HOARE LEA

Withington Community Hospital.
Withington, Manchester.
BAM Construction Limited.

SUSTAINABILITY
ENERGY STRATEGY

REVISION P01 – 13 MAY 2024

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
P01	13/05/2024	Stage 3 Issue for comment	S. Hunt	G. Papachristou	J.Nuttall

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Executive summary.

This Energy Statement has been prepared by Hoare Lea on behalf of BAM Construction Limited (hereafter referred to as 'the Applicant') in support of the full application for the new development at Withington Community Hospital (hereafter the 'Proposed Development').

The Proposed Development.

The Proposed Development will provide cardiorespiratory facilities as well as new consultation and treatment rooms. The remaining building space will include office spaces, reception and waiting areas, WC and changing rooms and plant facilities.

As the first floor is currently designed to shell and core only, for modelling purposes, we have assumed room (activity) layouts and HVAC system splits based on the ground floor layouts provided by Day Architects to help provide an understanding of potential Part L outcomes going forward.

To assist in meeting compliance, spaces with high energy consumption on the ground floor layouts (ie. Ultrasound room and ECO rooms) were not replicated on the assumed first floor layouts.

Policy, regulations and drivers.

With respect to energy and carbon performance, this project must comply with the following policies and regulations.

National drivers: Approved Document Part L.

Part L of the Building Regulations is the mechanism by which the government is driving reductions in regulated CO_2 emission from new buildings. The Proposed Development has been assessed in accordance with the criteria set out in Part L, Volume 2 2021, which came into force in June 2022.

Manchester Planning Policy.

Policy JP-S2 of the Greater Manchester Joint Development Plan, Places for Everyone, states that all developments should be consistent with the Part L2 2021 Building Regulations, unless superseded by changes to building regulations and/or national or local planning policies.

Approach.

A robust and future-proofed energy strategy for the building fabric and services has been adopted at the Proposed Development in accordance with the energy hierarchy advocated by Places for Everyone, as shown in Figure 1.

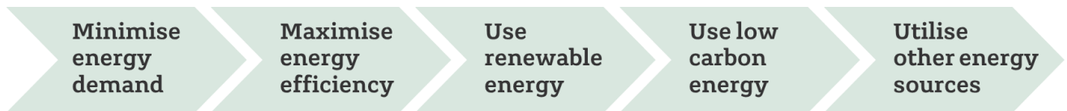


Figure 1: Energy Hierachy.

Part L2 Assessment.

The following table provides a summary of the energy strategy for the Proposed Development.

Table 1: Energy strategy summary.

Part L 2021	6.5% regulated CO_2 emissions improvement over Part L 2021 Through passive design, robust fabric, efficient systems and heat pump technologies, the Proposed Development will seek to generate a 6.5% reduction in regulated CO_2 as a minimum to the Part L 2021 Target emissions.
	9.6% regulated primary energy improvement over Part L 2021 The Proposed Development will seek to achieve a 9.6 % reduction in Building Primary Energy Efficiency over current Part L 2021 building regulations target.

It has been shown that, both Building Regulations and Local Plan requirements have been met for the Proposed Development.

BREEAM ENE01 Energy Performance.

The Joint Development Plan, Places for Everyone, includes a requirement for non-residential developments to achieve at least the BREEAM Excellent standard for the ENE 01 reduction of energy use and carbon emissions category; which equates to 4 credits.

These 4 credits can be achieved in two different ways:

1. Achieve an Energy Performance Ratio (EPR_{NC}) ≥0.4 (by uploading the inp file from the Part L assessment to the BREEAM platform)
2. Undertake detailed energy modelling to predict operational energy consumption and work with the design team to substantially reduce this

The BREEAM assessor (Ridge) has advised that the initial EPR_{NC} is ~0.1, so the project is currently achieving 1 credit under the first option.

To achieve a higher number of credits and further improve betterment over Part L 2021, the following measures are suggested:

- Reduce the glazing ratio in the reception and waiting spaces.
- Introduce solar shading, where needed.
- Improve Heating Generator Efficiency
- Improve Cooling Seasonal Energy Efficiency.
- Improve Heat Recovery Seasonal Efficiency.
- Improve system SFPs.

Alternatively, it may be possible to secure the minimum 4 credits through the Prediction of Operational Energy Consumption option. This is likely to be required to adhere to the NHS NZC Building Standard and so can be explored further during the next stage.

1. Introduction.

This Energy Statement has been prepared by Hoare Lea on behalf of BAM Construction Limited (hereafter referred to as 'the Applicant') in support of the full planning application for for the new development at Withington Community Hospital (hereafter the 'Proposed Development'), in Withington, Greater Manchester.

1.1 The proposed development.

The Proposed Development will provide cardiorespiratory facilities as well as new consultation and treatment rooms. The remaining building space will include office spaces, reception and waiting areas, WC and changing rooms and plant facilities.

As the first floor is currently designed to shell and core only, for modelling purposes, we have assumed room (activity) layouts and HVAC system splits based on the ground floor layouts provided by Day Architects to help provide an understanding of potential Part L outcomes going forward.

To assist in meeting compliance, spaces with high energy consumption on the ground floor layouts (ie. Ultrasound room and ECO rooms) were not replicated on the assumed first floor layouts.

1.2 Approach to the statement.

This Energy Statement proposes recommendations regarding the approach to reducing carbon dioxide (CO_2) emissions and optimising energy efficiency within the development. This statement summarises the pertinent regulatory and planning policies applicable to the Proposed Development, and sets targets commensurate with these policies, which the Proposed Development will seek to achieve.

The Energy Statement has been developed with reference to the approach advocated by Places for Everyone. energy hierarchy.

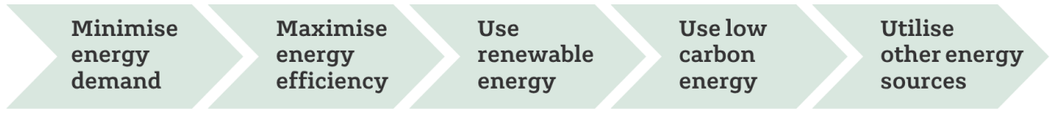


Figure 2 Energy Hierarchy, Places for Everyone

Area schedule

Table 2 sets out area schedule for the development that has been used to inform the energy strategy.

Table 2: The GIA of the Proposed Development.

Building	Total Gross Internal Area (GIA)
Withington Community Hospital	792 m^2

*Note that the IES<ve> BRUKL areas may vary from the actual GIA.

1.3 Definitions and limitations.

Definitions:

The following definitions should be understood throughout this statement:

- **Energy demand:** the 'room-side' amount of energy that must be input into a space to achieve comfortable conditions. In the context of space heating, this is the amount of heat that is emitted by a radiator, or other heat delivery mechanism.
- **Energy requirement:** the 'system-side' requirement for energy (fuel). In the context of a space heating system using a gas boiler, this is the amount of energy combusted (e.g. gas) to generate useful heat (i.e. the energy demand).

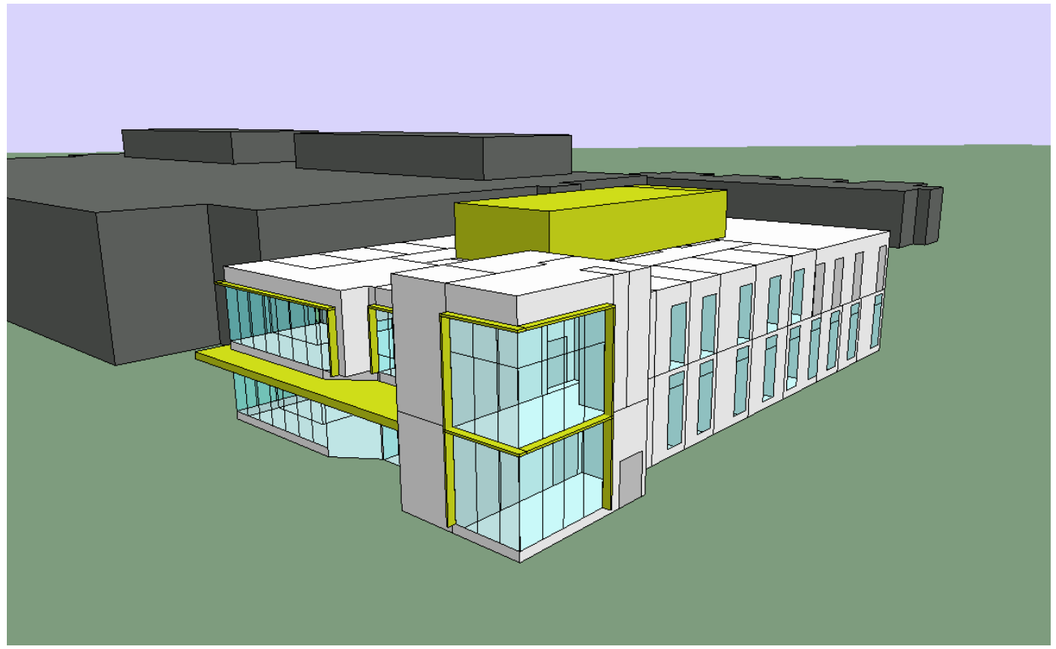


Figure 3: IES Model of the Proposed Development.

- **Regulated CO_2 emissions:** the CO_2 emissions emitted as a result of the combustion of fuel, or 'consumption' of electricity from the grid, associated with regulated sources (those controlled by Part L of the Building Regulations).

Limitations:

The appraisals within this statement are based on benchmark Part L data from similar developments and should not be understood as a predictive assessment of likely future energy requirements or otherwise. Occupants may operate their systems differently, and / or the weather may be different from the assumptions made by Part L approved calculation methods, leading to differing energy requirements.

2. Assessment Methodology.

The Proposed Development has been assessed using The National Calculation Methodology to demonstrate compliance with Building Regulations Part L2 (2021). The following is a summary of the data used and inputs/ assumptions made.

2.1 Site context

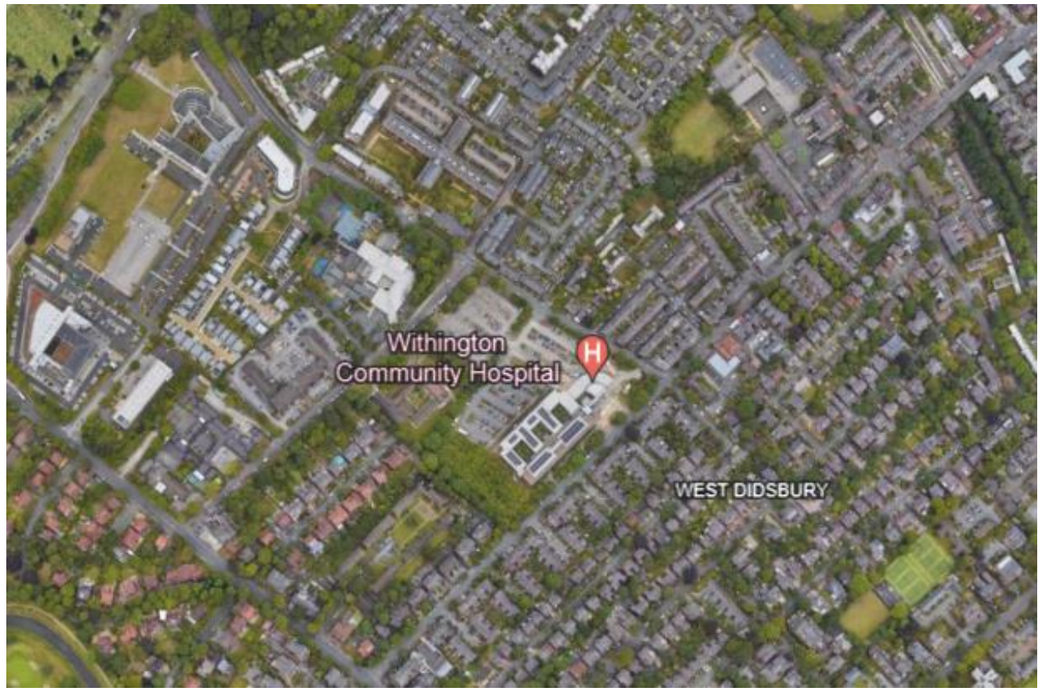


Figure 4: Satellite Image of Site Location [Google Earth].

The satellite image above shows the site location.

Site location, building form and orientation, and surrounding buildings all have an impact on the outcome of the building's energy consumption. These parameters, along with the location's corresponding weather file, can impact solar gains and losses of the building throughout the year, consequently impacting the amount of heating, cooling, and ventilation required to maintain the building's space conditions.

2.2 Architectural drawings.

The geometry used to assess Proposed Development was determined by the following information received from DAY Architects on 28/03/2024.

Table 3: Architectural Information.

Source	Data Type	Description	Date Received
DAY Architects	PDFs/ DWGs	22182-DAY-WCH127-00-DR-A-02002-Proposed Site Plan-P3 22182-DAY-WCH127-00-DR-A-20001-Proposed General Arrangement Plan - Ground Floor-P5 22182-DAY-WCH127-01-DR-A-20011-Proposed General Arrangement Plan - First Floor-P2 22182-DAY-WCH127-RF-DR-A-27021-Proposed Roof Plan-P1 22182-DAY-WCH127-ZZ-DR-A-20101-Proposed North & East Elevations-P1 22182-DAY-WCH127-ZZ-DR-A-20102-Proposed South & West Elevations-P1 22182-DAY-WCH127-ZZ-DR-A-20201-Proposed Sections (1-100)-P1	28/03/2024
	Revit Model	22182-DAY-V1-ZZ-M3-A-0001_Architectural Model_STAGE 2 ISSUE_28.03.2024	

2.3 Site location and weather data.

A building's thermal performance is its response to external environmental conditions. The more dependant a building is on passive features to achieve acceptable internal comfort, the more important the use of external weather information becomes.

Climate data is assigned to the virtual environment of the dynamic model to simulate external weather conditions that are likely to occur.

The UK Meteorological Office (MO) collects weather data at stations across the UK. Climate variables measured at hourly intervals include air temperatures, wind speed and direction and air pressure etc.

CIBSE licenses the historic weather data from the MO for 14 locations in the United Kingdom: Belfast, Birmingham, Cardiff, Edinburgh, Glasgow, Leeds, London (3 sites), Manchester, Newcastle, Norwich, Nottingham, Plymouth, Southampton and Swindon.

The weather variables used for the Part L compliance model, as set out in the ADL 2021 document, is the Test Reference Year (TRY): 2006 and 2016.

The TRY is composed of 12 separate months of data each chosen to be the most average month from the collected data. The TRY is used for energy analysis and for compliance with the UK Building Regulations (Part L).

The CIBSE weather file location selected for the proposed development is Manchester.

3. Policy drivers.

The following section outlines the national and local policies and drivers.

3.1 National drivers.

3.1.1 Building Regulations Part L2 2021.

Approved Document Part L (2021, England edition) is the Building Regulations relating to the conservation of fuel and power in buildings. The Approved Document is separated into two sections: Volume 1 and Volume 2:

- Part L Vol.1 relates to dwellings specifically, with individual criteria for this building-use type.
- Part L Vol.2 relates to buildings other than dwellings 'Conservation of fuel and power in buildings other than dwellings' and sets out specific criteria for this building use type.

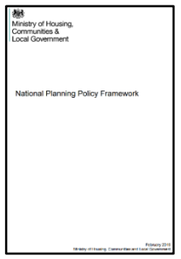
Schedule 1: Conservation of Fuel and Power.

Schedule 1 of the Building Regulations Part L states that reasonable provisions shall be made for:

- Limiting Heat Gains and Losses through:
  - Thermal elements and other parts of the building fabric; and
  - Pipes, ducts and vessels used for space heating, space cooling and hot water services.
- Providing fixed building services which are:
  - Energy Efficient;
  - Have effective controls; and;
  - Are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power then is reasonable in the circumstances

Developments should aim to at least meet the limiting values for system and fabric requirements in order to better the Building Emission Rate set by a notional building which uses standardised inputs based on the system and fabric design of each building.

3.1.2 National Planning Policy Framework.



The National Planning Policy Framework (NPPF) was first published in on 27 March 2012 and most recently updated in December 2023. The updated NPPF has superseded all Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) documents, with the exception of PPS10 (Waste). The NPPF sets out the Government's strategy on the delivery of sustainable development.

The NPPF states that there is a presumption in favour of sustainable development.

The following is extracted from paragraph 8 of the NPPF:

"Plans and decisions should apply a presumption in favour of sustainable development.

a) an economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure;

b) a social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being; and

c) an environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

Furthermore, in relation to energy policy paragraph, 157 sets out that:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to:

a) shape places in ways that contribute to radical reductions in greenhouse gas emissions,

b) minimise vulnerability and improve resilience;

c) encourage the reuse of existing resources, including the conversion of existing buildings;

d) and support renewable and low carbon energy and associated infrastructure.

In respect of energy policy contained within the NPPF, paragraph 160 sets out that:

"To help increase the use and supply of renewable and low carbon energy and heat, plans should:

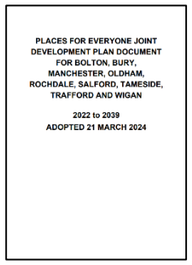
(a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, and their future re-powering and life extension, while ensuring that adverse impacts are addressed appropriately (including cumulative landscape and visual impacts);

(b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

(c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.

3.2 Local policy drivers.

3.2.1 Places for Everyone.



The Places for Everyone (PfE) Plan took effect and became part of the statutory development plan for nine of the ten Greater Manchester planning authorities (Bolton, Bury, Manchester, Oldham, Rochdale, Salford, Tameside, Trafford and Wigan) on March 21, 2024.

It sets out a framework for sustainable, inclusive growth across the nine districts and sets out ten strategic objectives, including each Council playing their part in ensuring that Greater Manchester is a more resilient and carbon neutral city-region.

Policy JP-S2: Carbon and Energy partially replaces Policy EN 4: Reducing CO_2 Emissions by Enabling Low and Zero Carbon Development and Policy EN 6: Target Framework for CO_2 reductions from low or zero carbon energy supplies of the Manchester Core Strategy 2012 to 2027. This policy sets a range of measures that will support the aim of delivering a carbon neutral Greater Manchester by 2038, including:

An expectation that new development will, unless it can be demonstrated that it is not practicable or financially viable:

- Be net zero carbon, which applies:
  1. from adoption– to regulated operational carbon emissions;
  2. from 2028 - to all emissions 'in construction'.

  From 2025 development should also calculate and minimise carbon emissions from unregulated emissions alongside regulated emissions.

  Development proposals should set out how this has been achieved in an energy statement in accordance with the energy hierarchy, which in order of importance seeks to:

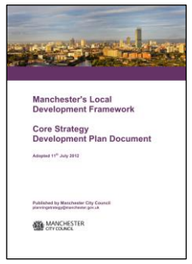
  i. Minimise energy demand;
  ii. Maximise energy efficiency;
  iii. Use renewable energy;

iv. Use low carbon energy; and
v. Utilise other energy sources.

As an interim measure, development should be consistent with Part L 2021 of the Building Regulations unless superseded by changes to building regulations and/or national or local planning policies.

For non-residential developments, achieve at least BREEAM excellent standard (or equivalent) for the 'Ene 01 – reduction of energy use and carbon emissions' category rising to 'BREEAM outstanding' equivalent for ENE 01 from 2028.

3.2.2 Manchester Core Strategy 2012 to 2027.



The Core Strategy (CS) was adopted by Manchester City Council on 11th July 2012 and was the key document in Manchester's Local Development Framework before the adoption of Places for Everyone. It covers a period of 15 years from 2012 to 2027.

It replaced significant elements of the Unitary Development Plan (UDP) as the document that sets out the long-term strategic policies for Manchester's future development for selected sustainability themes including energy and CO_2, water and flood risk, materials, waste, transport, pollution, ecology and biodiversity and community.

3.2.3 Guide to Development in Manchester - Supplementary Planning Document and guidance.

The Supplementary Planning Documentation and Planning Guidance (SPDPG) (April 2007) give more detail to policies in the Core Strategy and future Development Plan Documents. They do not form part of the development plan.

The SPDPG is based on UDP policies and therefore the CS documentation takes precedence.

3.3 Project targets.

The Proposed Development will have a reduced effect on climate change by reducing CO_2 emissions associated with energy use in line with national and local policy as stated within Building Regulations Part L (2021).

In addition to the requirements of the Building Regulations (2021), the Proposed Development is targeting a BREEAM Rating of 'Excellent'.

3.4 BREEAM ENE01 Energy Performance.

The Joint Development Plan, Places for Everyone, includes a requirement for non-residential developments to achieve at least the BREEAM Excellent standard for the ENE 01 reduction of energy use and carbon emissions category; which equates to 4 credits.

These 4 credits can be achieved in two different ways:

1. Achieve an Energy Performance Ratio (EPR_{NC}) ≥0.4 (by uploading the inp file from the Part L assessment to the BREEAM platform)
2. Undertake detailed energy modelling to predict operational energy consumption and work with the design team to substantially reduce this

4. Places for Everyone Energy Hierarchy.

The development has been assessed under Part L 2021, in line with the PfE energy Hierachy.

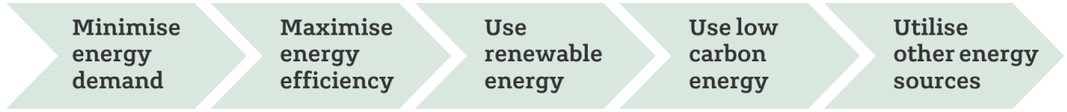


Figure 5: Energy Hierarchy.

4.1 Minimise energy demand

Passive design and energy efficiency measures form the basis for the reduction in overall energy demand and carbon emissions for the Proposed Development. In line with the PfE energy hierachy, the design intent is to reduce the energy demand initially by optimising the envelope and building services.

4.1.1 Passive Design

Passive design measures are those which reduce the demand for energy within buildings, without consuming energy in the process.

4.1.2 Fabric performance

The Proposed Development will benefit from an efficient thermal envelope. Heat losses and gains will be controlled by the optimisation of the fabric i.e. ensuring appropriate levels of glazing to control winter heat loss and summer heat gain. Reducing the thermal transmittance of the building envelope where appropriate will help to reduce both heating and cooling requirements and result in lower energy requirements.

The following table provides a summary of the building fabric specification used in this analysis.

Table 4: Building Fabric Specification as per NHS Net Zero Carbon Healthcare Building Standards for Primary Healthcare Buildings.

Parameter	Value
External Wall (Solid) U-value (W/m^2.K)	0.12
Roof U-value (W/m^2.K)	0.11
Ground/Exposed Floor U-value (W/m^2.K)	0.10
Entrance door (W/m^2.K)	1.60
Glazing U-value (including frame) (W/m^2.K)	1.20
Glazed door U-value (W/m^2.K)	1.20
Glazing g-value – North Facade	0.40
Glazing g-value – South/ East/ West	0.35
Air Permeability (m^3.h/m^2)	1.0

4.2 Maximise Energy Efficiency.

Systems with high develivery efficiencies have been specified wherever possible. Appendix C summarises the system inputs for Part L modelling.

4.3 Use Renewable Energy.

The Proposed Development will generate renewable energy on-site through the use of roof-mounted PV panels. A circa 386m^2 array of photovoltaic panels has been proposed for the site, offering substantial CO_2 emission reductions.

The roof area was estimated to be ~600m^2. Discounting the roof-top plant and making an allowance for maintenance and overshading reduced the roof area available for PV panels to ~386m^2.

4.4 Use low carbon energy.

The Proposed Development is an all-eletric scheme, set to supply heating, cooling and domestic hot water through Air Source Heat Pumps.

ASHPs are a low carbon technology which offer a high output of energy for every kW put in, maximising energy efficiency and considerably reducing CO_2 emissions.

4.5 Utilise other energy sources.

At present there are no further opportunities for the use of other energy sources. The potential to connect to a District Heat Network was considered however, this is not feasible due to the distance of the site from existing networks.

5. Part L2 results.

The proposed development will utilise air source heat pumps to providing the heating, cooling, and hot water. Photovoltaics are also included, located on the roof of the building to provide an assumed array of 386m^2. A full summary of the calculation parameters are detailed in Appendix C.

The below table summarises the regulated loads for Part L2 compliance.

Table 5: Energy Use Breakdown.

	Actual (kWh/m^2)	Notional (kWh/m^2)
Heating	4.62	5.94
Cooling	11.76	6.03
Auxiliary	43.31	16.46
Lighting	26.21	28.2
Hot water	4.32	1.2
Solar PV	40.28	0.0

5.1 Building Emission Rate.

The table below shows the results for the Building Emission Rate (BER) incomparison to the Target Emission Rate (TER) for the Proposed Development.

Table 6: Savings over Part L 2021.

	Building CO_2 Emission rate regulated ($kgCO_2/m^2/yr.$)	Target CO_2 Emission rate regulated ($kgCO_2/m^2/yr.$)	Savings (%)
Part L 2021 Building regulations	7.34	7.85	6.5%

It is anticipated that up to a 6.5% reduction in CO_2 emissions will be achieved beyond the Building Regulations Part L 2021 Target emissions with the combined use of ASHPs and PV array, as shown in the graph below.

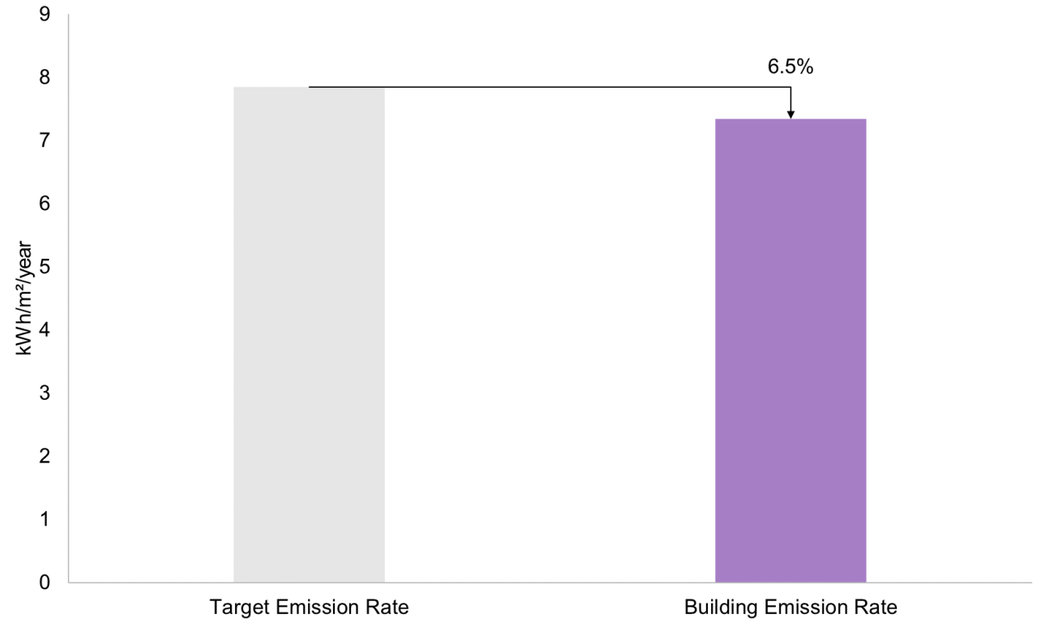


Figure 6: Building Emission Rate betterment over the notional.

5.2 Primary Energy Rate.

Measuring the Dwelling Primary Energy Rate against the notional Target is a new criterion of the Part L 2021 methodology and to comply, energy use intensity must be minimised as much as reasonably possible.

The table below shows the results of the Building Primary Energy Rate (BPER) incomparison to the Target Primary Eneregy rate (TPER) for the Proposed Development.

Table 7: Savings over Part L 2021.

	Building Primary Energy Rate (kWh/m_2/year)	Target Primary Energy Rate (kWh/m_2/year)	Savings (%)
Part L 2021 Building regulations	85.39	77.22	9.6%

It is anticipated that up to a 9.6% reduction in primary energy rate will be achieved beyond the Building Regulations Part L 2021 Target emissions, as shown in the graph below.

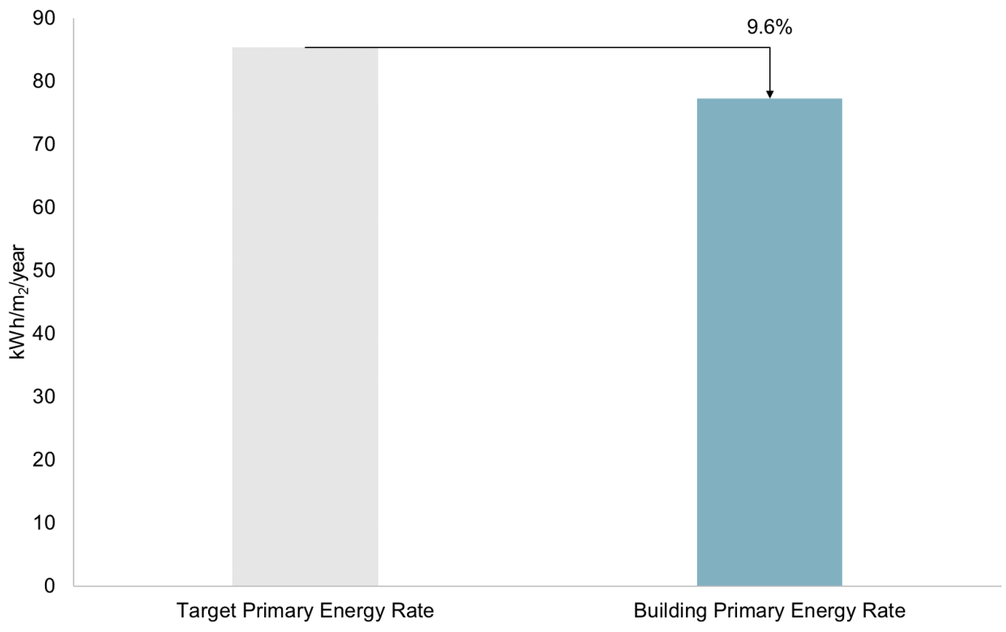


Figure 7: Building Primary Energy Rate compliance betterment over the notional.

6. Conclusion.

This document has been prepared in support of the application for planning permission for the Proposed Withington Hospital Development. This Energy Statement summarises the pertinent regulatory and planning policies applicable to the Proposed Development and sets out how the Proposed Development addresses the relevant policy requirements.

6.1 The energy statement.

The strategy has been developed to benefit from on site heat pumps for a high performaning building and has roof-mounted PV panels for on-site renewbale energy generation.

6.1.1 Part L2 Results.

The tables below shows the results for the carbon savings over Part L 2021.

Table 8: Summary of carbon emissions for the Proposed Development, using Part L 2021.

	Building CO_2 Emission rate regulated ($kgCO_2/m^2/yr.$)	Target CO_2 Emission rate regulated ($kgCO_2/m^2/yr.$)	Savings (%)
Part L 2021 Building regulations	7.34	7.85	6.5%

Table 9: Summary of the primary energy ratings for the Proposed Development, using Part L 2021.

	Building Primary Energy Rate ($kWh/m_2/year$)	Target Primary Energy Rate ($kWh/m_2/year$)	Savings (%)
Part L 2021 Building regulations	85.39	77.22	9.6%

Therefore, Building Regulations and local plan requirements have been met for the Proposed Development.

6.2 Outcomes.

It is anticipated that up to a 6.5% reduction in CO_2 emissions will be achieved beyond the Building Regulations Part L 2021 Target emissions with the combined use of ASHPs and PV array.

In line with PfE guidance, the Proposed Development is targeting a BREEAM rating of 'Excellent' for the ENE 01 reduction of energy use and carbon emissions category; which equates to 4 credits.

The BREEAM assessor (Ridge) has advised that the initial EPR_{NC} is ~0.1, so the project is currently achieving 1 credit under the first option.

In order to achieve a higher number of credits and further improve betterment over Part L 2021, the following measures are suggested:

- Reduce the glazing ratio in the reception and waiting spaces.
- Introduce solar shading, where needed.
- Improve Heating Generator Efficiency
- Improve Cooling Seasonal Energy Efficiency.
- Improve Heat Recovery Seasonal Efficiency.
- Improve system SFPs.

Alternatively, it may be possible to secure the minimum 4 credits through the Prediction of Operational Energy Consumption option. This is likely to be required to adhere to the NHS NZC Building Standard and so can be explored further during the next stage.

Appendix A: Grid decarbonisation.

The carbon factor of the National Grid – the amount of carbon dioxide released per kilowatt hour of electricity generated and distributed, has slowly been decreasing on record since the public availability of data in 2002. With the increase of renewable technologies being connected to the grid, by 2019, greenhouse gas emissions from electricity generation had fallen by 71% since 1990. This decarbonisation has led to the average carbon factor of gas surpassing that of electricity for the first time in 2020[1].

With the UK Government declaring a climate emergency, the Net Zero Carbon Agenda has taken precedent, with an ambition to achieve Net Zero Carbon in operation by 2050. In 2021, a commitment was made to ensure that the 'electricity power system' would be fully decarbonised by 2035 in order to reduce reliance on fossil fuels and exposure to global wholesale energy prices. At present, 39.1% of the UK's generation sources are from renewable sources[2].

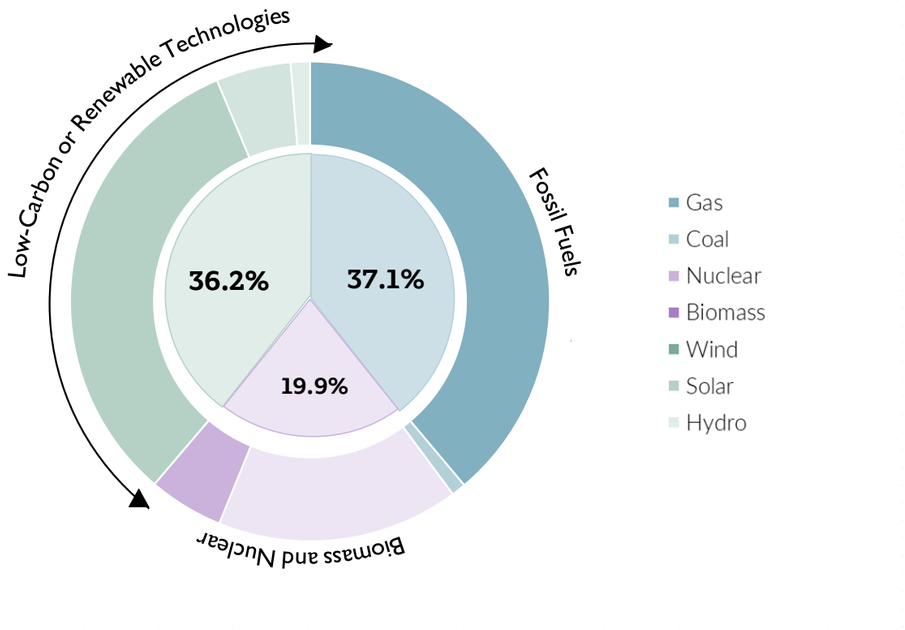


Figure 8: UK Energy Mix October 2023 (Source: National Grid iamkate.com).

Part L 2021 has taken advantage of this reduction in carbon content of the electricity supply and decreased the standardised factor from 0.519 in Part L 2013 to an average of 0.136 for use in assessments. This has resulted in all-electric strategies now being favoured over gas-led schemes.

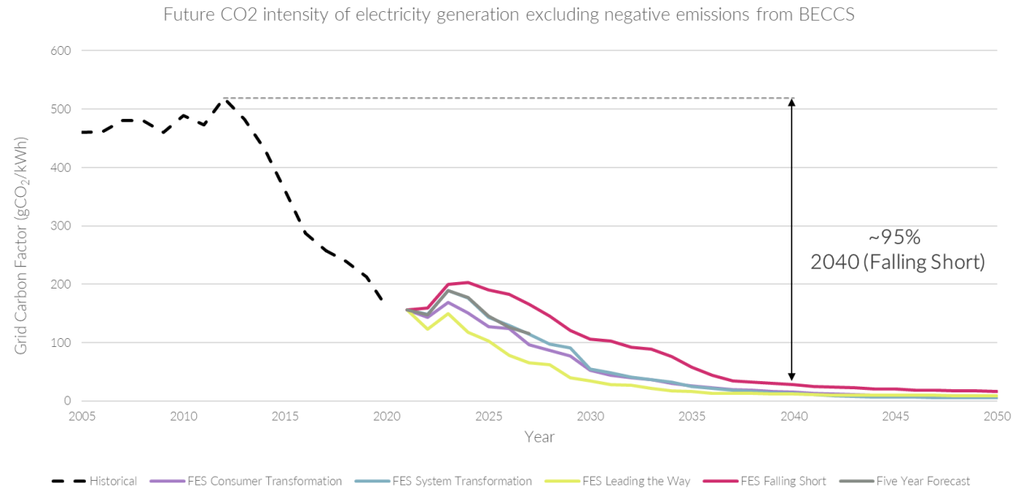


Figure 9: Grid Decarbonisation Factors from BEIS Future Energy Scenarios.

6.2.1 Carbon factors.

The updated Part L 2021 document uses the SAP 10.2 carbon factors. This assesses the emission rate using a different fuel factor for each month of the year depending on the average fuel mix seen to be accessible within that month.

Colder months are seen to have a higher carbon factor due to numerous items, most notably the reduction in available Photovoltaic power, and the introduction of more fossil fuel sources to help manage the increased energy demand from heating.

Table 10: Carbon factors comparison.

Month	Carbon Factor $kgCO_2/kWh$	Month	Carbon Factor $kgCO_2/kWh$
January	0.163	July	0.111
February	0.160	August	0.112
March	0.153	September	0.122
April	0.143	October	0.136
May	0.132	November	0.151
June	0.120	December	0.163

[1] Plans unveiled to decarbonise UK power system by 2035 (BEIS, 2021): https://www.gov.uk/government/news/plans-unveiled-to-decarbonise-uk-power-system-by-2035

[2] Britain's Electricity Explained: 2022 Review (National Grid ESO, 2023): https://www.nationalgrideso.com/news/britains-electricity-explained-2022-review

Appendix B: Dynamic Simulation Modelling.

A dynamic simulation model was created to assess the design.

Integrated Environmental Solutions Virtual Environment (IESve) is a Dynamic Simulations Modelling (DSM) software package that has the capabilities of enabling the user to create a virtual representation of a building.

The results presented in this report were calculated using the approved compliance software IESve 2022, (v2022.4.0.0).

Modelling disclaimer.

It should be noted that the data generated by this work is obtained using computer simulations. These simulations are the best means of predicting the performance of the building at this stage. Full certainty can only be achieved by measuring the performance of the building and associated systems after a period of use. It was made sure that the thermal model is as close to possible to the design. However, some simplifications were made to avoid any unexpected errors in the thermal calculations in lieu of the complex nature of the building design.

The actual performance and/or energy usage for the building once occupied may vary from the calculated values submitted to Building Control. These differences will occur due to several variable parameters between the modelled building and the actual building. Such differences will include the hours, levels of occupancy, how the plant is used and the design criteria with regards to how the rooms are environmentally controlled.

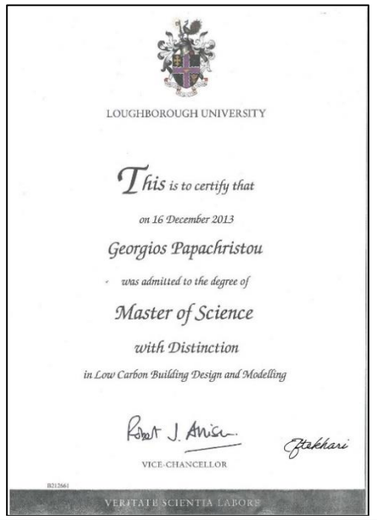
Whilst the simulations have been undertaken in good faith using reasonable skill and care, Hoare Lea can take no responsibility for differences between the computer simulations and the actual performance of the completed building due to the inherent complexity and variability of the physics in a building and its environment.

This section provides details of the Suitably qualified energy modeller involved in these works.

This is defined as an individual who:

- Holds a degree or equivalent qualification in building services or a sustainability related subject
- Has a practical experience of conducting energy modelling and has appropriate knowledge of the tool being used, e.g. has attended training by independent providers.
- Is a member of a professional body such as CIBSE.

George Papachristou – Relevant qualifications


LOUGHBOROUGH UNIVERSITY

This is to certify that

on 16 December 2013

Georgios Papachristou

was admitted to the degree of

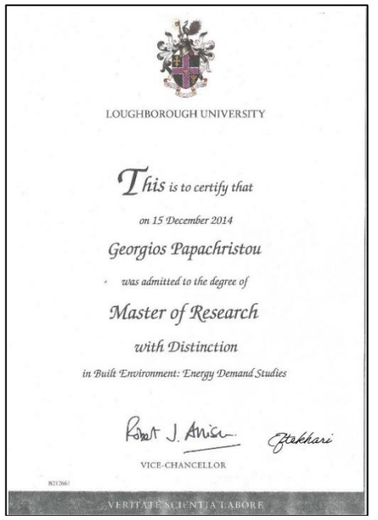
Master of Science

with Distinction

in Low Carbon Building Design and Modelling

VICE-CHANCELLOR

VERITATI SCIENTIA LABORE


LOUGHBOROUGH UNIVERSITY

This is to certify that

on 15 December 2014

Georgios Papachristou

was admitted to the degree of

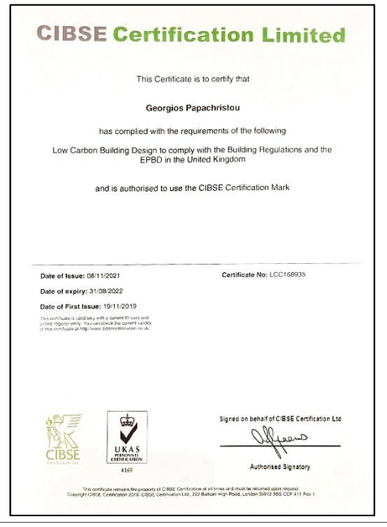
Master of Research

with Distinction

in Built Environment: Energy Demand Studies

VICE-CHANCELLOR

VERITATI SCIENTIA LABORE


CIBSE Certification Limited

This Certificate is to certify that

Georgios Papachristou

has complied with the requirements of the following

Low Carbon Building Design to comply with the Building Regulations and the EPBD in the United Kingdom

and is authorised to use the CIBSE Certification Mark

Date of Issue: 08/11/2021

Certificate No: LCC168935

Date of expiry: 31/08/2022

Date of First Issue: 19/11/2019

Signed on behalf of CIBSE Certification Ltd

Authorised Signatory

4163

CIBSE Certification Limited

This Certificate is to certify that

Georgios Papachristou

has complied with the requirements of the following

Low Carbon Energy Assessor Level 5 for the production of Energy Performance Certificates to meet the requirements of the Energy Performance of Buildings Regulations in England, Wales and Northern Ireland AND Low Carbon Building Design to comply with the Building Regulations and the EPBD in the United Kingdom AND Computer Software for the Simulated Evaluation of Environmental Performance of Buildings related to Building Regulations in the United Kingdom

and is authorised to use the CIBSE Certification Mark

Date of Issue: 15/02/2022

Certificate No: LCEA168935

Date of expiry: 31/08/2022

Date of First Issue: 15/02/2022

Signed on behalf of CIBSE Certification Ltd

Authorised Signatory

4163

Appendix C – Part L Modelling Inputs.

System summary.

Table 11: System Inputs

System Name/Description	-	AHU 01 – Non-Clinical S+E	AHU 02 – Clinical S+E	Radiators	Radiant Panel Heaters + centralised AHU
UK NCM System Type	-	Constant volume system	Constant volume system	Central heating using radiators	Central heating using radiators
Heat Source	-	ASHP	ASHP	ASHP	ASHP
Fuel Type	-	Elec	Elec	Elec	Elec
Was the System Installed After 1998	Y/N	Y	Y	Y	Y
Generator Seasonal Efficiency (COP)	%	3.8	3.8	3.8	3.8
Pack Chiller Type	-	ASHP	ASHP	ASHP	ASHP
Pack Chiller Power	kW	-	-	-	
Chiller Fuel Type	-	Elec	Elec		
Generator Seasonal EER (SEER)	%	4.3	4.3		
Does it Qualify for ECAs	Y/N	-	-	-	
Ductwork Air Leakage CEN Classification	-	Class A	Class A	N/A	Class A
AHU Air Leakage CEN Classification	-	L2	L2	N/A	L2
System Specific Fan Power (SFP)	W/l/s	1.6	1.6		
Pump Type				Variable speed differential sensor in system	Variable speed differential sensor in system
Does the System have Provision for Metering	Y/N	Y	Y	Y	Y
Does the Metering Warn "Out of Range" Values?	Y/N	Y	Y	Y	Y
Cooling / Ventilation Mechanism	-	Centralised balanced A/C mech vent system with terminal reheat batteries	Centralised balanced A/C mech vent system with terminal reheat batteries	Natural vent	Supplementary Heating
Air Supply Mechanism	-	Fan remote from zone	Fan remote from zone		Fan remote from zone
Heat Recovery Type	-	Plate heat exchanger	Plate heat exchanger		Plate heat exchanger
Heat Recovery Seasonal Efficiency	%	0.68	0.75		0.68
Room type		Office / Meeting/ Waiting	Clinical Spaces (Consulation /Treatment)	Staircase / Lift Lobby	Extract-only spaces (dirty utility, WC, shower, store)

Hot Water Systems

Table 12: Hot water inputs.

Domestic Hot Water system	Inputs
Generator	Central heating using radiators ASHPs
Delivery efficiency	3.10
Storage (litres)	-
Storage losses (kWh/l/day)	-
Circulation Losses (W/m)	8
Pump Power (kW)	0.2
Loop Length (m)	200
Time Switch	N

Renewables

Table 13: Renewables input

	East Facing	West Facing
Area	193m^2	193
Azimuth (˚clockwise from north)	54	234
Inclination (˚ from horizontal)	10	10
Shading Factor	0.95	0.95
Efficiency	22%	22%
Degradation Factor	0.99	0.99
Nominal Cell Temp.	42˚C	42˚C
Annual Yield	61,745kWh	

Lighting Parameters.

Table 14: Lighting Inputs

Space	Lux Level (lux)	Light Output Ratio (LOR)	Radiant Fraction	Constant illuminance control	Lighting Controls *	Photoelectric (Daylight) Control	Total Parasitic Power (W/m^2)	Display lamps (lm/W)
Circulation Areas	200	1.0	0.45	No	AUTO-ON-DIMMED	-	0.10	-
Changing Facilities	300	1.0	0.45	No	AUTO-ON-OFF	-	0.10	-
Clean Utility	200	1.0	0.45	No	MAN-ON-AUTO-OFF	-	0.10	-
Dirty Utility	200	1.0	0.45	No	MAN-ON-AUTO-OFF	-	0.10	-
Plant	200	1.0	0.45	No	NONE	-	0.10	-
Stores	200	1.0	0.45	No	AUTO-ON-OFF	-	0.10	-
Office	300	1.0	0.45	No	MAN-ON-AUTO-OFF	Y**	0.10	-
Meeting/ Seminar	300	1.0	0.45	No	MAN-ON-DIMMED	Y**	0.10	-
Interview/ quiet	300	1.0	0.45	No	MAN-ON-DIMMED	Y**	0.10	-
Reception	300	1.0	0.45	No	MAN-ON-AUTO-OFF	-	0.10	Y – 95 lm/W
Ultrasound	300	1.0	0.45	No	NONE	-	0.10	-
Staff Change/ Lockers	300	1.0	0.45	No	AUTO-ON-OFF	-	0.10	-
Staff reset	300	1.0	0.45	No	NONE	Y**	0.10	-
Sub-Wait	200	1.0	0.45	No	AUTO-ON-OFF	-	0.10	-
Reporting	300	1.0	0.45	No	MAN-ON-AUTO-OFF	-	0.10	-
Venepuncture	500	1.0	0.45	No	NONE	-	0.10	-
Consultation	500	1.0	0.45	No	NONE	-	0.10	-
Ambulatory Serbice for Cardio	500	1.0	0.45	No	NONE	-	0.10	-
Lung Function	500	1.0	0.45	No	NONE	-	0.10	-
Sleep consulation	500	1.0	0.45	No	NONE	-	0.10	-
ECO room	500	1.0	0.45	No	NONE	-	0.10	-

Space	Lux Level (lux)	Light Output Ratio (LOR)	Radiant Fraction	Constant illuminance control	Lighting Controls *	Photoelectric (Daylight) Control	Total Parasitic Power (W/m^2)	Display lamps (lm/W)
WC	200	1.0	0.45	No	AUTO-ON-OFF	-	0.10	-
Lift Lobby	300	1.0	0.45	No	AUTO-ON-DIMMED	-	0.10	-
Resus	500	1.0	0.45	No	NONE	-	0.10	-
Waiting	200	1.0	0.45	No	AUTO-ON-OFF	Y**	0.10	Y – 95 lm/W

Table 14 shows the target installed power densities and lighting controls for each space. The values are specified as an average for these space types. Lighting loads have been set at the W/m^2/100 lux shown below. It is considered that this lighting level is achievable and could be bettered, as such the Luminaire Efficacy (lm/W) and Light Output Ratio (LOR) values can be ignored.

Y** Daylight dimming was inputted for selected non-clinical perimeter spaces.

*** Values assumed for the majority of rooms – a full breakdown of each individual room can be provided in request**
⁺ Applied to Perimeter areas only
*** Lighting Controls are defined as follows:**
Auto On – Auto Off: Specifies presence detection sensors within the space which automatically switches lighting on when occupants are detected and switches lighting off when the space is detected to be unoccupied.
Manual On – Auto Off: Specifies absence detection sensors within the space. Lighting is required to be manually switched on. Automatically switches lighting off when the space is detected to be unoccupied.

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