

ENERGY STRATEGY REPORT

Site: Crowthorne

Client: Barchester Healthcare





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Revision	Date Issued	Description/Summary of Changes	Prepared	Approved
A	09.05.2025	First Issue	JB	TS



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Executive Summary

This document details the intended energy strategy for the proposed care home located at Lower Wokingham Road, Crowthorne. The development briefly comprises of the construction of a new 60 bed care home (Use Class C2) on the site and the associated works including car parking, access, landscaping, and associated engineering. This report has been prepared by Harniss Consulting on behalf of Barchester Healthcare.

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

Prior to the application of LZC technologies the development will reduce regulated CO₂ emissions by incorporating a range of passive design and energy efficiency measures for the development, including improved building fabric standards beyond the requirements of Approved Document L:2021 of the Building Regulations and energy efficient mechanical and electrical plants. These measures will enable the proposed development to exceed Target Emission Rates (TER) through energy efficiency measures alone.

To accord with the Wokingham Borough Council Managing Development Delivery (Local Plan) 217m² PV array was applied to the building in addition to electric ASHP systems to supply heating to the development and efficient lighting and ventilation included within the passive design measures.

The below table outlines the carbon emissions of the baseline Approved Document L compliance, the Hoyle and Dean Energy Strategy that is noted within the planning conditions and the proposed updated strategy.

	(kgCO ₂ /m ² /year)	CO ₂ emissions (tonnes/year)
Development Baseline	21.87	70.18
Hoyle and Dean Strategy	21.60	69.31
Updated Strategy	21.22	68.09

Table 1 – Energy Hierarchy Emissions

The energy strategy shows that the overall CO₂ emissions from regulated energy can be reduced by 9.89 tCO₂ per annum against Baseline and 1.22 tCO₂ per annum against the Hoyle and Dean strategy which is equivalent to circa 12.7% and 1.7% reduction, respectively. This accords with policy CC05 of the Wokingham Borough Council Managing Development Delivery (Local Plan) and improves on the initial strategy.



1 Introduction

1.1 Background

Harniss Consulting has been appointed by Barchester Healthcare to produce an Energy Strategy Statement to support a planning application to build a new 60 bed care home located at Lower Wokingham Road, Crowthorne.

This report outlines the energy strategy of the development to accord with local planning policies and conditions applicable to the carbon dioxide emissions. This document identifies and describes the energy efficiency design and low carbon/renewable technology options that have been explored and the preferred options for achieving the required reduction in carbon emissions.

1.2 Description of the Development

The proposed development consists of a new 60 bed care home (Use Class C2) with a GIA of 3,812m² located at Lower Wokingham Road briefly comprising of:

- 60 bed care home with dedicated en-suites
- Community spaces including
- Main reception area
- Café
- Lounges
- Dining Rooms
- Activity Areas
- Internal & External Plant Areas.

Our Assessment has been based on the following architectural AutoCAD drawings, produced by Harris Irwin Architects;

- 3210-HIA-01-00-DR-A-0201-Proposed Ground Floor Plan
- 3210-HIA-01-00-DR-A-0211-Proposed First Floor Plan
- 3210-HIA-01-00-DR-A-0221-Proposed Second Floor Plan
- 3210-HIA-01-00-DR-A-2701-Roof Plan
- 3210-HIA-01-00-DR-A-0301-Proposed Elevations – South & East
- 3210-HIA-01-00-DR-A-0302-Proposed Elevations – North & West



Figure 1 – Site Plan

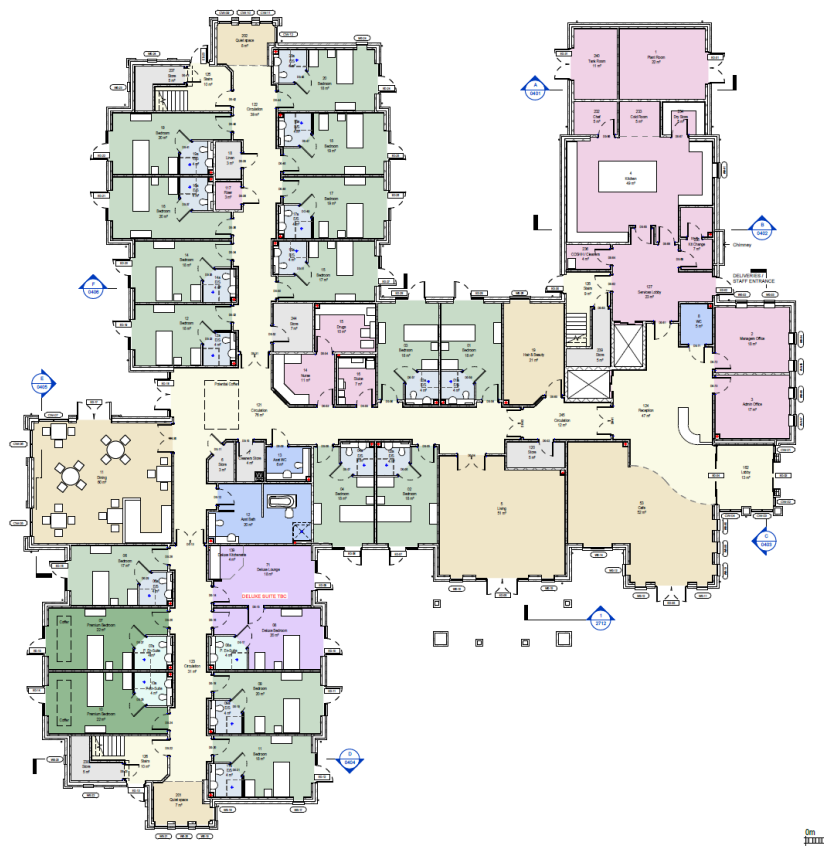


Figure 2 – Ground Floor Plan



2 Planning Policies

2.1 Summary of Policy Requirements

The Wokingham Borough Council Managing Development Delivery (Local Plan) CP1 outlines guidance on the sustainable design measures for new developments that should be accorded with alongside Building Regulations, specifically Approved Document L.

Policy CC05 – Renewable Energy & Decentralised Energy Networks

1. *Local opportunities to contribute towards decentralised energy supply from renewable and low-carbon technologies will be encouraged*
2. *Planning permission will only be granted for proposals that deliver a minimum 10% reduction in carbon emissions through renewable energy or low carbon technology where the development is for;*
 - a. *Schemes of more than 10 dwellings (gross), or*
 - b. *Non-residential proposals of more than 1,000 sq m gross floorspace*
3. *Proposals for renewable energy and decentralised energy works, including wind turbines, must demonstrate that:*
 - a. *They are appropriate in scale, location and technology type;*
 - b. *Are compatible with the surrounding area, including the impact of noise and odour;*
 - c. *Do not have a damaging impact on the local topography and landscape;*
 - d. *There is no significant impact upon heritage assets, including views important to their setting*
 - e. *In the case of wind turbines, take account of their cumulative effect and properly reflect their impact on the landscape and on local amenity*

2.2 Planning Conditions

Planning condition 17 for the application reference 223256 states the following;

Prior to the first occupation of the development hereby permitted, the photovoltaic array of minimum delivery capacity 92kWp, as stated in the energy statement by Hoyle Dean dated 30th September 2022 and shown in approved drawing ref Proposed Roof Plan 3210-HIA-01-XX-DRA-0231 P3, shall be installed in accordance with this approved plan and details and retained thereafter.

A 92kWp PV array is not feasible within the spatial constraints of the proposed development. The PV array would be in the order of 161-217no panels given available panels on the market. The above HIA roof drawing only details 104 panels with a number of these needing to be omitted to accommodate roof mounted plant and equipment relating to the ventilation, comfort cooling and air source heat pumps.

2.3 Development Requirements

This report shall outline how the energy strategy of the proposed development shall be in line with the applicable local and regional planning policies, follow the energy hierarchy and demonstrate an equivalence to the Hoyle Dean energy strategy in terms of primary energy usage and emissions.



Energy Strategy Report

- **Be Lean**
 - Incorporate passive design measures that will reduce energy usage and therefore carbon emissions through the use of a high specification building fabric and efficient building services systems such as heating, lighting and ventilation.
- **Be Clean**
 - Connect to a local heat network, where feasible.
- **Be Green**
 - Incorporate low zero technologies to achieve a 10% reduction in carbon emissions in line with Wokingham Borough Council CC05 and have carbon emissions less than 21.6kgCO₂/m².annum in line with the Hoyle Dean Energy Strategy and Planning Condition 17.



3 Energy Strategy Approach

3.1 Energy Hierarchy

The proposed energy strategy for the development will follow the Energy Hierarchy approach of Be Lean, Be Clean and Be Green to enable the maximum viable reductions in regulated and total CO₂ emissions over the baseline.

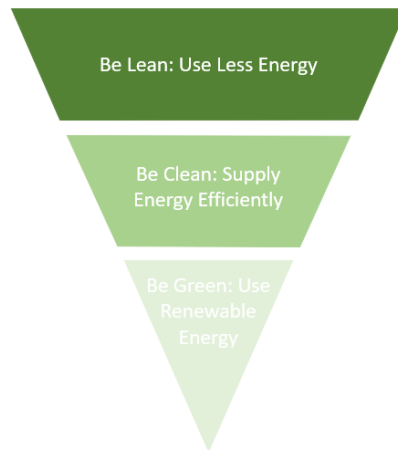


Figure 3 – Energy Hierarchy

By following the above the development will be modelled as follows:

- Baseline Development
 - This will be the baseline development that would achieve compliance with Approved Document L : 2021.
- Be Lean
 - Develop on the baseline and incorporate high efficiency heating, lighting, ventilation and other fixed building services and fabric.
- Be Clean
 - Connect to a public heat network in the vicinity of the site, where available, to supply heat to the development for space heating and domestic hot water generation.
- Be Green
 - Incorporate technically, practically, and functionally feasible renewable technologies such as photovoltaics, solar thermal or wind turbines to generate on site electricity, reduce the developments grid energy usage and the associated carbon emissions.

3.2 Energy and Carbon Assessment Methodology

Analysis for the building has been undertaken utilising EDSL Tas software version 9.5.6. EDSL Tas is industry leading NCM accredited thermal modelling software which carries out dynamic hourly simulations of the anticipated energy usage and compares it against the notional benchmarks set under Approved Document Part L2 of the building regulations. The software was initially used to determine a baseline carbon emission using fabric performance values as discussed with the



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development team (as detailed in the body of the report) without contribution from additional renewable technologies.

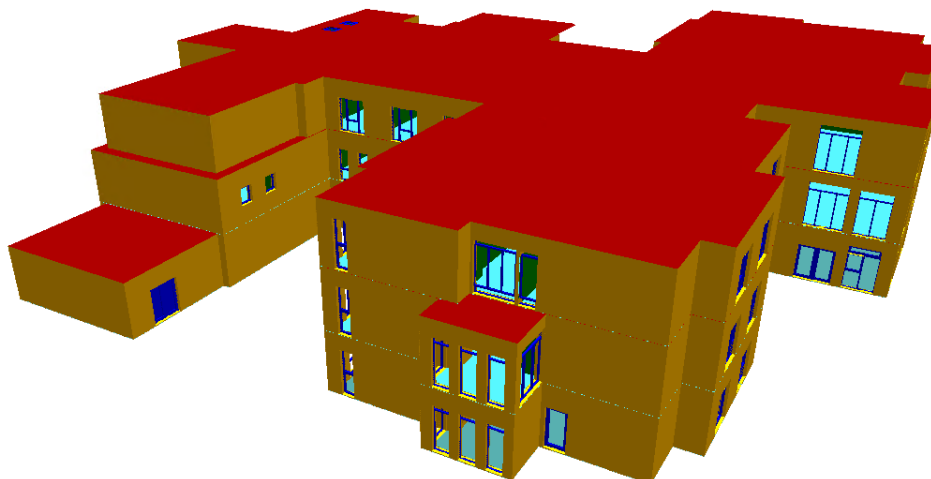


Figure 4 – EDSL TAS Model Screenshot

An assessment of the energy performance of the development considers regulated energy usage for different building services such as cooling, heating, lighting and ventilation.

Although the produced data by the EDSL Tas software provides estimations of possible energy and carbon performance of the non-residential development for assessment purposes, again it is not intended to be used as a detailed design tool.

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

4 Baseline CO₂ Emissions

In order to assess CO₂ performance of the proposed energy strategy, a CO₂ emissions baseline needs to be established. This section sets out the approach taken to calculating the baseline CO₂ emissions for the residential and the non-residential parts of the development.

The total baseline CO₂ emissions for the proposed development is defined as regulated CO₂ emissions covered by Building Regulations Part L.

For the development, the CO₂ emissions baseline is determined based on the TER for building services calculated using EDSL Tas software.

	(kg CO ₂ /m ² /annum)	CO ₂ emissions (tonnes/annum)
Development Baseline (Part L2:2021)	24.30	77.98

Table 2 – Baseline Emissions



5 Energy Efficiency (Be Lean)

5.1 Passive Design

The proposed design incorporates optimal thermal characteristics of buildings to achieve and maintain good environmental conditions with minimum resources of material and fuel. The passive design aims to maximise use of natural heating, cooling, and ventilation to create comfortable conditions inside the buildings.

An optimal site layout and building with efficient room layouts are proposed.

It is proposed to incorporate passive solar design measures across the development. The building incorporates balconies which help to provide shading. The proposed glazed areas have been designed to maximise daylight and optimise solar gains. The glazing specification will be selected to provide a balance of solar control and access to passive solar gain.

Natural ventilation has been incorporated across most areas; however, some zones have required an element of mechanical ventilation. These areas have been determined to require the implementation of a mechanical ventilation strategy with heat recovery to supply fresh air and expel unwanted pollutants using a controlled and balanced ventilation strategy.

Openable windows and balcony doors are available to provide fresh air.

The ventilation strategy will be reviewed and developed as the design progresses to ensure compliance with all the relevant regulations and standards.

5.2 Building Fabric

Part L2:2021 Building Regulations highlights the need for an energy efficient design. The minimum building fabric requirements for Part L2:2021 and the proposed specification for individual building elements for the non-residential floor space are presented below.

Building Fabric Parameter	Value
Air permeability (m ³ /(m ² .h) @ 50Pa)	5.0
External Wall U-Value (W/m ² .K)	0.19
Roof U-value (W/m ² .K)	0.13
Ground Floor U-Value (W/m ² .K)	0.15
Glazing U-Value (W/m ² .K)	0.8
Glazing G-Value	0.3

Table 3 – Proposed Fabric Targets



Implementing these (or similar) building fabric standards will help to deliver substantial reductions in CO₂ emissions compared with the current building performance and regulations. The proposed specification should be viewed as guidance.

A significant improvement over limiting U-Values within Building Regulations. The thermal performance of the building envelope has been maximised to its fullest within the constraints of a traditional build with 100mm cavity.

Air permeability improved over the limiting value. The target will be to improve yet further on the air permeability during the construction phase but given the relatively small percentage of total energy that the heating system contributes to, any further gain will result in minimal actual reduction against the Target Emission Rate calculated under Approved Document Part L.

5.3 Energy Efficient Systems

Energy demand can be significantly reduced by using energy efficient M&E systems. The below energy efficiency measures for the proposed development have been used to conduct the energy and carbon modelling for this report. The overarching principle for final selection of the building fabric standards and energy efficient systems is to achieve compliance with Part L 2021 requirements.

Lighting

A major energy demand within modern non-residential developments is typically the lighting loads. Specified lighting in these areas should be low wattage and designed to CIBSE Illuminance levels.

Display lighting may be required which generate a significant energy demand. Therefore, if applicable, it is proposed that all display lighting should use energy efficient luminaires.

This development has improved efficacy lighting specified which reduces primary energy usage.

Appropriate automatic lighting controls used throughout, where appropriate for care i.e. proximity infrared used throughout in en-suites, bathrooms, stores, etc. Absence detection controls have also been included in the energy strategy and have been provided to all day spaces and offices.

Ventilation

Air tightness standards will exceed Approved Document Part L2 requirements. Mechanical ventilation with heat recovery has been modelled for the purposes of this report.

Improved SFP's for ventilation systems including high efficiency heat recovery.

Domestic Hot Water

The estimated hot water demand will be significant due the nature of the development use. However, it is expected to present a consistent load throughout the year, although there will be peaks and troughs in daily use. This hot water demand will be efficiently supplied by instantaneous gas fired water heaters.



Heating and Cooling

The space heating load does not present a consistent demand and is seasonal in nature. It will also be minimised through the application of the proposed energy efficiency measures modelled for this report. During the summer months, space heating may not be needed, or its requirement will be relatively low.

At this stage, it is assumed that space heating can effectively be provided by a standalone energy efficient heating system such as Air Source Heat Pump (ASHP). It is recommended to select a ASHP system with a high Seasonal Coefficient of Performance (SCOP).

At this stage, it is assumed that cooling will need to be provided to the development in specific spaces. The cooling requirement has been minimised by the proposed solar gain control measures. Cooling can be effectively provided by a Variable Refrigerant Flow (VRF) system.

Energy Metering and Monitoring

It is assumed that metering and submetering within the development of major energy consuming systems together with an accessible energy monitoring and management system or separate accessible energy sub-meters with pulsed or other open protocol will be provided.



5.4 Proposed Energy Efficiency Data

Weather File	Swindon TRY
LTHW Heating System	
Heat Source	Heat Pump (electric): air source
Fuel Type	Grid Supplied Electricity
Seasonal Efficiency	320%
Circulation Pump	Variable speed, pressure control across pump
System Controls	Central time control, Weather Compensation control
VRF Heat Pump System	
Heat Source	Heat Pump (electric): air source
Fuel Type	Grid Supplied Electricity
SEER	4.5
SCOP	4.0
DHWS System	
Heat Source	Direct Fired
Fuel Type	Natural Gas
Seasonal Efficiency	96%
Ventilation Systems	
Overall supply and extract SFP	1.1W/l/s
Min. heat recovery efficiency	80%
Overall extract SFP	0.2
Kitchen extract SFP	1.0W/l/s
Lighting	
Lumens / circuit Watt	As per specification

Table 4 – System Input Information



6 Efficient Energy Supply (Be Clean)

6.1 Energy Supply Options Assessment

The feasibility of a building wide heating network as a Be Clean measure has been evaluated. Following reduction of the energy demand, this strategy must demonstrate how systems will supply energy efficiently and reduce CO₂ emissions by following the hierarchy detailed below.

- Connection to existing area wide heat networks;
- Use of site-wide heat network or building level heating system;
- Low Carbon Individual heating system.

The inclusion of a decentralised heating network has been investigated in terms of appropriateness to the proposed development as it can help to provide the greatest reductions in CO₂ emissions.

6.2 Connection to Existing District Heating Networks

The site falls outside of the London Heat Map, however an investigation using the Heat Networks Planning Database has been carried out to identify existing and planned district heating networks in the vicinity of the site. The search provided below indicates that there are no existing or proposed heat networks within close proximity of the site. The site is also found within an area of low heat demand.

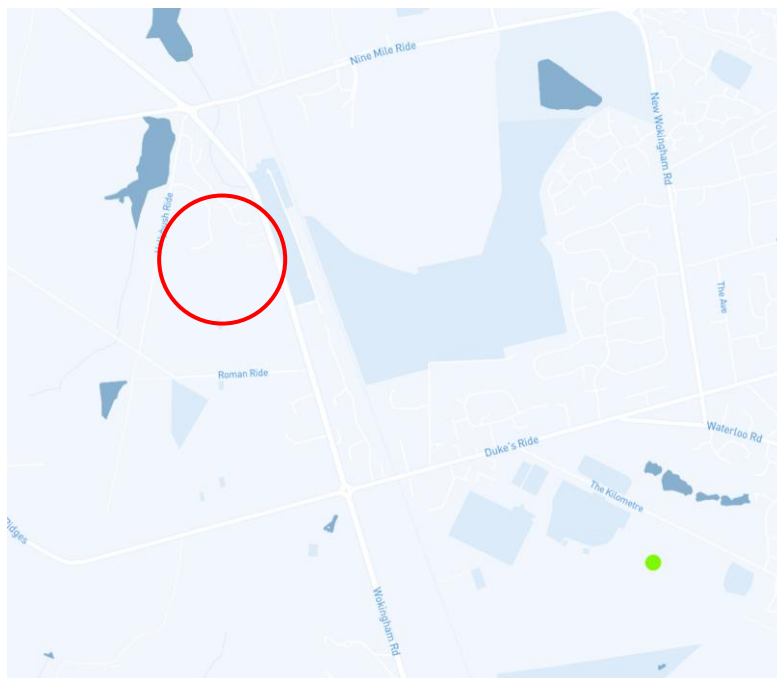


Figure 5 – Local Heat Network Search

The most local heat network is currently under construction at Wellington College – Victoria House & Raglan House. This is around 1.4 miles from site, and it would therefore not be feasible to connect to this once it is complete even if there is available capacity within the heat network. This does not preclude the development to connect to a heat network should one become available.



7 Renewable Energy Technology (Be Green)

7.1 Summary

The 'Be Green' element of the energy hierarchy uses renewable energy technologies to provide a further reduction in anticipated carbon dioxide emissions, through on-site generation where feasible.

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

Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
Solar Photovoltaic	Photovoltaic panels convert solar radiation into electrical energy	Low maintenance. No moving parts. Easily integrated into building design.	Any overshadowing affects panel performance. Large area required for installation. Panels ideally inclined and facing southerly direction.	Yes
Solar Thermal	Solar thermal energy can contribute towards space heating and hot water requirements.	Low maintenance.	Must be sized for the building base load hot water requirements. Panels ideally inclined at around 30 degrees and facing southerly direction	Yes
Wind Turbine	Wind generation equipment operates on the basis of wind turning a propeller, which is used to drive an alternator to generate electricity. Small scale (1kW – 15kW) wind turbines can be pole or roof mounted.	Low maintenance/ On-going cost. Excess electricity can be exported to the grid.	Planning issues. Aesthetic impact. Background noise Space limitations on site. Minimum wind speed requirements. Wind survey to be undertaken to verify 'local' viability.	No
Biomass	Modern wood-fuel boilers are highly efficient, clean and almost carbon	Stable long-term running costs. Potential good CO ₂ saving.	Large area needed for fuel delivery and storage. Reliable fuel supply chain required.	No



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Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
			Regular maintenance required Significant plant space required. Air pollution / Clean Air Act limits use.	
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. The lack of space to locate the underground pipework loops and the associated plant around the site.	No
Air Source Heat Pump (ASHP)	Electric air source heat pumps extract thermal energy from the surrounding air and transfer it to the working fluid (air or water).	Efficient use of fuel. Relatively low capital costs.	Specialist maintenance. Some additional plant space required. External proximity to boundary and noise generation with units cycling. Impact of the required external plant and associated noise within the domestic setting can be a nuisance to residents.	Yes



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Technology	Brief Description	Benefits	Issues/Limitations	Feasible for site
Combined Heat and Power	A Combined Heat and Power (CHP) installation is effectively a mini on-site power plant providing both electrical power and thermal heat. CHP is strictly an energy efficiency measure rather than a renewable energy technology.	Excess electricity can be exported to the grid	Maintenance intensive. Sufficient base thermal and electrical demand required. Additional plant space required. Noise and air quality constraints. Limited CO ₂ savings available due to the carbon factors.	No
Earth Ducts	Passive pre-treatment of fresh air	Low cost Free energy	Requires significant air loads and riser space	No
Onsite Battery Storage	PV Battery Storage able to charge the battery during periods of low electrical load & discharging battery power at times of low/no solar radiation	Battery discharges power during periods of low solar radiation. Reduce electrical energy supply costs.	Specialist Maintenance Additional Plant space required Low Electrical baseload, battery storage not economically viable	No

Table 5 – LZC Technology Feasibility

The following zero carbon technologies have been considered and deemed potentially feasible for the development:

- Photovoltaic Panels (PV)
- Solar Thermal
- Air Source Heat Pumps (ASHP)

Within the above feasibility assessment both Photovoltaic and Solar Thermal panels are outlined as feasible. For the development only photovoltaic panels will be incorporated. With solar thermal panels the energy generated can only be used for the production of domestic hot water. As electrically driven air source heat pumps will generate the buildings domestic hot water these can utilise the electricity produce by the photovoltaic array. As such the energy from the PV array can be utilised to operate these or for other purposes in the building meaning that a larger array would be possible whilst allowing for more flexibility in the energy use within the building before needing to export.



7.2 Air Source Heat Pumps (ASHP's)

Although Heat Pumps aren't alike other renewable energy sources as they still utilise an energy source to power them, they are considered industry wide as a 'pure form' renewable technology they still are under the category of renewable technology in the correct application.

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

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

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.

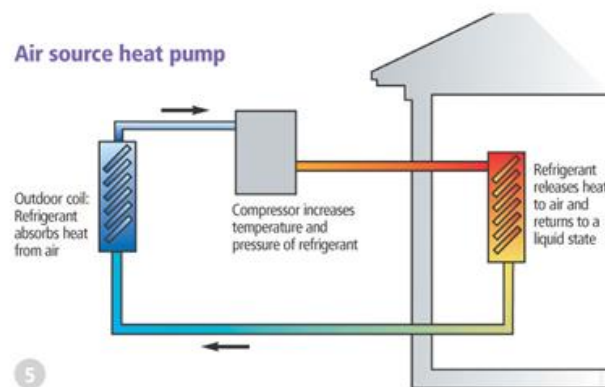


Figure 6 – Air Source Heat Pump

7.3 Photovoltaic Array

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

The PV panel system proposed of 251m². PV panels are mounted on a metal racking system which are typically angled at between 5 and 30 degrees to improve the energy capture, for maintenance the system requires access paths, provided with man safe system where required. Visual impact has to be taken into consideration, PV solar system installation will be prevented on sloping roof and therefore will be visible. The intermittency and unpredictability of solar energy due to weather is an



element which can dictate that the system is not used at full potential. A further consideration is the additional structural provisions support the photovoltaic panels and metal racking system which for a system of this size is considerable.



Figure 8 – Frame mounted panels on flat roof



Figure 7 - Roof mounted panels



8 Available Grants

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

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

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

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

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

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

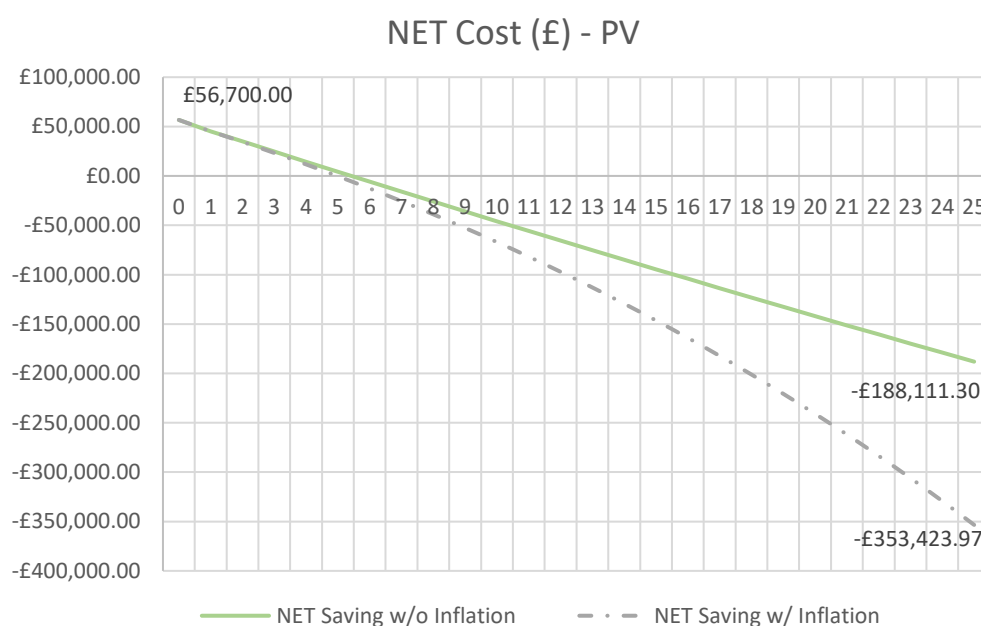
The heating system used within the care home is a private standalone system and therefore the Green Heat Network Fund (GHNF) is not an applicable grant.



9 Payback

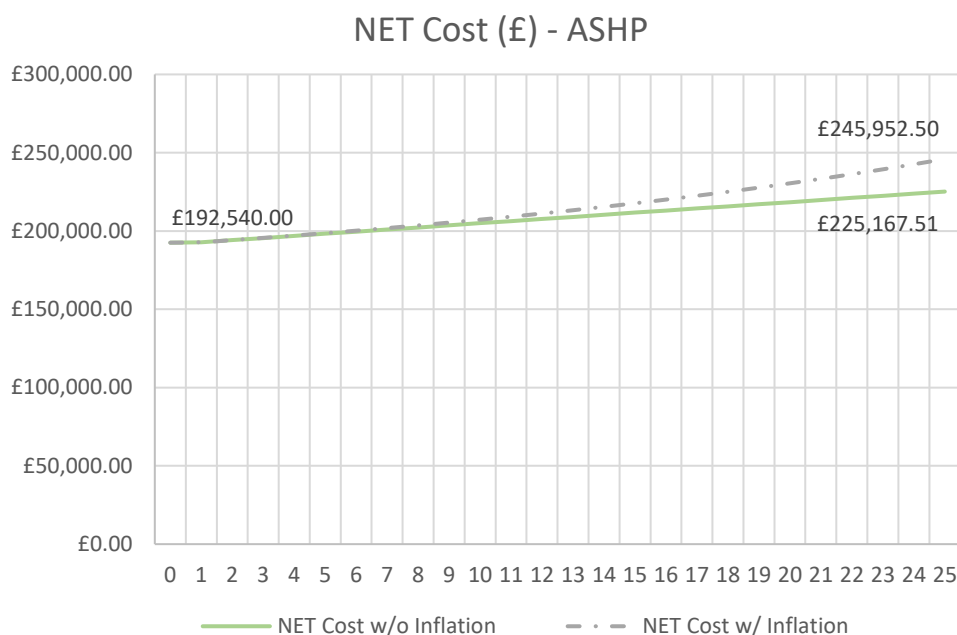
In order to establish the life cycle cost for the renewable systems the report will need to establish costing for Energy Consumption, Energy Generation, Maintenance and Estimated Fuel Tariffs. Based on the current Tariffs known of the operator of 7p/kWh and 27p/kWh for gas and electricity, respectively, the following can be calculated.

To achieve compliance with Approved Document L2: 2021 217m² photovoltaic panel array is required to be placed on the building. This is estimated at an installation cost of £56,700. Following the estimated electrical generation of the array based on the building location a payback period of 5.8 years has been calculated with a saving of £188,111.30 as over the 25-year life span of the installation. This can be seen as a reasonable worst case for the array with the above calculation accounting for a reduction in output of 0.5% per year and assuming no inflation in energy prices. Should the average inflation in energy prices of energy prices over the last 20-years (4%) be included in the calculation the saving over the installation lifespan increases to £353,423.97.



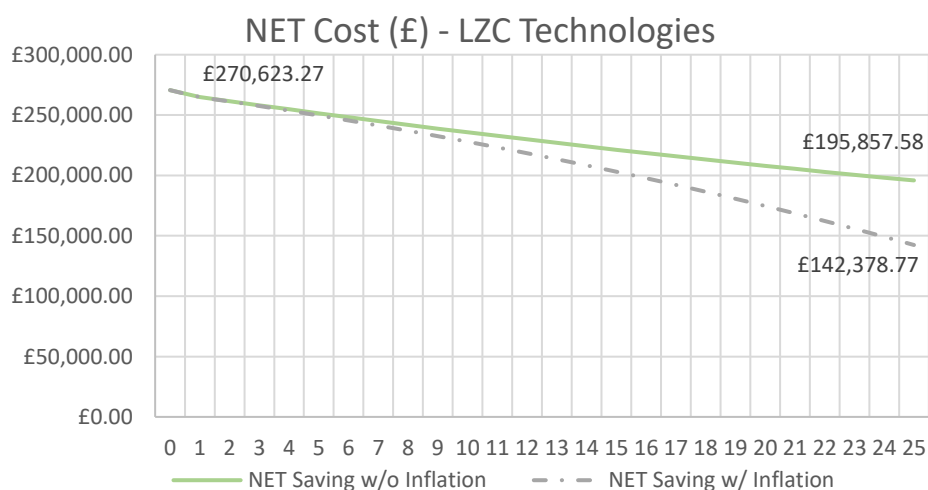
Graph 1 – Photovoltaic Lifecycle Cost

However, it should be noted that whilst the installation of a photovoltaic array will have a reduction in the operational running costs of the development the installation of an ASHP will be negative with an additional running cost compared to gas boilers of an estimated £225,167.51 (rising to an estimated £245,952.50 accounting for inflation).



Graph 2 – ASHP Lifecycle Cost

Whilst the ASHP provides a negative running cost compared to a traditional gas boiler system once the low carbon and renewable systems are paired together, they provide an overall loss of only £37,056.20. However, once this figure is adjusted for inflation the systems provide a saving of £107,471.48 over a 25-year period.



Graph 3 – LZC Technologies life cycle cost



10 Summary and Conclusion

10.1 Emissions & Primary Energy

Through the above services strategy and the application of an air source heat pump to serve the space heating, gas fired hot water generation, 217m² PV array, BMS controls, highly efficient HVAC, and highly efficient lighting the below emissions and primary energy ratings where achieved.

Target Emissions Rating (TER)	-	24.30	kgCO ₂ /m ² .annum
Building Emissions Rating (BER)	-	21.22	kgCO ₂ /m ² .annum
Target Primary Energy Rating (TPER)	-	155.21	kWh/m ² .annum
Building Primary Energy Rating (BPER)	-	125.88	kWh/m ² .annum

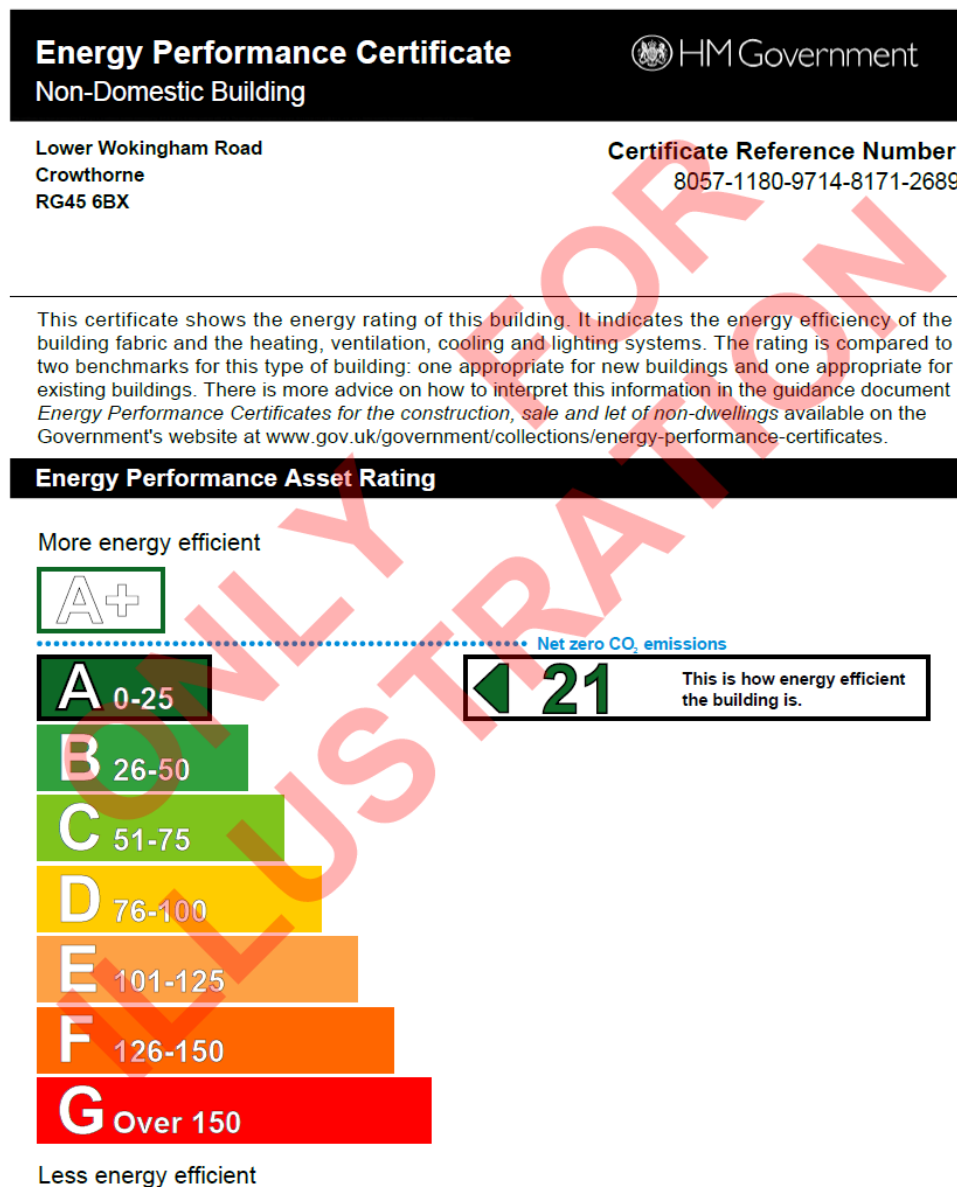


Figure 9 – Draft EPC



10.2 Planning Conditions

The table below outlines that the Building Emissions Rating (BER) noted within the Hoyle Dean report, that required to achieve a 10% reduction in line with Policy CC05 and the emissions rating for the proposed strategy outlined within this report.

Strategy	Building Emission Rate (BER)	Comments
CC05	21.87	10% reduction on the target emissions rating (TER) of 24.30kgCO ₂ /m ² .annum.
Condition 17	21.60	Emissions rate outlined in the Hoyle Dean Report that is noted in Condition 17.
Proposed Outlined	21.22	

Table 6 – BER Summary Table

As can be seen in the above table the proposed strategy outlined within this report demonstrates compliance with CC05 whilst also emitting less CO₂ than the proposed strategy in Condition 17.

10.3 Final Strategy

The Energy Strategy for the development has been formulated following the Energy Hierarchy: Be Lean, Be Clean and Be Green. The overarching objective in the formulation of the strategy is to maximise the reductions in total CO₂ emissions through the application of this hierarchy with a cost-effective and technically appropriate approach and to minimise the emission of other pollutants. The energy strategy measures are summarised and presented below.

Energy Hierarchy	Energy Strategy Measures
Be Lean	<u>Passive design</u> Compact building form, efficient layout Optimised design to enable controlled solar gain and improved direct and indirect natural lighting. Incorporation of balconies into the design to provide shading. <u>Building Fabric</u> Use of high efficiency building fabric standards. Designed with low air permeability rates <u>Energy Efficiency</u> Energy efficient lighting and appropriate controls Variable speed heating system with high delta T and low return temperatures High efficiency motors and variable speed pumps for heating and ventilation systems High efficiency heating plant and auxiliary equipment Appropriate controls for heating system Appropriate temperature and time zoning Appropriate insulation of heating distribution system ASHP systems to supply heating and hot water.



Energy Strategy Report

Energy Hierarchy	Energy Strategy Measures
Be Green	<u>Renewable energy</u> PV array.

Table 7 – Energy hierarchy summary



Appendix A – BRUKL Document

Project name

2822 - Crowthorne**As designed****Date:** Fri May 09 15:02:29 2025

Administrative information

Building Details

Address: Lower Wokingham Road, Crowthorne, RG45 6BX

Certifier details

Name: Harniss Consulting LTD**Telephone number:** 01933656850**Address:** 1 Weekley Wood Avenue , Kettering, NN14 1UQ

Certification tool

Calculation engine: TAS**Calculation engine version:** "v9.5.6"**Interface to calculation engine:** TAS**Interface to calculation engine version:** v9.5.6**BRUKL compliance module version:** v6.1.e.0**Foundation area [m²]:** 1058.64The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	24.3
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	21.22
Target primary energy rate (TPER), kWh _{PE} /m ² annum	155.21
Building primary energy rate (BPER), kWh _{PE} /m ² annum	125.88
Do the building's emission and primary energy rates exceed the targets?	BER ≤ TER BPER ≤ TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.19	0.19	External Wall
Floors	0.18	0.15	0.15	Ground Floor
Pitched roofs	0.16	0.13	0.92	null-ceiling-exposed
Flat roofs	0.18	-	-	No flat roofs in project
Windows** and roof windows	1.6	0.8	0.83	EW.13 D - 1.697x0.475
Rooflights***	2.2	0.84	0.84	EW.17 (RL) - 1.054x1.234 (0.28)
Personnel doors^	1.6	0.82	0.82	ED.07 A (LOUVRED) - 0.91x2.06
Vehicle access & similar large doors	1.3	-	-	No vehicle access or similar large doors in project
High usage entrance doors	3	-	-	No high usage entrance doors in project

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

* Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.

** Display windows and similar glazing are excluded from the U-value check.

*** Values for rooflights refer to the horizontal position.

^ For fire doors, limiting U-value is 1.8 W/m²K

NB: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	5

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	NO
Whole building electric power factor achieved by power factor correction	>0.95

1- Rad Heat/Nat Vent

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

2- Rad Heat/Extract (75 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

3- Rad Heat/Mech Vent (35 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.5	-	-	-	0.8
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

4- VRF/Mech Vent (7 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	4.5	-	-	0.8
Standard value	N/A	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

5- VRF/Extract (3 Zones)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	4.5	-	-	-
Standard value	2.5*	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

6- VRF/Nat Vent (1-Comms 1)

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

7- Kitchen (0-Kitchen 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4	4.5	-	-	-
Standard value	2.5*	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps.					

8- Laundry (1-Laundry 1)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0	4.5	-	-	0.8
Standard value	N/A	3	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

1- HWS

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	0.96	0
Standard value	0.91	N/A

Zone-level mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
0-Ensuite 1	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 2	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 3	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 4	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 6	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 7	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 8	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 9	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 10	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 11	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 12	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 14	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 15	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 16	0.2	-	-	-	-	-	-	-	-	-	N/A	

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
0-Ensuite 17	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 18	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 19	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Ensuite 20	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 21	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 22	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 23	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 24	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 25	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 26	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 27	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 28	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 29	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 30	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 31	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 32	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 33	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 34	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 35	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 36	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 37	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 38	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 39	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 40	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Ensuite 41	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 42	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 43	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 44	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 45	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 46	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 47	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 48	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 49	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 50	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 51	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 52	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 53	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 54	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 55	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 56	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 57	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 58	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Ensuite 59	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	Zone	Standard
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1		
2-Ensuite 60	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Ensuite 61	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Circulation 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Circulation 2	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Circulation 3	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Circulation 4	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Circulation 5	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Circulation 6	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Circulation 7	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Circulation 8	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Circulation 9	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Circulation 10	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Circulation 11	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Circulation 12	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Circulation 13	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Circulation 14	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Living 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Living 2	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Living 3	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Dining 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Dining 2	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Dining 3	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Nurse 1	-	-	-	1.1	-	-	-	-	-	-	N/A
1-Nurse 2	-	-	-	1.1	-	-	-	-	-	-	N/A
2-Nurse 3	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Assisted Bath 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Assisted Bath 2	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Assisted Bath 3	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Drugs 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Drugs 2	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Drugs 3	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Sluice 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Sluice 2	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Sluice 3	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Assisted WC 1	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Assisted WC 2	0.2	-	-	-	-	-	-	-	-	-	N/A
1-Assisted WC 3	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Assisted WC 4	0.2	-	-	-	-	-	-	-	-	-	N/A
2-Assisted WC 5	0.2	-	-	-	-	-	-	-	-	-	N/A
0-WC 1	0.2	-	-	-	-	-	-	-	-	-	N/A
0-Managers Office 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Admin Office 1	-	-	-	1.1	-	-	-	-	-	-	N/A
0-Reception 1	-	-	-	1.1	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]										HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I			
Standard value	0.3	1.1	0.5	2.3	2	0.5	0.5	0.4	1	Zone	Standard	
0-Cafe 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Cleaners 1	0.2	-	-	-	-	-	-	-	-	-	N/A	
1-Cleaners 2	0.2	-	-	-	-	-	-	-	-	-	N/A	
2-Cleaners 3	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Kitchen 1	-	-	-	-	-	-	-	-	1	-	N/A	
0-Dry Store 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Chefs Office 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Hair and Beauty 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-COSHH 1	0.2	-	-	-	-	-	-	-	-	-	N/A	
0-Kitchen Change 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Quiet Space 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Quiet Space 2	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Quiet Space 3	-	-	-	1.1	-	-	-	-	-	-	N/A	
0-Quiet Space 4	-	-	-	1.1	-	-	-	-	-	-	N/A	
1-Private Dining 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
1-Laundry 1	-	-	-	1.2	-	-	-	-	-	-	N/A	
1-Activity Lounge 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
2-Male Change 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
2-Maintenance 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
2-Female Change 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
2-Staff Room 1	-	-	-	1.1	-	-	-	-	-	-	N/A	
2-Cinema 1	-	-	-	1.1	-	-	-	-	-	-	N/A	

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

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
0-Bedroom 19		110	-	-
0-Bedroom 20		110	-	-
1-Bedroom 21		110	-	-
1-Bedroom 22		110	-	-
1-Bedroom 23		110	-	-
1-Bedroom 24		110	-	-
1-Bedroom 25		110	-	-
1-Bedroom 26		110	-	-
1-Bedroom 27		110	-	-
1-Bedroom 28		110	-	-
1-Bedroom 29		110	-	-
1-Bedroom 30		110	-	-
1-Bedroom 31		110	-	-
1-Bedroom 32		110	-	-
1-Bedroom 33		110	-	-
1-Bedroom 34		110	-	-
1-Bedroom 35		110	-	-
1-Bedroom 36		110	-	-
1-Bedroom 37		110	-	-
1-Bedroom 38		110	-	-
1-Bedroom 39		110	-	-
1-Bedroom 40		110	-	-
1-Bedroom 41		110	-	-
2-Bedroom 42		110	-	-
2-Bedroom 43		110	-	-
2-Bedroom 44		110	-	-
2-Bedroom 45		110	-	-
2-Bedroom 46		110	-	-
2-Bedroom 47		110	-	-
2-Bedroom 48		110	-	-
2-Bedroom 49		110	-	-
2-Bedroom 50		110	-	-
2-Bedroom 51		110	-	-
2-Bedroom 52		110	-	-
2-Bedroom 53		110	-	-
2-Bedroom 54		110	-	-
2-Bedroom 55		110	-	-
2-Bedroom 56		110	-	-
2-Bedroom 57		110	-	-
2-Bedroom 58		110	-	-
2-Bedroom 59		110	-	-
2-Bedroom 60		110	-	-
2-Bedroom 61		110	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
0-Ensuite 1		95	-	-
0-Ensuite 2		95	-	-
0-Ensuite 3		95	-	-
0-Ensuite 4		95	-	-
0-Ensuite 6		95	-	-
0-Ensuite 7		95	-	-
0-Ensuite 8		95	-	-
0-Ensuite 9		95	-	-
0-Ensuite 10		95	-	-
0-Ensuite 11		95	-	-
0-Ensuite 12		95	-	-
0-Ensuite 14		95	-	-
0-Ensuite 15		95	-	-
0-Ensuite 16		95	-	-
0-Ensuite 17		95	-	-
0-Ensuite 18		95	-	-
0-Ensuite 19		95	-	-
0-Ensuite 20		95	-	-
1-Ensuite 21		95	-	-
1-Ensuite 22		95	-	-
1-Ensuite 23		95	-	-
1-Ensuite 24		95	-	-
1-Ensuite 25		95	-	-
1-Ensuite 26		95	-	-
1-Ensuite 27		95	-	-
1-Ensuite 28		95	-	-
1-Ensuite 29		95	-	-
1-Ensuite 30		95	-	-
1-Ensuite 31		95	-	-
1-Ensuite 32		95	-	-
1-Ensuite 33		95	-	-
1-Ensuite 34		95	-	-
1-Ensuite 35		95	-	-
1-Ensuite 36		95	-	-
1-Ensuite 37		95	-	-
1-Ensuite 38		95	-	-
1-Ensuite 39		95	-	-
1-Ensuite 40		95	-	-
1-Ensuite 41		95	-	-
2-Ensuite 42		95	-	-
2-Ensuite 43		95	-	-
2-Ensuite 44		95	-	-
2-Ensuite 45		95	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m²]
	Standard value	95	80	0.3
2-Ensuite 46		95	-	-
2-Ensuite 47		95	-	-
2-Ensuite 48		95	-	-
2-Ensuite 49		95	-	-
2-Ensuite 50		95	-	-
2-Ensuite 51		95	-	-
2-Ensuite 52		95	-	-
2-Ensuite 53		95	-	-
2-Ensuite 54		95	-	-
2-Ensuite 55		95	-	-
2-Ensuite 56		95	-	-
2-Ensuite 57		95	-	-
2-Ensuite 58		95	-	-
2-Ensuite 59		95	-	-
2-Ensuite 60		95	-	-
2-Ensuite 61		95	-	-
0-Stairs 1		106	-	-
0-Stairs 2		106	-	-
0-Stairs 3		106	-	-
1-Stairs 4		106	-	-
1-Stairs 5		106	-	-
1-Stairs 6		106	-	-
2-Stairs 7		106	-	-
2-Stairs 8		106	-	-
2-Stairs 9		106	-	-
0-Circulation 1		95	-	-
0-Circulation 2		95	-	-
0-Circulation 3		95	-	-
0-Circulation 4		95	-	-
1-Circulation 5		95	-	-
1-Circulation 6		95	-	-
1-Circulation 7		95	-	-
1-Circulation 8		95	-	-
1-Circulation 9		95	-	-
2-Circulation 10		95	-	-
2-Circulation 11		95	-	-
2-Circulation 12		95	-	-
2-Circulation 13		95	-	-
2-Circulation 14		95	-	-
0-Store 1		140	-	-
0-Store 2		140	-	-
0-Store 3		140	-	-
0-Store 4		140	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
0-Store 5		140	-	-
0-Store 6		140	-	-
1-Store 7		140	-	-
1-Store 8		140	-	-
1-Store 9		140	-	-
1-Store 10		140	-	-
1-Store 11		140	-	-
2-Store 12		140	-	-
2-Store 13		140	-	-
0-Living 1		110	-	-
1-Living 2		110	-	-
2-Living 3		110	-	-
0-Dining 1		110	-	-
1-Dining 2		110	-	-
2-Dining 3		110	-	-
0-Nurse 1		140	-	-
1-Nurse 2		140	-	-
2-Nurse 3		140	-	-
0-Assisted Bath 1		95	-	-
1-Assisted Bath 2		95	-	-
2-Assisted Bath 3		95	-	-
0-Drugs 1		160	-	-
1-Drugs 2		160	-	-
2-Drugs 3		160	-	-
0-Sluice 1		160	-	-
1-Sluice 2		160	-	-
2-Sluice 3		160	-	-
0-Assisted WC 1		106	-	-
1-Assisted WC 2		106	-	-
1-Assisted WC 3		106	-	-
2-Assisted WC 4		106	-	-
2-Assisted WC 5		106	-	-
0-WC 1		106	-	-
0-Managers Office 1		95	-	-
0-Admin Office 1		95	-	-
0-Reception 1		95	95	-
0-Cafe 1		110	-	-
0-Cleaners 1		106	-	-
1-Cleaners 2		106	-	-
2-Cleaners 3		106	-	-
0-Kitchen 1		160	-	-
0-Cold Store 1		140	-	-
0-Dry Store 1		140	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
0-Chefs Office 1		95	-	-
0-Hair and Beauty 1		95	-	-
0-COSHH 1		140	-	-
0-Service Lobby 1		95	-	-
0-Kitchen Change 1		106	-	-
0-Tank Room 1		160	-	-
0-Plant Room 1		160	-	-
0-Lobby 1		95	-	-
0-Linen 1		140	-	-
1-Linen 2		140	-	-
2-Linen 3		140	-	-
0-Quiet Space 1		95	-	-
0-Quiet Space 2		95	-	-
0-Quiet Space 3		95	-	-
0-Quiet Space 4		95	-	-
1-Private Dining 1		110	-	-
1-Laundry 1		160	-	-
1-Activity Lounge 1		110	-	-
1-Comms 1		160	-	-
2-Male Change 1		106	-	-
2-Maintenance 1		95	-	-
2-Female Change 1		95	-	-
2-Staff Room 1		140	-	-
2-Cinema 1		110	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0-Bedroom 1	NO (-64%)	NO
0-Bedroom 2	NO (-53%)	NO
0-Bedroom 3	NO (-62%)	NO
0-Bedroom 4	NO (-52%)	NO
0-Deluxe Lounge	NO (-50%)	NO
0-Bedroom 6	NO (-38%)	NO
0-Bedroom 7	NO (-57%)	NO
0-Deluxe Bedroom 8	NO (-54%)	NO
0-Bedroom 9	NO (-53%)	NO
0-Bedroom 10	NO (-57%)	NO
0-Bedroom 11	NO (-64%)	NO
0-Bedroom 12	NO (-65%)	NO
0-Bedroom 14	NO (-42%)	NO
0-Bedroom 15	NO (-58%)	NO
0-Bedroom 16	NO (-57%)	NO
0-Bedroom 17	NO (-65%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
0-Bedroom 18	NO (-63%)	NO
0-Bedroom 19	NO (-57%)	NO
0-Bedroom 20	NO (-70%)	NO
1-Bedroom 21	NO (-36%)	NO
1-Bedroom 22	NO (-62%)	NO
1-Bedroom 23	NO (-55%)	NO
1-Bedroom 24	NO (-39%)	NO
1-Bedroom 25	NO (-52%)	NO
1-Bedroom 26	NO (-38%)	NO
1-Bedroom 27	NO (-22%)	NO
1-Bedroom 28	NO (-37%)	NO
1-Bedroom 29	NO (-44%)	NO
1-Bedroom 30	NO (-47%)	NO
1-Bedroom 31	NO (-43%)	NO
1-Bedroom 32	NO (-47%)	NO
1-Bedroom 33	NO (-58%)	NO
1-Bedroom 34	NO (-55%)	NO
1-Bedroom 35	NO (-48%)	NO
1-Bedroom 36	NO (-26%)	NO
1-Bedroom 37	NO (-47%)	NO
1-Bedroom 38	NO (-53%)	NO
1-Bedroom 39	NO (-47%)	NO
1-Bedroom 40	NO (-50%)	NO
1-Bedroom 41	NO (-62%)	NO
2-Bedroom 42	NO (-50%)	NO
2-Bedroom 43	NO (-54%)	NO
2-Bedroom 44	NO (-36%)	NO
2-Bedroom 45	NO (-52%)	NO
2-Bedroom 46	NO (-33%)	NO
2-Bedroom 47	NO (-32%)	NO
2-Bedroom 48	NO (-22%)	NO
2-Bedroom 49	NO (-42%)	NO
2-Bedroom 50	NO (-45%)	NO
2-Bedroom 51	NO (-41%)	NO
2-Bedroom 52	NO (-45%)	NO
2-Bedroom 53	NO (-58%)	NO
2-Bedroom 54	NO (-55%)	NO
2-Bedroom 55	NO (-39%)	NO
2-Bedroom 56	NO (-26%)	NO
2-Bedroom 57	NO (-44%)	NO
2-Bedroom 58	NO (-46%)	NO
2-Bedroom 59	NO (-43%)	NO
2-Bedroom 60	NO (-46%)	NO
2-Bedroom 61	NO (-60%)	NO
0-Living 1	NO (-63%)	NO
1-Living 2	NO (-64%)	NO
2-Living 3	NO (-63%)	NO
0-Dining 1	NO (-46%)	NO
1-Dining 2	NO (-30%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
2-Dining 3	NO (-50%)	NO
0-Nurse 1	N/A	N/A
1-Nurse 2	N/A	N/A
2-Nurse 3	N/A	N/A
0-Drugs 1	N/A	N/A
1-Drugs 2	N/A	N/A
2-Drugs 3	N/A	N/A
0-Managers Office 1	NO (-82%)	NO
0-Admin Office 1	NO (-80%)	NO
0-Reception 1	NO (-98%)	NO
0-Cafe 1	NO (-37%)	NO
0-Kitchen 1	NO (-95%)	NO
0-Chefs Office 1	N/A	N/A
0-Hair and Beauty 1	NO (-68%)	NO
1-Private Dining 1	NO (-67%)	NO
1-Laundry 1	NO (-91%)	NO
1-Activity Lounge 1	NO (-38%)	NO
2-Maintenance 1	N/A	N/A
2-Staff Room 1	NO (-13%)	NO
2-Cinema 1	NO (-37%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	3209	3209
External area [m ²]	4394	4394
Weather	SWI	SWI
Infiltration [m ³ /hm ² @ 50Pa]	5	3
Average conductance [W/K]	1005	1466
Average U-value [W/m ² K]	0.23	0.33
Alpha value* [%]	29.75	14.75

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

Building Use

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.55	4.95
Cooling	6.57	6.78
Auxiliary	7.41	10.15
Lighting	13.47	11.28
Hot water	89.76	94.21
Equipment*	83.45	83.45
TOTAL **	119.75	127.38

* 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	13.23	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>13.23</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	144.18	162.61
Primary energy [kWh _{PE} /m ²]	125.88	155.21
Total emissions [kg/m ²]	21.22	24.3

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 SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	46.6	0	3.9	0	3.1	3.32	0	3.5	0	
Notional	54.2	0	5.7	0	1.9	2.64	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	99.3	0	8.3	0	9.4	3.32	0	3.5	0	
Notional	102.9	0	10.8	0	13	2.64	0	----	----	
[ST] Central heating using water: floor heating, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	4.5	0	0.4	0	14.3	3.32	0	3.5	0	
Notional	11.4	0	1.2	0	21	2.64	0	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	495	0	30.6	8.3	0	4.5	0	4.5	
Notional	0	441.3	0	27.9	13.5	0	4.4	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	186.5	0	11.5	0	4	4.5	4	4.5	
Notional	0	97.2	0	6.1	0	0	4.4	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	0	0	0	0	0	0	0	0	
Notional	0	0	0	0	0	0	0	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	3103.4	0	191.6	0	4	4.5	4	4.5	
Notional	0	3679.4	0	232.3	0	0	4.4	----	----	
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity										
Actual	0	656.5	0	40.5	3.3	0	4.5	0	4.5	
Notional	0	587.5	0	37.1	4.9	0	4.4	----	----	

Key to terms

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