discussed with the Architect. These values for the building elements were as follows:

- External Walls 0.19 W/m²K
- Ground Floor 0.15 W/m²K
- Exposed Roofs 0.12 W/m²K
- Windows/Doors 1.4 W/m²K / G-Value 0.50

Although the U-values above have been proposed at this stage, further adjustment may be necessary at later stages of the design to provide feasible construction details. The Contractor shall therefore ensure that the overall strategy of this report is complied with where any change to u-values is required.

Initially, in all areas, glazing was presumed to have a G-value of 0.50. upon analysis of the BRUKL document, this was found to be inadequate. To achieve compliance with Criterion 3, a g-value of 0.20 was added to the green room glazing.

The D&B contractor shall undertake 'As Designed' & 'As Constructed' AD Part L compliance models & assessments. It is the responsibility of the D&B Contractor to undertake their own Criterion 3 assessment prior to the procurement of glazing.

Equally, uncontrolled ventilation losses should be controlled, and the new building constructed to meet stringent air permeability targets. Whilst Part L minimum requirements are $10m^3/m^2/hr$ at 50Pa, the notional building used for analysis includes a significantly lower rate ($3m^3/m^2/hr$ at 50Pa), therefore it would be advantageous for the project to target a better air permeability. A rate of $5m^3/m^2/hr$ at 50Pa has been assumed for the purpose of this analysis which would be easily achieved with traditional construction.

As the design progresses, the detailing architect will need to advise specified 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 as part of the mechanical contractors D&B remit.

4.1 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 Norwich TRY 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
Heating generally assumed as a mix of low surface temperature heating and refrigerant VRF units as outlined below. The following parameters have been assumed in the analysis:

LTHW Heating System:	
Heat Source:	LTHW boiler
Fuel Type:	Natural gas
Seasonal Efficiency:	96%
Circulation pump:	Variable Speed, pressure control within system
System Controls:	Central time control, Weather compensation control

Heat Pump Systems:	
Heat source:	Heat pump (electric): air source
Fuel type:	Electricity
Nominal SEER:	7.0
Nominal COP:	4.0

CHP Unit:	
Fuel type:	Natural Gas
Heating Efficiency:	60%
Power Efficiency:	30%
Overall Efficiency:	90%

Mechanical extract is provided to en-suites, bathrooms, WCs etc:
Mechanical extract SFP: 0.3 W/l/s

Heat recovery ventilation is provided to day spaces, corridors, laundry etc:
Overall supply & extract SFP: 1.8 W/l/s
Min heat recovery efficiency: 80%

Hot Water Services:
Hot water services are to be provided via the same heating system as is utilised for the wet radiator space heating system.

Lighting

A minimum lighting efficacy of 100 lumens/circuit watt will be provided to all spaces.

All input data is to be reviewed and developed by the 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 tender.

Electrical services shall generally be as per the specification and room data sheets, with LED lighting incorporated throughout in-line with the luminaire schedule. Lighting control shall incorporate PIR and day-lighting, as appropriate and as detailed within the Employers Requirements / MEP performance specification.

5.0 Be Lean – Use Less Energy

In line with the first stage of the recognised energy hierarchy of intervention to "Be Lean, Be Clean, Be Green", it is essential to ensure that an efficient building and building services systems have been designed and proposed, prior to the consideration of application of LZC technologies. Design measures that have been considered include, but are not limited to:

- Improved insulation of walls, roofs, glazing and floors to reduce heat losses (but not at the expense of summertime overheating). Improvements to the glazing in the existing building.
- Maximisation of potential for natural ventilation (where ambient noise levels and room function and location permit).
- Minimisation of requirements for mechanical cooling, by the application of good ventilation techniques, the orientation of the building and the internal configuration of spaces.
- 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.

6.0 Be Clean – Supply Energy Efficiently

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

Natural ventilation shall be maximised where possible in back-of-house areas such as offices & staff rooms. Mechanical ventilation shall be provided by a series of high efficiency heat recovery units. Mechanical ventilation shall be provided to the reception, the great room, the lounge/dining spaces, resident day rooms & corridors.

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 local ceiling extract fans ducted to roof. The systems will provide continuous extract with a ‘boost’ activated upon presence detection.

VRF heating and cooling shall be provided to the Bedrooms, Dayrooms, Drugs Stores, Corridors (HRUs), Kitchen, Laundry and Comms Room etc in line with the specification. The Contractor shall develop the proposals and utilise VRV/VRF systems to serve multiple indoor units from a single external unit. Units shall be heating and cooling type in all spaces.

Electrical services shall generally be as per the specification and room data sheets, with LED lighting incorporated throughout in-line with the luminaire schedule. Lighting control shall incorporate PIR and day-lighting, as appropriate and as detailed within the MEP performance specification.

6.1 Results – Be Clean (New Build Elements including CHP)

The figures were determined as follows:

TER	38.2 kg.CO_2/m² per annum
BER	41.5 kg.CO_2/m² per annum

Given the already included improvements to fabric design and building construction, appropriate technologies are considered in section 7 to achieve the further reduction required to attain compliance.

7.0 Be Green - Low & Zero 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.

7.1 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 8% to 15% 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 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.

Picture 1: Frame mounted PV on a flat roof

Picture 2: Roof Mounted PV Panels

7.2 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.


Picture 3: Evacuated tube solar thermal panels

7.3 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.


Picture 4: Micro-Wind Turbine (multiple required for reasonable yield)

7.4 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.

Picture 5: Wood Pellet Fuel

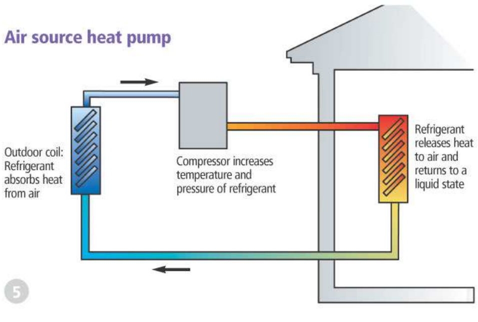
Picture 6: Wood Chip Fuel

7.5 Heat Pumps

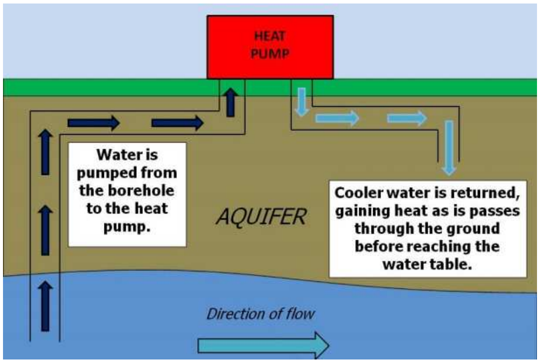
Heat pumps take a low-grade source of heat e.g. a lake or external air, and though a process similar to that of a domestic refrigerator, "upgrade" the heat for use in a heating system, or for domestic hot water generation.

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.



Picture 7: Air Source Heat Pump



Picture 8: Open Water Loop

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

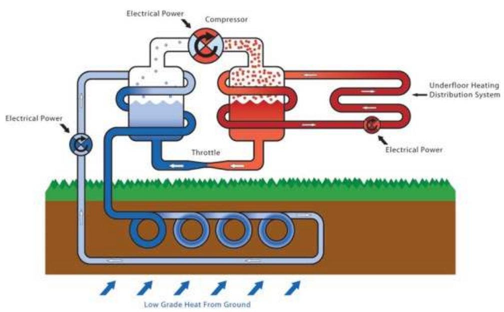
A borehole is dug to an underground water source such as an aquifer. Water is drawn through the heat pump where heat is extracted or added, and then reinjected into another borehole.
This is highly dependent on site geology, and abstraction rights are required from the Environment Agency to extract water 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.



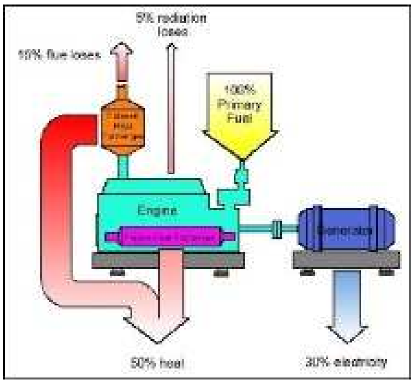
Picture 9: Ground Source Heat Pump Diagrammatic

7.6 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.

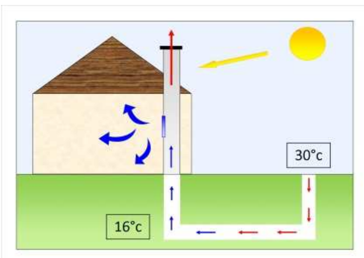


Picture 10: CHP Diagrammatic

7.7 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.



Picture 11: Earth Tube (Summer Cycle)

7.8 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.	No
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.	No
Combined Heat and Power	A Combined Heat and Power	Potential high CO_2 saving available. Efficient use of fuel.	Maintenance intensive.	Yes

Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
	(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.	Excess electricity can be exported to the grid	Sufficient base thermal and electrical demand required. Some additional plant space required.	
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 for a small scale CHP.

Based on the thermal and electrical efficiencies, heat to power ratio and CHPQA Quality Index of typical commercially available units, the building was modelled to determine the proportion of CHP that would be required to comply with the local planning policy requirements.

In order to achieve compliance with local Policy, it was determined from the EDSL Tas energy simulation software tool that a CHP sized to provide in the order of 143,703kWh of the overall thermal demand was required.

7.9 Results – Be Green (New Build Elements with PV)

The figures were determined as follows:

TER 38.2 kg.CO2/m² per annum
BER 34.2 kg.CO2/m² per annum

A copy of the BRUKL output documents is provided in Appendix A for information.

Based on commercially available PV and CHP sizes, the actual reduction is likely to be higher than this, although this will be subject to the specific equipment selected by the D & B contractor and the final calculated vessel size.

The CHP has been included within this energy strategy as one particular, low investment solution to achieve compliance with building regulations criteria as noted. It is the contractor's responsibility to provide a holistic energy strategy that will comply with both criteria whilst also achieving specification compliance. Alternative solutions to the CHP would therefore be considered as a means of compliance with all criteria.

8.0 Life Cycle Costing

This section of the report shall examine the life cycle cost of the CHP system selected to meet the aforementioned policy requirements.

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	£0.126
Gas	£0.032

**Figures are based on a fair to good tariffs as current during 2020.*

Analysis of a commercially available CHP unit against the figures provided by the BRUKL document in 'Appendix A' provides the basis for the energy used and generated which we can then use to calculate the overall costs.

9.1 Combined Heat & Power (CHP)

The CHP has been sized to account for around **23% of the thermal requirements of the new part of the building and has been increased to provide additional benefit to the existing building, the total thermal production is estimated to be 287,406kWh per annum**. In a CHP unit heat is generated with an efficiency of around 60% whereas heat generated by a boiler will be around 97%. This will result in the following cost difference:

Heat Generator	**Heat Energy (kWh)**	**Generator Efficiency (%)**	**Total Energy Consumed (kWh)**	**Fuel Cost (£)** *Gas*
Boiler	287,406	97%	296,294	£9,481
CHP	287,406	60%	479,010	£15,328
			Cost Difference (£) =	**£5,847**

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 **143,703kWh per annum** when accounting for the above heat requirements.

This will result in the following savings:

Electricity Generator	**Elec Energy (kWh)**	**Fuel Cost (£)** *Elec*
Grid	143,703	£18,107
CHP	143,703	£0
	Cost Difference (£) =	**£18,107**

**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	£9,481	£18,107	£27,588
CHP	£15,328	£0*	£15,328
		Cost Difference (£) =	**£12,260**

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

From the above calculations we can see that the CHP unit should provide fuel cost savings of around £12,260 per annum.

Annual maintenance costs on a 20kWe 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 £10,585.

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 £55,000 (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)*
£55,000	£10,585	Under 6 years

A typical CHP unit of this capacity and theoretical operational profile would have a design life of around 15 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 15 years (£)	Total Savings over 15 years (£)
£55,000	£158,775	£103,775

The Life Cycle Cost of the proposed CHP unit will result in estimated total saving of **£103,775.**

9.0 Available Grants for LZC Technology

This section of the report lists the grants available for the LZC technology proposed on this scheme, in this case CHP.

CHPQA:

'The CHP Quality Assurance programme (CHPQA) is a government initiative providing a practical, determinate method for assessing all types and sizes of Combined Heat & Power (CHP) schemes throughout the UK. CHP, the simultaneous generation of heat & power in a single process, provides one of the most cost-effective approaches for making carbon savings and plays a crucial role in the UK Climate Change programme.
CHPQA aims to monitor, assess and improve the quality of UK Combined Heat and Power.
While participation in the CHPQA programme is voluntary, the government is committed to increasing the UK's CHP capacity because of the considerable environmental, economic and social benefits it can bring together with its contribution to security of supply. Successful CHPQA certification grants eligibility to a range of benefits, including Renewable Obligation Certificates, Renewable Heat Incentive, Carbon Price Floor (heat) relief, Climate Change Levy exemption (in respect of electricity directly supplied), Enhanced Capital Allowances and preferential Business Rates.'

Description taken from www.gov.uk/guidance/combined-heat-power-quality-assurance-programme

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.'

The Climate Change Levy:

'The Climate Change Levy was introduced by the UK Government in 2001 and is charged on most non-domestic supplies of energy used as fuel for lighting, heating and power. The CCL is designed to promote energy efficiency and encourage investment in energy saving equipment, thereby reducing emissions of greenhouse gases. CHP schemes that are fully or partially certified as Good Quality CHP under CHPQA and have obtained a Secretary of State (CHP) Exemption Certificate are exempt from the main rates of CCL on the fuel they utilise (assuming they meet a power efficiency threshold of 20% otherwise this exemption is scaled back).'

ECA:

'The Enhanced Capital Allowances scheme allows businesses to write-off 100% of their investment in those energy saving technologies that are listed in the Energy Technology Criteria List against the taxable profits of the period during which they make the investment. ECAs are claimed in the same way as other capital allowances on the Corporation Tax Return for companies and the Income Tax Return for individuals and partnerships.'

Description above taken from www.gov.uk/guidance/combined-heat-and-power-incentives

10.0 <u>Appendix A – BRUKL Documentation</u>

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 and provides a ‘draft’ to inform the tender process & identify an intent for illustration to the planning authority. 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

Compliance with England Building Regulations Part L 2013

Project name

KYN - Hotel Felix

As designed

Date: Wed Feb 03 16:39:18 2021

Administrative information

Building Details

Address: Cambridge,

Certification tool

Calculation engine: TAS

Calculation engine version: "v9.5.0"

Interface to calculation engine: TAS

Interface to calculation engine version: v9.5.0

BRUKL compliance check version: v5.6.a.1

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Harniss Building Services Solutions

Telephone number: 01933 656850

Address: 23 Paterson Road, Wellingborough, NN8 4BZ

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	38.2
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	38.2
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	34.2
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	0.19	0.19	External Wall
Floor	0.25	0.15	0.15	Ground Floor
Roof	0.25	0.12	0.12	Roof
Windows***, roof windows, and rooflights	2.2	1.49	1.55	EW3 1.04x.045
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- Rad Heating/Mech Vent (SFP 1.8) (17 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	-	1.8	0.8
Standard value	0.91*	N/A	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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.

2- Rad Heating/Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	-	-	-
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.

3- Kitchen HVAC (Kitchen 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	-	-	-
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.

4- Rad Heating/Extract Only (118 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	-	-	-
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- VRF/Nat Vent (Comms 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	6	-	-	-
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

6- VRF/Mech Vent (SFP 1.8) (22 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	-	1.8	0.8
Standard value	0.91*	2.6	N/A	1.6^	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.

7- VRF/Extract Only (4 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	6	-	-	-
Standard value	0.91*	2.6	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.					

1- New HWS Circuit

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.96	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- CHP

	CHPQA quality index	CHP electrical efficiency
This building	144	0.3
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**
En-Suite 1	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 2	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 3	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 4	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 5	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 6	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 7	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 8	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 9	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 10	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 11	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 12	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 13	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 14	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 15	0.3	-	-	-	-	-	-	-	-	-	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
En-Suite 16	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 17	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 18	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 19	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 20	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 21	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 22	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 23	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 24	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 25	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 26	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 27	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 28	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 29	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 30	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 31	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 32	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 33	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 34	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 35	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 36	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 37	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 38	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 39	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 40	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 41	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 42	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 43	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 44	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 45	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 46	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 47	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 48	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 49	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 50	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 51	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 52	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 53	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 54	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 55	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 56	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 57	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 58	0.3	-	-	-	-	-	-	-	-	-	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
En-Suite 59	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 60	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 61	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 62	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 63	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 64	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 65	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 66	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 67	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 68	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 69	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 70	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 71	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 72	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 73	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 74	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 75	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 76	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 77	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 78	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 79	0.3	-	-	-	-	-	-	-	-	-	N/A
En-Suite 80	0.3	-	-	-	-	-	-	-	-	-	N/A
Corridor 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 2	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 3	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 4	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 5	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 6	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 7	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 8	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 9	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 10	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 11	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 12	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 13	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 14	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 15	-	-	-	1.8	-	-	-	-	-	-	N/A
Corridor 16	-	-	-	1.8	-	-	-	-	-	-	N/A
Laundry 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Kitchen 1	-	-	-	-	-	-	-	-	1	-	N/A
Kitchen Office 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Managers Office 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Admin Office 1	-	-	-	1.8	-	-	-	-	-	-	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
Kitchen Change 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Hoist Store 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Hoist Store 2	0.3	-	-	-	-	-	-	-	-	-	N/A
Hoist Store 3	0.3	-	-	-	-	-	-	-	-	-	N/A
Hoist Store 4	0.3	-	-	-	-	-	-	-	-	-	N/A
Hoist Store 5	0.3	-	-	-	-	-	-	-	-	-	N/A
Garden Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
WC 1	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 2	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 3	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 4	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 5	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 6	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 7	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 8	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 9	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 10	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 11	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 12	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 13	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 14	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 15	0.3	-	-	-	-	-	-	-	-	-	N/A
WC 16	0.3	-	-	-	-	-	-	-	-	-	N/A
Sluice 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Sluice 2	0.3	-	-	-	-	-	-	-	-	-	N/A
Sluice 3	0.3	-	-	-	-	-	-	-	-	-	N/A
Sluice 4	0.3	-	-	-	-	-	-	-	-	-	N/A
Male Staff Ch. 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Female Staff Ch. 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Staff Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Nurse Station 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Nurse Station 2	-	-	-	1.8	-	-	-	-	-	-	N/A
Nurse Station 3	-	-	-	1.8	-	-	-	-	-	-	N/A
Nurse Station 4	-	-	-	1.8	-	-	-	-	-	-	N/A
Drugs Store 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Drugs Store 2	0.3	-	-	-	-	-	-	-	-	-	N/A
Drugs Store 3	0.3	-	-	-	-	-	-	-	-	-	N/A
Drugs Store 4	0.3	-	-	-	-	-	-	-	-	-	N/A
Cinema 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Hair and Beauty 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Gym 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Lounge 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Lounge 2	-	-	-	1.8	-	-	-	-	-	-	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
Lounge 3	-	-	-	1.8	-	-	-	-	-	-	N/A
Dining 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Dining 2	-	-	-	1.8	-	-	-	-	-	-	N/A
Great Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Assisted Bath 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Assisted Bath 2	0.3	-	-	-	-	-	-	-	-	-	N/A
Assisted Bath 3	0.3	-	-	-	-	-	-	-	-	-	N/A
Assisted Bath 4	0.3	-	-	-	-	-	-	-	-	-	N/A
Wheelchair Store 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Cleaners Store 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Cleaners Store 2	0.3	-	-	-	-	-	-	-	-	-	N/A
Cleaners Store 3	0.3	-	-	-	-	-	-	-	-	-	N/A
Cleaners Store 4	0.3	-	-	-	-	-	-	-	-	-	N/A
Arts and Hobbies Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Dementia Centre 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Consult. Room 1	-	-	-	1.8	-	-	-	-	-	-	N/A
Shower 1	0.3	-	-	-	-	-	-	-	-	-	N/A
Therapy 1	-	-	-	1.8	-	-	-	-	-	-	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	
Bedroom 1	-	100	-	52
Bedroom 2	-	100	-	57
Bedroom 3	-	100	-	57
Bedroom 4	-	100	-	57
Bedroom 5	-	100	-	52
Bedroom 6	-	100	-	52
Bedroom 7	-	100	-	52
Bedroom 8	-	100	-	60
Bedroom 9	-	100	-	60
Bedroom 10	-	100	-	62
Bedroom 11	-	100	-	57
Bedroom 12	-	100	-	57
Bedroom 13	-	100	-	52
Bedroom 14	-	100	-	52
Bedroom 15	-	100	-	52
Bedroom 16	-	100	-	52
Bedroom 17	-	100	-	52
Bedroom 18	-	100	-	52
Bedroom 19	-	100	-	52
Bedroom 20	-	100	-	52
Bedrooms 21	-	100	-	52

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Bedrooms 22	-	100	-	57
Bedrooms 23	-	100	-	57
Bedrooms 24	-	100	-	57
Bedrooms 25	-	100	-	52
Bedrooms 26	-	100	-	52
Bedrooms 27	-	100	-	52
Bedrooms 28	-	100	-	60
Bedrooms 29	-	100	-	60
Bedrooms 30	-	100	-	62
Bedrooms 31	-	100	-	57
Bedrooms 32	-	100	-	57
Bedrooms 33	-	100	-	52
Bedrooms 34	-	100	-	52
Bedrooms 35	-	100	-	52
Bedrooms 36	-	100	-	52
Bedrooms 37	-	100	-	52
Bedrooms 38	-	100	-	52
Bedrooms 39	-	100	-	52
Bedrooms 40	-	100	-	52
Bedrooms 41	-	100	-	52
Bedrooms 42	-	100	-	51
Bedrooms 43	-	100	-	57
Bedrooms 44	-	100	-	57
Bedrooms 45	-	100	-	57
Bedrooms 46	-	100	-	52
Bedrooms 47	-	100	-	52
Bedrooms 48	-	100	-	52
Bedrooms 49	-	100	-	60
Bedrooms 50	-	100	-	60
Bedrooms 51	-	100	-	62
Bedrooms 52	-	100	-	57
Bedrooms 53	-	100	-	52
Bedrooms 54	-	100	-	52
Bedrooms 55	-	100	-	52
Bedrooms 56	-	100	-	52
Bedrooms 58	-	100	-	52
Bedrooms 59	-	100	-	52
Bedrooms 60	-	100	-	52
Bedrooms 61	-	100	-	52
Bedrooms 62	-	100	-	52
Bedrooms 63	-	100	-	57
Bedrooms 64	-	100	-	57
Bedrooms 65	-	100	-	57

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Bedrooms 66	-	100	-	52
Bedrooms 67	-	100	-	52
Bedrooms 68	-	100	-	52
Bedrooms 69	-	100	-	60
Bedrooms 70	-	100	-	60
Bedrooms 71	-	100	-	62
Bedrooms 72	-	100	-	57
Bedrooms 73	-	100	-	51
Bedrooms 74	-	100	-	51
Bedrooms 75	-	100	-	52
Bedrooms 76	-	100	-	52
Bedrooms 77	-	100	-	52
Bedrooms 78	-	100	-	52
Bedrooms 79	-	100	-	52
Bedrooms 80	-	100	-	52
En-Suite 1	-	100	-	28
En-Suite 2	-	100	-	28
En-Suite 3	-	100	-	28
En-Suite 4	-	100	-	28
En-Suite 5	-	100	-	28
En-Suite 6	-	100	-	28
En-Suite 7	-	100	-	28
En-Suite 8	-	100	-	28
En-Suite 9	-	100	-	28
En-Suite 10	-	100	-	28
En-Suite 11	-	100	-	28
En-Suite 12	-	100	-	28
En-Suite 13	-	100	-	28
En-Suite 14	-	100	-	28
En-Suite 15	-	100	-	28
En-Suite 16	-	100	-	28
En-Suite 17	-	100	-	28
En-Suite 18	-	100	-	28
En-Suite 19	-	100	-	28
En-Suite 20	-	100	-	28
En-Suite 21	-	100	-	28
En-Suite 22	-	100	-	28
En-Suite 23	-	100	-	28
En-Suite 24	-	100	-	28
En-Suite 25	-	100	-	28
En-Suite 26	-	100	-	28
En-Suite 27	-	100	-	28
En-Suite 28	-	100	-	28

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
En-Suite 29	-	100	-	28
En-Suite 30	-	100	-	28
En-Suite 31	-	100	-	28
En-Suite 32	-	100	-	28
En-Suite 33	-	100	-	28
En-Suite 34	-	100	-	28
En-Suite 35	-	100	-	28
En-Suite 36	-	100	-	28
En-Suite 37	-	100	-	28
En-Suite 38	-	100	-	28
En-Suite 39	-	100	-	28
En-Suite 40	-	100	-	28
En-Suite 41	-	100	-	28
En-Suite 42	-	100	-	28
En-Suite 43	-	100	-	28
En-Suite 44	-	100	-	28
En-Suite 45	-	100	-	28
En-Suite 46	-	100	-	26
En-Suite 47	-	100	-	28
En-Suite 48	-	100	-	27
En-Suite 49	-	100	-	28
En-Suite 50	-	100	-	28
En-Suite 51	-	100	-	28
En-Suite 52	-	100	-	28
En-Suite 53	-	100	-	27
En-Suite 54	-	100	-	26
En-Suite 55	-	100	-	28
En-Suite 56	-	100	-	28
En-Suite 57	-	100	-	28
En-Suite 58	-	100	-	27
En-Suite 59	-	100	-	28
En-Suite 60	-	100	-	28
En-Suite 61	-	100	-	28
En-Suite 62	-	100	-	26
En-Suite 63	-	100	-	28
En-Suite 64	-	100	-	27
En-Suite 65	-	100	-	28
En-Suite 66	-	100	-	28
En-Suite 67	-	100	-	28
En-Suite 68	-	100	-	27
En-Suite 69	-	100	-	28
En-Suite 70	-	100	-	27
En-Suite 71	-	100	-	28

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
En-Suite 72	-	100	-	28
En-Suite 73	-	100	-	27
En-Suite 74	-	100	-	28
En-Suite 75	-	100	-	28
En-Suite 76	-	100	-	28
En-Suite 77	-	100	-	28
En-Suite 78	-	100	-	28
En-Suite 79	-	100	-	28
En-Suite 80	-	100	-	28
Corridor 1	-	100	-	114
Corridor 2	-	100	-	230
Corridor 3	-	100	-	213
Corridor 4	-	100	-	291
Corridor 5	-	100	-	98
Corridor 6	-	100	-	293
Corridor 7	-	100	-	212
Corridor 8	-	100	-	234
Corridor 9	-	100	-	142
Corridor 10	-	100	-	328
Corridor 11	-	100	-	261
Corridor 12	-	100	-	213
Corridor 13	-	100	-	260
Corridor 14	-	100	-	256
Corridor 15	-	100	-	213
Corridor 16	-	100	-	262
Laundry 1	-	100	-	466
Stairwell 1	-	100	-	73
Stairwell 2	-	100	-	68
Stairwell 3	-	100	-	66
Stairwell 4	-	100	-	77
Stairwell 5	-	100	-	66
Stairwell 6	-	100	-	66
Stairwell 7	-	100	-	66
Stairwell 8	-	100	-	61
Stairwell 9	-	100	-	83
Stairwell 10	-	100	-	73
Kitchen 1	-	100	-	705
Kitchen Office 1	100	-	-	55
Comms 1	100	-	-	47
Managers Office 1	100	-	-	153
Admin Office 1	100	-	-	95
Kitchen Change 1	-	100	-	47
Staff Corridor 1	-	100	-	105

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Staff Corridor 2	-	100	-	49
Staff Corridor 3	-	100	-	172
Linen Store 1	100	-	-	12
Linen Store 2	100	-	-	14
Linen Store 3	100	-	-	11
Linen Store 4	100	-	-	11
Linen Store 5	100	-	-	14
Linen Store 6	100	-	-	12
Linen Store 7	100	-	-	10
Linen Store 8	100	-	-	12
Entrance Foyer 1	-	100	-	235
Plant Room 1	100	-	-	209
Store 1	100	-	-	30
Store 2	100	-	-	32
Store 3	100	-	-	20
Store 4	100	-	-	13
Store 5	100	-	-	20
Store 6	100	-	-	15
Store 7	100	-	-	14
Store 8	100	-	-	33
Store 9	100	-	-	15
Hoist Store 1	100	-	-	17
Hoist Store 2	100	-	-	17
Hoist Store 3	100	-	-	32
Hoist Store 4	100	-	-	25
Hoist Store 5	100	-	-	31
Linen Store 9	100	-	-	10
Garden Room 1	-	100	-	295
WC 1	-	100	-	31
WC 2	-	100	-	32
WC 3	-	100	-	30
WC 4	-	100	-	30
WC 5	-	100	-	30
WC 6	-	100	-	29
WC 7	-	100	-	30
WC 8	-	100	-	31
WC 9	-	100	-	29
WC 10	-	100	-	28
WC 11	-	100	-	28
WC 12	-	100	-	29
WC 13	-	100	-	29
WC 14	-	100	-	29
WC 15	-	100	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
WC 16	-	100	-	25
Sluice 1	100	-	-	45
Sluice 2	100	-	-	53
Sluice 3	100	-	-	52
Sluice 4	100	-	-	52
Male Staff Ch. 1	-	100	-	80
Female Staff Ch. 1	-	100	-	116
Staff Room 1	-	100	-	115
Nurse Station 1	-	100	-	80
Nurse Station 2	-	100	-	80
Nurse Station 3	-	100	-	80
Nurse Station 4	-	100	-	81
Drugs Store 1	100	-	-	32
Drugs Store 2	100	-	-	32
Drugs Store 3	100	-	-	32
Drugs Store 4	100	-	-	32
Cinema 1	-	100	-	172
Hair and Beauty 1	-	100	-	170
Gym 1	-	100	-	158
Lounge 1	-	100	-	197
Lounge 2	-	100	-	320
Lounge 3	-	100	-	320
Dining 1	-	100	-	226
Dining 2	-	100	-	225
Great Room 1	-	100	-	877
Assisted Bath 1	-	100	-	93
Assisted Bath 2	-	100	-	88
Assisted Bath 3	-	100	-	90
Assisted Bath 4	-	100	-	88
Wheelchair Store 1	100	-	-	26
Bedrooms 57	-	100	-	52
Cleaners Store 1	100	-	-	12
Cleaners Store 2	100	-	-	11
Cleaners Store 3	100	-	-	13
Cleaners Store 4	100	-	-	12
Room Service Store 1	100	-	-	15
Garden Service Room 1	100	-	-	68
Linen Store 10	100	-	-	12
Arts and Hobbies Room 1	-	100	-	249
Dementia Centre 1	-	100	-	130
Consult. Room 1	-	100	-	72
Staff Corridor 4	-	100	-	148
Shower 1	-	100	-	43

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Therapy 1	-	100	-	84
Maintenance Store 1	100	-	-	25
Clothes Store 1	100	-	-	48

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?
Bedroom 1	NO (-27%)	NO
Bedroom 2	NO (-40%)	NO
Bedroom 3	NO (-29%)	NO
Bedroom 4	NO (-40%)	NO
Bedroom 5	NO (-27%)	NO
Bedroom 6	NO (-45%)	NO
Bedroom 7	NO (-27%)	NO
Bedroom 8	NO (-40%)	NO
Bedroom 9	NO (-29%)	NO
Bedroom 10	NO (-45%)	NO
Bedroom 11	NO (-24%)	NO
Bedroom 12	NO (-45%)	NO
Bedroom 13	NO (-22%)	NO
Bedroom 14	NO (-53%)	NO
Bedroom 15	NO (-53%)	NO
Bedroom 16	NO (-53%)	NO
Bedroom 17	NO (-71%)	NO
Bedroom 18	NO (-52%)	NO
Bedroom 19	NO (-52%)	NO
Bedroom 20	NO (-50%)	NO
Bedrooms 21	NO (-50%)	NO
Bedrooms 22	NO (-59%)	NO
Bedrooms 23	NO (-52%)	NO
Bedrooms 24	NO (-59%)	NO
Bedrooms 25	NO (-50%)	NO
Bedrooms 26	NO (-62%)	NO
Bedrooms 27	NO (-50%)	NO
Bedrooms 28	NO (-59%)	NO
Bedrooms 29	NO (-51%)	NO
Bedrooms 30	NO (-45%)	NO
Bedrooms 31	NO (-24%)	NO
Bedrooms 32	NO (-45%)	NO
Bedrooms 33	NO (-21%)	NO
Bedrooms 34	NO (-34%)	NO
Bedrooms 35	NO (-30%)	NO
Bedrooms 36	NO (-29%)	NO
Bedrooms 37	NO (-57%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Bedrooms 38	NO (-30%)	NO
Bedrooms 39	NO (-30%)	NO
Bedrooms 40	NO (-30%)	NO
Bedrooms 41	NO (-67%)	NO
Bedrooms 42	NO (-62%)	NO
Bedrooms 43	NO (-69%)	NO
Bedrooms 44	NO (-63%)	NO
Bedrooms 45	NO (-69%)	NO
Bedrooms 46	NO (-62%)	NO
Bedrooms 47	NO (-78%)	NO
Bedrooms 48	NO (-62%)	NO
Bedrooms 49	NO (-69%)	NO
Bedrooms 50	NO (-63%)	NO
Bedrooms 51	NO (-71%)	NO
Bedrooms 52	NO (-60%)	NO
Bedrooms 53	NO (-75%)	NO
Bedrooms 54	NO (-75%)	NO
Bedrooms 55	NO (-75%)	NO
Bedrooms 56	NO (-80%)	NO
Bedrooms 58	NO (-75%)	NO
Bedrooms 59	NO (-75%)	NO
Bedrooms 60	NO (-75%)	NO
Bedrooms 61	NO (-77%)	NO
Bedrooms 62	NO (-73%)	NO
Bedrooms 63	NO (-79%)	NO
Bedrooms 64	NO (-75%)	NO
Bedrooms 65	NO (-79%)	NO
Bedrooms 66	NO (-73%)	NO
Bedrooms 67	NO (-84%)	NO
Bedrooms 68	NO (-73%)	NO
Bedrooms 69	NO (-79%)	NO
Bedrooms 70	NO (-74%)	NO
Bedrooms 71	NO (-71%)	NO
Bedrooms 72	NO (-61%)	NO
Bedrooms 73	NO (-64%)	NO
Bedrooms 74	NO (-63%)	NO
Bedrooms 75	NO (-63%)	NO
Bedrooms 76	NO (-71%)	NO
Bedrooms 77	NO (-64%)	NO
Bedrooms 78	NO (-63%)	NO
Bedrooms 79	NO (-64%)	NO
Bedrooms 80	NO (-65%)	NO
Laundry 1	NO (-90%)	NO
Kitchen Office 1	N/A	N/A
Comms 1	N/A	N/A
Managers Office 1	NO (-59%)	NO
Admin Office 1	NO (-29%)	NO
Garden Room 1	NO (-30%)	NO
Staff Room 1	NO (-90%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Nurse Station 1	N/A	N/A
Nurse Station 2	N/A	N/A
Nurse Station 3	N/A	N/A
Nurse Station 4	N/A	N/A
Drugs Store 1	N/A	N/A
Drugs Store 2	N/A	N/A
Drugs Store 3	NO (-80%)	NO
Drugs Store 4	NO (-72%)	NO
Cinema 1	NO (-64%)	NO
Hair and Beauty 1	NO (-71%)	NO
Gym 1	NO (-74%)	NO
Lounge 1	NO (-18%)	NO
Lounge 2	NO (-79%)	NO
Lounge 3	NO (-79%)	NO
Dining 1	NO (-28%)	NO
Dining 2	NO (-34%)	NO
Great Room 1	NO (-32%)	NO
Bedrooms 57	NO (-75%)	NO
Arts and Hobbies Room 1	NO (-62%)	NO
Dementia Centre 1	NO (-59%)	NO
Consult. Room 1	NO (-42%)	NO
Therapy 1	NO (-66%)	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?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	4352	4352
External area [m²]	7323	7323
Weather	NOR	NOR
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	1897	2818
Average U-value [W/m²K]	0.26	0.38
Alpha value* [%]	12.73	12.73

* 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/m²]

	Actual	Notional
Heating	16.67	21.77
Cooling	2.36	5.12
Auxiliary	16.48	9.52
Lighting	18.2	12.59
Hot water	132.02	90.94
Equipment*	51.87	51.87
TOTAL**	**152.69**	**139.94**

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	33.02	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	104.29	138.71
Primary energy* [kWh/m²]	193.91	219.4
Total emissions [kg/m²]	34.2	38.2

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0.8	0	0.2	0	18.1	0.91	0	0.96	0
	Notional	0.4	0	0.2	0	11.3	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	83.9	0	25.5	0	3.1	0.91	0	0.96	0
	Notional	95.3	0	32.3	0	1.9	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	0.1	0	0	0	132.5	0.91	0	0.96	0
	Notional	0.4	0	0.1	0	53.7	0.82	0	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	162.6	0	49.5	0	14.9	0.91	0	0.96	0
	Notional	224.8	0	76.2	0	17.1	0.82	0	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0	121.3	0	5.9	0	0	5.7	0	6
	Notional	0	185.5	0	14.3	0	0	3.6	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	1.9	248.2	0.1	12.1	35.2	3.8	5.7	4	6
	Notional	6.6	358	0.8	27.6	18.2	2.43	3.6	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Electricity, [CFT] Electricity										
	Actual	0.4	86.2	0	4.2	1.7	3.8	5.7	4	6
	Notional	0	117	0	9	5.2	0	3.6	----	----

Key to terms

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

Key Features

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

Building fabric

Element	**$U_{i\text{-}Typ}$**	**$U_{i\text{-}Min}$**	**Surface where the minimum value occurs***
Wall	0.23	0.19	External Wall
Floor	0.2	0.15	Ground Floor
Roof	0.15	0.12	Roof
Windows, roof windows, and rooflights	1.5	1.45	EW7 4.8x3.0
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

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