Holiday Inn Express, Bicester Gateway
Bicester
Oxfordshire
Energy Statement

Client	London + Regional Properties Ltd

Date	9th March 2018
File Ref	100183
Edition	5

REVISION

Issue Type / Revision	Document prepared by				Document checked by		
	Name	Signature	Date	Page Nos	Name	Signature	Date
Information	A Dolzhenko		06/12/2017	All	O Hanson		06/12/2017

Edition	Date	Page Nos	Revision Details	Approved by
1	06/12/2017	All	First Issue	O Hanson
2	11/12/2017	All	Revised air permeability value & renewables	A Dolzhenko
3	15/12/2017	3, 11, 24, 29	Comments of the planning consultant incorporated	A Dolzhenko
4	08/03/2017	3, 11, 25, 29	Comments of the planning consultant incorporated	A Dolzhenko
5	09/03/2017	25	Comments of the planning consultant incorporated	O Hanson

EXECUTIVE SUMMARY

The National Planning Policy Framework (NPPF) recognises the purpose of the planning system is to help achieve sustainable development. It views sustainable development as change for the better and positive growth – making economic, environmental and social progress for this and future generations. The NPPF seeks development that is sustainable to be approved without delay and advises that sustainable development should be seen as a 'golden thread' running through both the plan-making and decision-making process.

Summary of the planning requirements by The Cherwell Local Plan 2011 – 2031 (Adopted July 2015) for the proposed **Holiday Inn Express, Bicester Gateway** is presented below:

- Reduce site energy demand by incorporating sustainable design and construction methods;
- Reduce carbon dioxide emissions and energy use in the proposed development (reduction target has not been specified by the local council);
- Achieve BREEAM rating of 'Very Good' (BREEAM assessment is covered by a separate document);
- Provide a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day;
- Reflect high quality design and high environmental standards, demonstrating sustainable construction methods;
- Conduct a feasibility assessment for District Heating / CHP installations opportunities;
- Conduct a feasibility assessment for the onsite renewable energy provision.

In addition, Condition 27 of the outline planning permission specifies that significant on-site renewable energy provision should be incorporated into the development except where such on-site renewable energy provision is robustly demonstrated to be unfeasible or unviable.

This report shows that:

- Steps have been taken to minimise the environmental impact of the proposed development and the building design is shown to be highly energy efficient
- There is no suitable existing or proposed decentralised heat network to connect to at this site

The energy assessment incorporates the review of passive design measures, feasibility assessment for District Heating / CHP installations and feasibility assessment for the onsite renewable energy generation options. The proposed development will incorporate renewable energy generation in the form of Air Source Heat Pumps (ASHP) for space heating and Low/Zero Carbon energy generation in the form of micro-CHP for the DHW services. The report shows that the combination of these measures and systems can achieve energy savings of **18.7%** of total site energy demand as well as **11.2%** reduction in Carbon Dioxide emissions.

- Water efficiency measures and sustainable construction methods have been referenced in the separate report: *"BREEAM Pre-assessment Report - Holiday Inn Express Bicester Gateway"*

CONTENTS

1.0 INTRODUCTION

This report sets out client's approach to the energy efficient design measures which will be integrated into the new proposed **Holiday Inn Express, Bicester Gateway in Oxfordshire**.

1.1 Summary of Energy Statement Requirements

The objective of this report is to define and outline how to incorporate low energy and renewable energy systems into the project at an early stage so that advice can be given early on the implications of compliance with Part L of the Building Regulations and the implications in relation to relevant planning policies.

In this document, the principles for developing an energy strategy are presented, where the main objective of the energy strategy is to reduce the CO_2 emissions from the proposed development.

The development of the energy strategy is based on the following principles:

- Reduce demand
- Meet end-use demand efficiently
- Supply from low/zero carbon technologies
- Enable effective energy management

1.2 Structure of Report

This report comprises a number of sections that together provide a full description of the evaluation criteria, input data, assumptions and modelling methodology used in order to provide recommendations for the project to reduce energy consumption and associated CO_2 emissions.

This comprises:

- Policy review
- Energy performance analysis
- Decentralised Energy
- Review of low/zero carbon technologies
- Energy performance of the proposed building

2.0 SITE CONTEXT

The proposed **Holiday Inn Express, Bicester Gateway** will be located in **Bicester**, Oxfordshire.

As shown in **Figure 1**, the proposed site has a long triangular shape. Wendlebury Road forms the South-East and South-West boundaries of the site with A41 to the North-West. The proposed site is in close proximity to Bicester Avenue Retail Outlet and Bicester Park and Ride.

Figure 1: Aerial View of the Proposed Site location

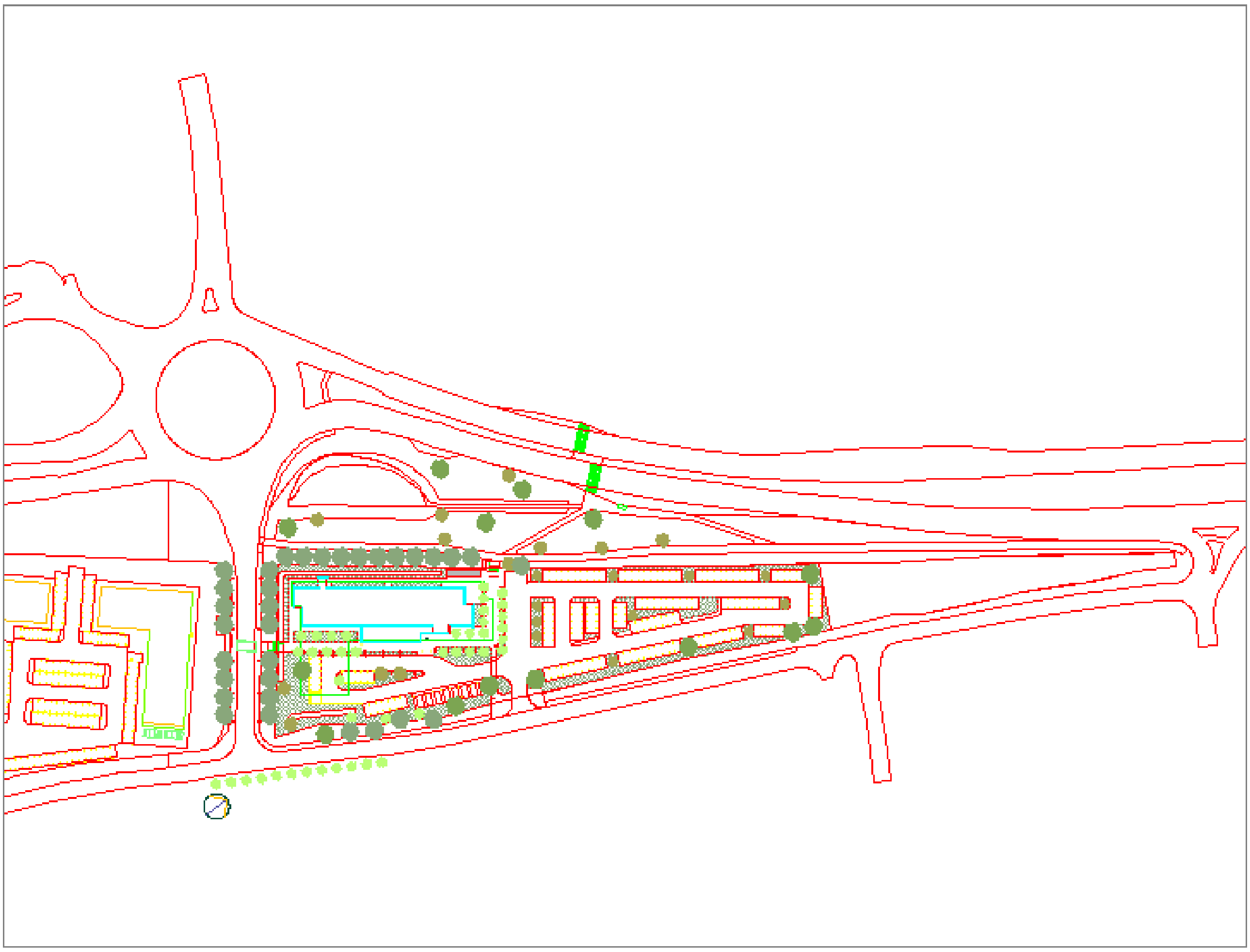


Figure 2: Proposed Site Plan by NORR Consultants Ltd

3.0 POLICY REVIEW

This section reviews the planning policies, energy and sustainability targets that are relevant to this development.

3.1 National Planning Policy Framework (March 2012)

The National Planning Policy Framework (NPPF) recognises that the purpose of planning system is to help achieve sustainable development. It sees sustainable development as a change for the better and positive growth – making economic, environmental and social progress for this and future generations. The NPPF seeks development that is sustainable to be approved without delay and advises that sustainable development should be seen as a 'golden thread' running through both the plan-making and decision-making processes. The NPPF sets out core planning principles, including:

- Supporting sustainable economic development to deliver homes, businesses, infrastructure and thriving local places;
- Seeking high quality design and a good standard of amenity for all existing and future occupants of land and buildings;
- Taking account of the different roles and characters of different areas, promoting the vitality of urban areas, and protecting Green Belt;
- Supporting the transition to a low carbon future in a changing climate, taking full account of flood risk and encourage the reuse of existing resources and the use of renewable resources including renewable energy;
- Contribute to conserving and enhancing the natural environment and reducing pollution;
- Encouraging the effective use of land by reusing land that has been previously developed (brownfield land), provided it is not of high environmental value;
- Promoting mixed use developments, and encourage multiple benefits from the use of land in urban or rural areas;
- Conserving heritage assets in a manner appropriate to their significance;
- Making the fullest possible use of public transport, walking and cycling, and focus significant development in locations which are or can be made sustainable.
- Supporting local strategies to improve health, social and cultural wellbeing for all, and deliver sufficient community and cultural facilities and services to meet local needs.

3.2 The Cherwell Local Plan 2011 – 2031 (Adopted July 2015)

3.2.1 Policy ESD 1 – Mitigating and Adapting to Climate Change

Measures will be taken to mitigate the impact of development within the District on climate change. At a strategic level, this will include:

- Distributing growth to the most sustainable locations as defined in this Local Plan;
- Delivering development that seeks to reduce the need to travel and which encourages sustainable travel options including walking, cycling and public transport to reduce dependence on private cars;
- Designing developments to reduce carbon emissions and use resources more efficiently, including water (see Policy ESD 3 Sustainable Construction)
- Promoting the use of decentralised and renewable or low carbon energy where appropriate (see Policies ESD 4 Decentralised Energy Systems and ESD 5 Renewable Energy).

The incorporation of suitable adaptation measures in new development to ensure that development is more resilient to climate change impacts will include consideration of the following:

- Taking into account the known physical and environmental constraints when identifying locations for development;
- Demonstration of design approaches that are resilient to climate change impacts including the use of passive solar design for heating and cooling;
- Minimising the risk of flooding and making use of sustainable drainage methods, and
- Reducing the effects of development on the microclimate (through the provision of green infrastructure including open space and water, planting, and green roofs)

Adaptation through design approaches will be considered in more locally specific detail in the Sustainable Buildings in Cherwell Supplementary Planning Document (SPD)

3.2.2 Policy ESD 2 – Energy Hierarchy and Allowable Solutions

In seeking to achieve carbon emissions reductions, we will promote an ‘energy hierarchy’ as follows:

- Reducing energy use, in particular by the use of sustainable design and construction measures;
- Supplying energy efficiency and giving priority to decentralised energy supply;
- Making use of renewable energy;
- Making use of allowable solutions.

3.2.3 Policy ESD 3 – Sustainable Construction

All new residential developments will be expected to incorporate sustainable design and construction technology to achieve zero carbon development through a combination of fabric energy efficiency, carbon compliance and allowable solutions in line with Government policy.

Cherwell District is in an area of water stress and as such the Council will seek a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day.

All new non-residential development will be expected to meet at least BREEAM ‘Very Good’ with immediate effect, subject to review over the plan period to ensure the target remains relevant. The demonstration of the achievement of this standard should be set out in the Energy Statement.

The strategic site allocation identified in this Local Plan are expected to provide contributions to carbon emissions reductions and to wider sustainability.

All development proposals will be encouraged to reflect high quality design and high environmental standards, demonstrating sustainable construction methods including but not limited to:

- Minimising both energy demand and energy loss;
- Maximising passive solar lighting and natural ventilation;
- Maximising resource efficiency;
- Incorporating the use of recycled and energy efficient materials;
- Incorporating the use of locally sourced building materials;
- Reducing waste and pollution and making adequate provision for the recycling of waste;
- Making use of sustainable drainage methods;
- Reducing the impact on the external environment and maximising opportunities for cooling and shading (by the provision of open space and water, planting, and green roofs, for example); and
- Making use of the embodied energy within buildings wherever possible and re-using materials where proposals involve demolition or redevelopment.

Should the promoters of development consider that individual proposals would be unviable with the above requirements, ‘open-book’ financial analysis of proposed developments will be expected so that an independent economic viability assessment can be undertaken. Where it is agreed that an economic viability assessment is required, the cost shall be met by the promoter.

3.2.4 Policy ESD 4 – Decentralised Energy Systems

The use of decentralised energy systems, providing either heating (District Heating (DH)) or heating and power (Combined Heat and Power (CHP)) will be encouraged in all new developments.

A feasibility assessment for DH / CHP, including consideration of biomass fuelled CHP, will be required for:

- All residential developments for 100 dwellings or more;
- All residential developments in off-gas areas for 50 dwellings or more;
- All applications for non-domestic developments above 1000 m^2 floorspace

The feasibility assessment should be informed by the renewable energy map and the national mapping of heat demand densities undertaken by the Department for Energy and Climate Change (DECC).

Where feasibility assessments demonstrate that decentralised energy systems are deliverable and viable, such systems will be required as part of the development unless an alternative solution would deliver the same or increased benefit.

3.2.5 Policy ESD 5 – Decentralised Energy Systems

The Council supports renewable and low carbon energy provision wherever any adverse impacts can be addressed satisfactorily. The potential local environmental, economic and community benefits of renewable energy schemes will be a material consideration in determining planning applications.

Planning applications involving renewable energy development will be encouraged provided that there is no unacceptable adverse impact, including cumulative impact, on the following issues, which are considered to be of particular local significance in Cherwell.

- Landscape and biodiversity including designations, protected habitats and species, and Conservation Target Areas;
- Visual impacts on local landscapes;
- The historic environment including designated and non-designated assets and their settings;
- The Green Belt, particularly visual impact on openness;
- Aviation activities
- Highway and access issues, and
- Residential amenity

A feasibility assessment of the potential for significant on site renewable energy provision (above any provision required to meet national building standards) will be required for:

- All residential development for 100 dwellings or more
- All residential developments in off-gas areas for 50 dwellings or more
- All applications for non-domestic developments above 1000 m^2 floorspace

When feasibility assessments demonstrate that on site renewable energy provision is deliverable and viable, this will be required as part of the development unless an alternative solution would deliver the same of increased benefit. This may include consideration of ‘allowable solutions’ as Government Policy evolves.

3.3 Condition 27 of the outline planning permission (26th July 2017)

The first application for approval of reserved matters relating to development on each of Phases 1A and 1B shall be accompanied by an Energy Statement that demonstrates the significant on-site renewable energy provision that will be incorporated into the development except where such on-site renewable energy provision is robustly demonstrated within the Statement to be unfeasible or unviable.

The on-site renewable energy provision as detailed in the Energy Statement shall thereafter be fully incorporated into development within that phase and no occupation of development within the relevant phase shall take place until the approved on-site renewable energy provision is fully installed and operational.

Reason - To ensure sustainable construction and reduce carbon emissions in accordance with the requirements of Policy ESD1 - 5 of the Cherwell Local Plan 2011-2031 Part 1.

3.4 Summary of the planning requirements

Summary of the planning requirements for the proposed Holiday Inn Express, Bicester Gateway is presented below:

- Reduce site energy demand by incorporating sustainable design and construction methods;
- Reduce carbon dioxide emissions and energy use in the proposed development (reduction target has not been specified by the local council);
- Achieve BREEAM rating of ‘Very Good’ (BREEAM assessment is covered by a separate document);
- Conduct a feasibility assessment for District Heating / CHP installations opportunities;
- Conduct a feasibility assessment for the onsite renewable energy provision;
- Water efficiency measures and sustainable construction methods have been referenced in the separate report: *“BREEAM Pre-assessment Report - Holiday Inn Express Bicester Gateway”*

4.0 ENERGY PERFORMANCE ANALYSIS

4.1 Description of Process

Dynamic Simulation Modelling (DSM), as used for Part L Building Regulations compliance, has been conducted using the IES Virtual Environment (IES-VE) software package.

The Virtual Environment (VE) 2017 software package has been used for this project, as it allows a single model to be used for all the required analysis related to the building performance regarding passive and active strategies, energy efficient mechanical and electrical systems, and LZC technologies.

IES-VE is a dynamic simulation modelling (DSM) software, which assists architects and engineers in developing a sustainable building design by offering a quantitative feedback as a response to different design options.

The software allows the user to create a "virtual environment" where building mass, form, climate, natural resource availability, occupancy, materials and services are taken into consideration in order to analyse different energy saving strategies.

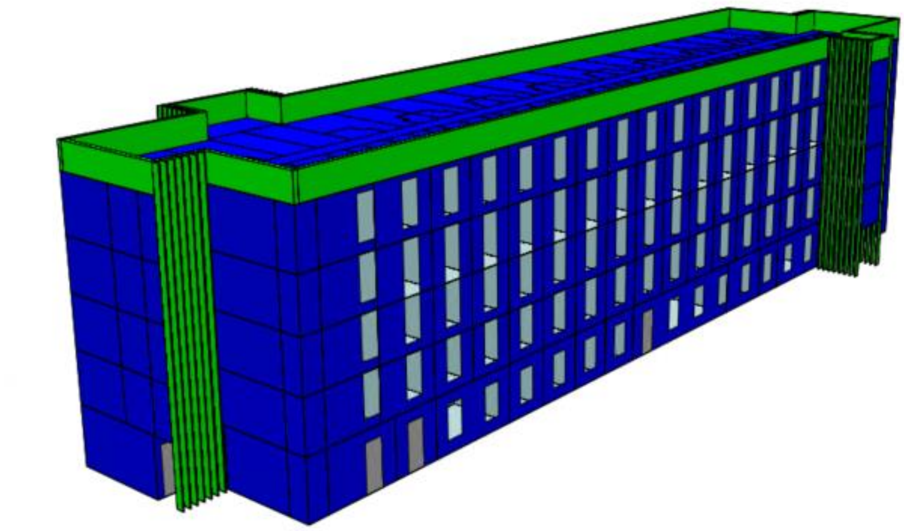
The standard building model which is used throughout the project will be based on the following information where available:

- Architectural drawings
- Architectural specification
- Mechanical specification
- Electrical specification
- Local Weather Data

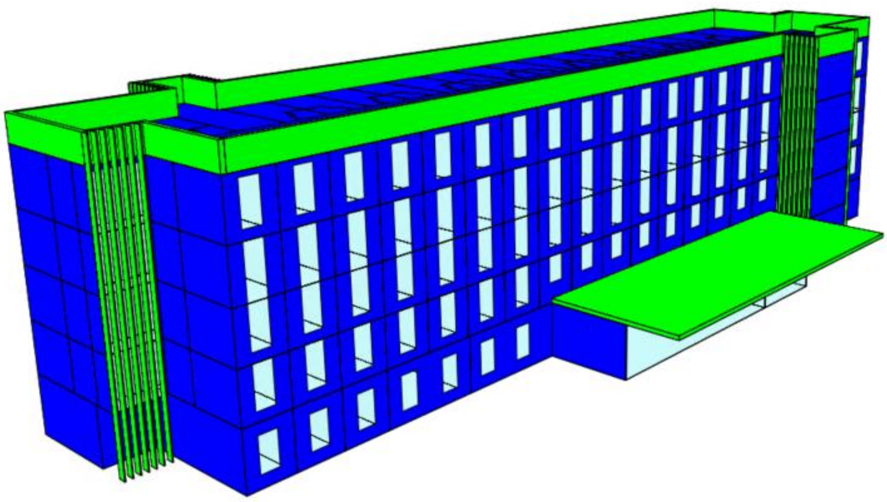
Software simulation was run to calculate energy demand for the site. After that IES models for two buildings were analysed, the first representing the Notional Building as defined by the NCM[1], and the second the building as proposed. The difference in CO_2 emissions between the models represents the CO_2 reduction achieved by the proposed low energy and low carbon design.

[1] National Calculation Method

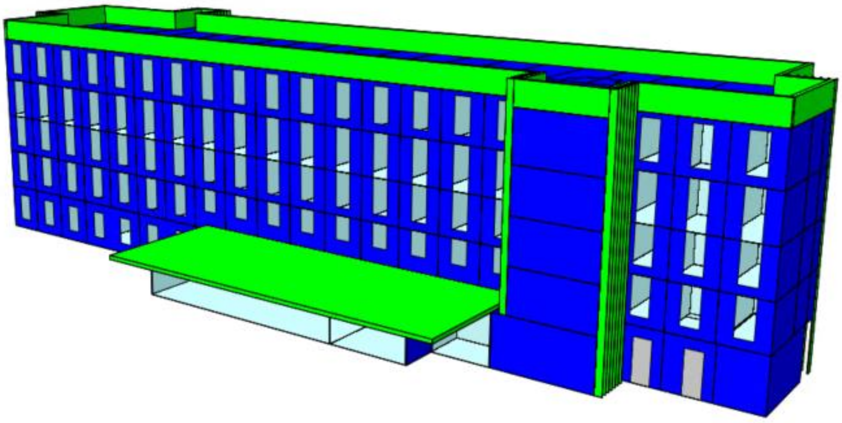
4.2 3D views of the modelled building



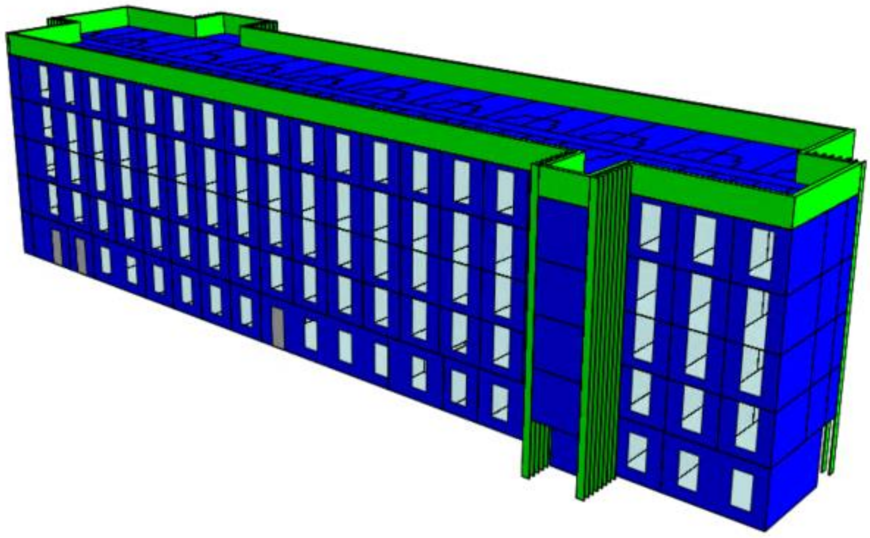
North View



South View



East View



West View

4.3 IES results of Energy Demand Calculations for the proposed site.

The following is a breakdown of the energy demand of the building by the type of use:

	Heating (MWh)	Cooling (MWh)	Auxiliary Energy (MWh)	Lighting (MWh)	DHW (MWh)	Equipment (MWh)	Total (MWh)
Summed total	196.11	44.27	221.29	46.87	1018.13	143.87	1670.54

Table 1- Energy demand by the type of use

4.3.1 Conclusion of the energy demand estimation.

Total estimated heating energy demand for the site is **196.11 MWh** per annum.

Total estimated energy demand for DHW for the site is **1018.13 MWh** per annum

Total estimated energy demand for the site is **1670.54 MWh** per annum

5.0 REVIEW OF PASSIVE DESIGN STRATEGIES

It is the best practice to maximise the energy performance of a building during the design process, with energy reduction and fabric efficiency measures prioritised over fuel sources and renewable energy. The development of the energy strategy should be based on the following process:

- Reduce demand
- Meet end-use demand efficiency
- Supply from low carbon sources
- On site renewable energy generation
- Enable effective energy management

The sections below analyse different passive design strategies to be implemented for this site.

5.1 Site Location

Capturing the value of sustainable building opportunities begins with a good site analysis. Initially, basic site analysis can be used to inform the choice of the site where there are options available. Once a site has been selected, thorough analysis will be essential in informing later design decisions. Good site analysis includes assessment of the following conditions:

- Topography and landscape
- Biodiversity
- Microclimate (sun/wind)
- Access, routes and transport
- Existing building / structures
- Facilities / amenities and access to them
- Contamination
- Flood risk
- Noise
- Constraints and opportunities

The proposed **Holiday Inn Express, Bicester Gateway** will be located in the low-density rural area South-West of Bicester. The effect of the conditions related to energy performance and carbon emissions of the proposed site, such as topography, landscape, weather, microclimate, existing buildings and structures can be simulated using Dynamic Simulation Software (IES-VE) and will be explained further in this section of the report.

5.2 Site weather

The characteristics of the climate have a large part to play in the energy use of any building. Factors such as temperature, humidity, prevailing wind conditions and light levels interact with the building envelope to determine the energy use and energy efficiency of a building.

Dynamic Simulation Modelling software such as IES-VE, allow account for different weather profiles for thermal modelling and calculations. Usually simulation weather files contain data for variables including dry bulb & wet bulb temperature, wind speed & direction, solar altitude & azimuth, cloud cover etc for each hour of the year.

The proposed new Holiday Inn Express will be situated in **Bicester, Oxfordshire**. The CIBSE TRY weather file for London has been selected for calculations as the most representative weather data for this site.

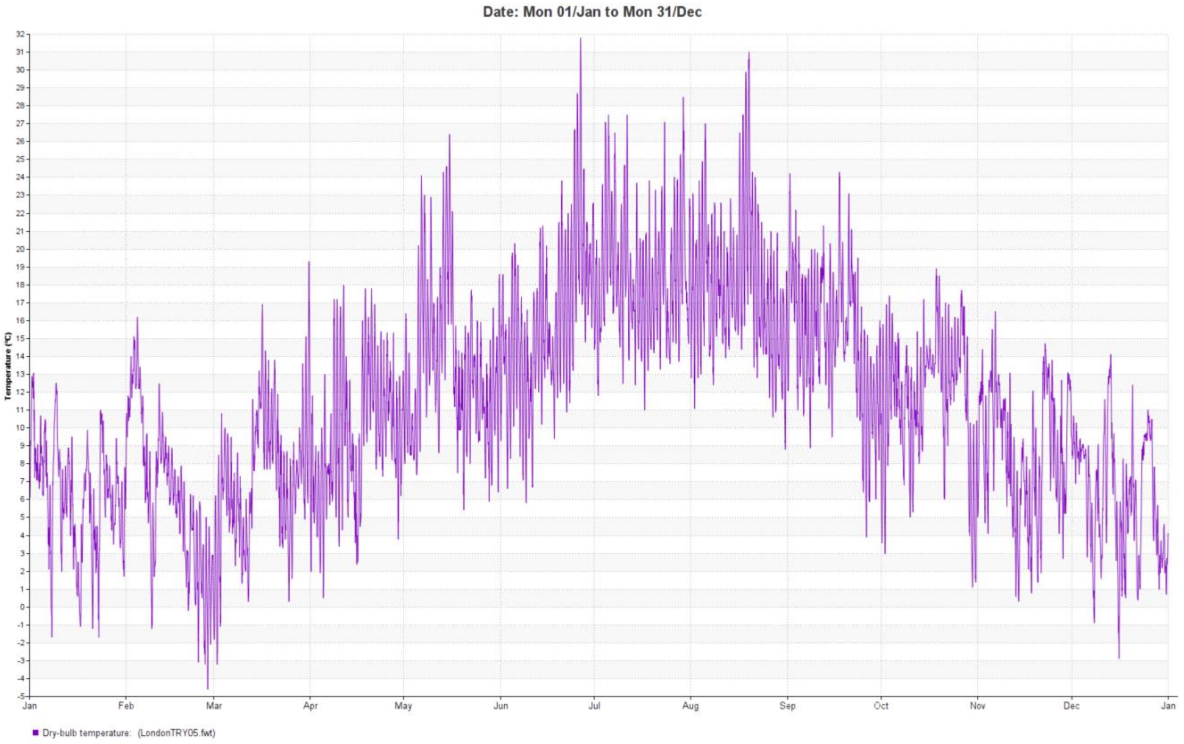


Figure 3 - Dry-bulb temperature graph for London weather file

5.3 Microclimate

Microclimate refers to localised weather conditions around buildings or small neighbourhood clusters. Microclimatic phenomena are localised at the scale of building or building cluster and include air movement, precipitation, and temperature. Building location and geometry can affect microclimate especially in dense urban areas where air movement can be distorted to form wake and downwash phenomena that reduce the liveability of external space. A well-considered microclimatic strategy in the design of buildings and urban space, help reduce exposure and to contribute to the success of well used external space.

Dynamic Simulation Modelling accounts for microclimatic phenomena when performing energy and carbon calculations. A 3D model of the proposed **Holiday Inn Express, Bicester Gateway** and influential surrounding topography / buildings has been created for further analysis based on the site plan provided by **NORR Consultants Ltd** and featured in Section 2 of this report.

5.4 Building layout and orientation

Design for orientation is a fundamental step to ensure that a building works with the passage of the sun across the sky. Knowledge of sunpath for any site is fundamental in the design of building facades to let in light and beneficial passive solar gains, as well as reducing glare and minimising overheating to the building interior. It is important to remember that the position of the sun in the sky is dynamic, changing according to time of the day, time of year and the site's latitude.

Well-orientated buildings maximise daylighting through building facades reducing the need for artificial lighting. Some building typologies can be zoned to ensure different functional uses receive sunlight at different times of the day. A careful strategy can also mitigate overheating and glare when sunlight is excessive.

The proposed **Holiday Inn Express, Bicester Gateway** is oriented along the North-East – South-West axis with main façade facing South-East.

The proposed layout of the new **Holiday Inn Express, Bicester Gateway** helps to utilise benefits of daylighting. The high occupancy Restaurant and Reception areas with large windows are facing South-East, in order to allow daylight to penetrate into the named areas for more hours during winter months. Canopy over the display windows / main entrance area will be designed to protect these areas from unwanted solar gains during summer months and thus reduce cooling demand.

IES VE software takes into account the layout and orientation for energy and carbon calculations. The image below shows the sunpath for this particular site combined with a 3d model of the building:

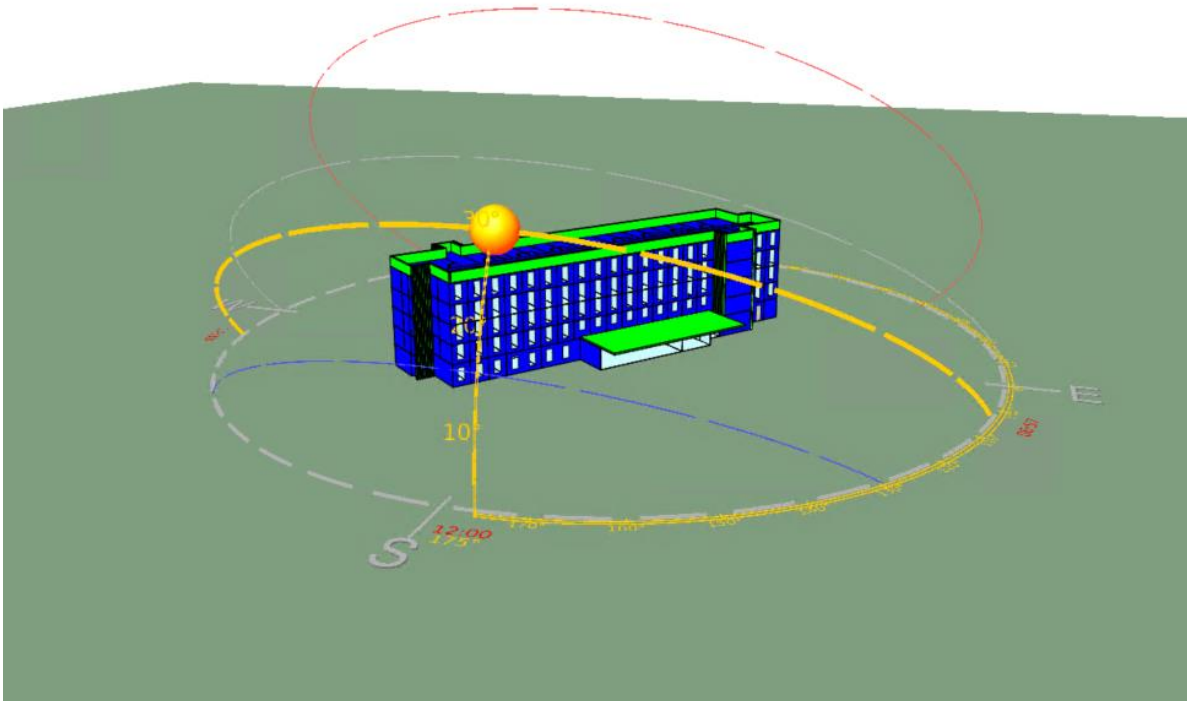


Figure 4 - Sunpath diagram for the site of the proposed development

5.5 Building form

A building's shape and the proportion of the building which is exposed to the environment will also affect internal temperatures and heat losses. The smaller the external surface area of a building the less opportunity there is for heat to escape. The overall 'Form Factor' is the ratio of the surface area of the entire external fabric, including ground contact, to the treated floor area. The better the Form Factor, the cheaper it will become to make a building more efficient. As a rule of thumb for sustainable buildings, the Form Factor ratio should be less than 3.

The new proposed **Holiday Inn Express, Bicester Gateway** has a simple rectangular shape with the Form Factor of approximately 1.31, which makes the building more energy efficient. Low Form Factor requires less insulation to reduce heat losses and achieve greater performance.

5.6 Building fabric

5.6.1 Insulation and U-values

Typically, two thirds of the heat generated in a building is lost through the building fabric itself; that is, the roof, walls, windows floors and doors of a building. Different fabric elements have different thermal (heat transfer) properties. The ability of fabric to transfer heat is a measured factor expressed as its U-value. The lower the U-value the better the material is at preventing heat loss. Building regulations state limiting U-values for different building elements and fittings, but there is some flexibility to allow designs to integrate other options for reducing heat loss.

Building fabric parameters for the proposed **Holiday Inn Express, Bicester Gateway** have been significantly improved over and above the Building regulations limiting values in order to reduce heat loss. U-values used in the building simulation are shown in the table below:

Building U-values		
Building Element	**Part L 2013 U-values, W/m2.K**	**Holiday Inn Express U-values, W/m2.K**
Wall	0.35	0.18
Floor	0.25	0.22
Roof	0.25	0.18
Glazing	2.2	1.44

5.6.2 Building Air permeability

Aiming for the best possible level of airtightness will improve thermal performance. Building air permeability standards are defined in Part L of the Building Regulations. The need to improve fabric performance to meet climate change objectives is likely to increase focus on airtightness levels.

Building air permeability is measured by the degree of air leakage (uncontrolled ventilation) through the building fabric over a specified period of time and at a defined pressure. To achieve an airtight building, a high build quality and adequate inspection regime is required as air leakage is usually due to imperfections of the building construction such as cracks, gaps or porous joints.

If airtightness is designed in, from the outset, it can be one of the most cost effective energy efficiency measures. Whilst airtightness has a significant impact on energy consumption, reducing air leakage is also important in reducing discomfort due to drafts and the potential for condensation leading to decay within the building.

Building regulations define a limiting building air permeability of 10 $m^3/h/m^2$ @50Pa. However, the proposed building will benefit from lower air permeability rate. For further calculations, **5 $m^3/h/m^2$** will be assumed for the proposed **Holiday Inn Express, Bicester Gateway**.

5.7 Daylighting strategy

Designing a building to take advantage of plentiful daylight improves the comfort and aesthetic appeal of interior spaces. If done correctly, the use of daylight can dramatically reduce the energy consumption of the building by reducing the time the lights are on. Reducing the electric lighting output also reduces cooling requirements.

As described in paragraph 5.4 of this section, daylighting in the proposed **Holiday Inn Express** benefits from the building's orientation and layout. South-East facing windows provide light to the occupied Restaurant / Reception areas. However, due to the depth of the ground floor (well over 6m) artificial lighting will be required even during the daytime to provide adequate illuminance levels.

5.8 Ventilation strategy

Natural ventilation is a passive strategy that consists of using natural forces, such as wind buoyancy to drive fresh cool outdoor air through a space. If well implemented, it can considerably contribute to reducing the energy consumption of a building. Natural ventilation as an alternative to mechanical ventilation has several benefits: low running costs, zero energy consumption, low maintenance and probably lower initial costs. It is also regarded as healthier, avoiding hygiene problems with ducts, filters, etc, and in the natural way that the building connects with outside, often in conjunction with windows, which is all seen as a psychological benefit.

However, the two main goals of natural ventilation are to improve the indoor air quality and to reduce the cooling/ventilation energy consumption of a building. Both of these goals must be fulfilled by guaranteeing that the indoor thermal comfort conditions are acceptable. If this condition is not met, the natural ventilation system is more likely to be replaced by a mechanical system. Due to the type of activity (hotel), size of the building and the air tightness the proposed **Holiday Inn Express, Bicester Gateway** is not suitable to be ventilated naturally. Efficient mechanical ventilation with heat recovery is proposed for this development and will be described later in this report.

The proposed passive measures will be incorporated in the final building simulation, results of the simulation are presented in Section 8

6.0 DECENTRALISED ENERGY SOURCE

The purpose of this section is to analyse feasibility of decentralised energy sources for the site. Two options for decentralised energy will be investigated in this section of the report:

- Option 1: District heating
- Option 2: Combined heat and power (CHP)

6.1 District Heating

The National Heat Map was commissioned by the Department of Energy and Climate Change and created by The Centre of Sustainable Energy. The purpose of the map is to support planning and deployment of local low-carbon energy projects in England. It aims to achieve this by providing publicly accessible high-resolution web-based maps of heat demand by area.

The Heat Map provides spatial intelligence on factors relevant to the identification and development of district heating opportunities, such as: major energy consumers and heat density.

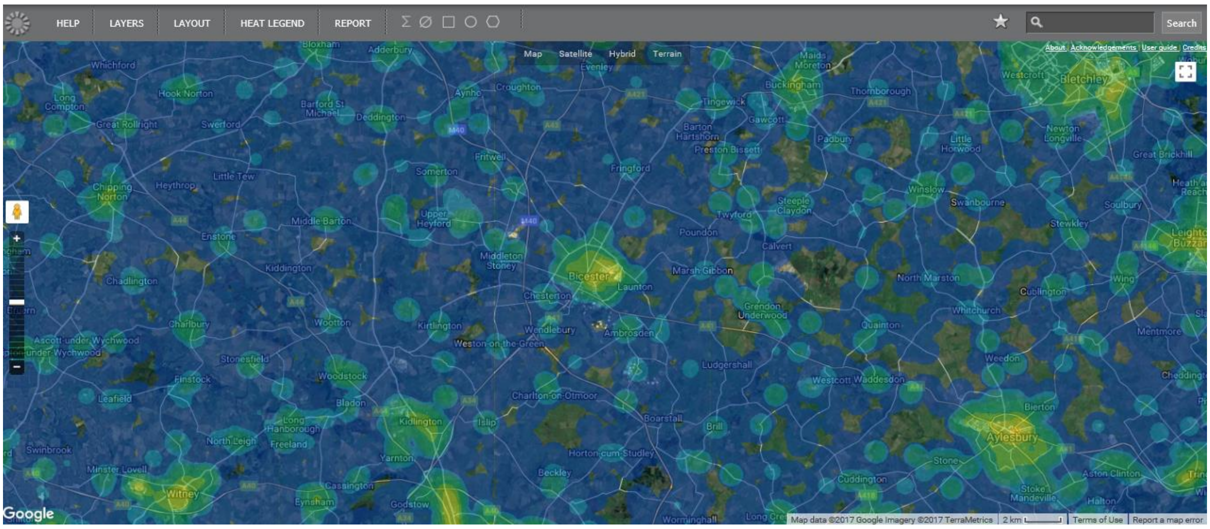


Figure 5: National Heat Map showing heat density in Bicester and surrounding areas

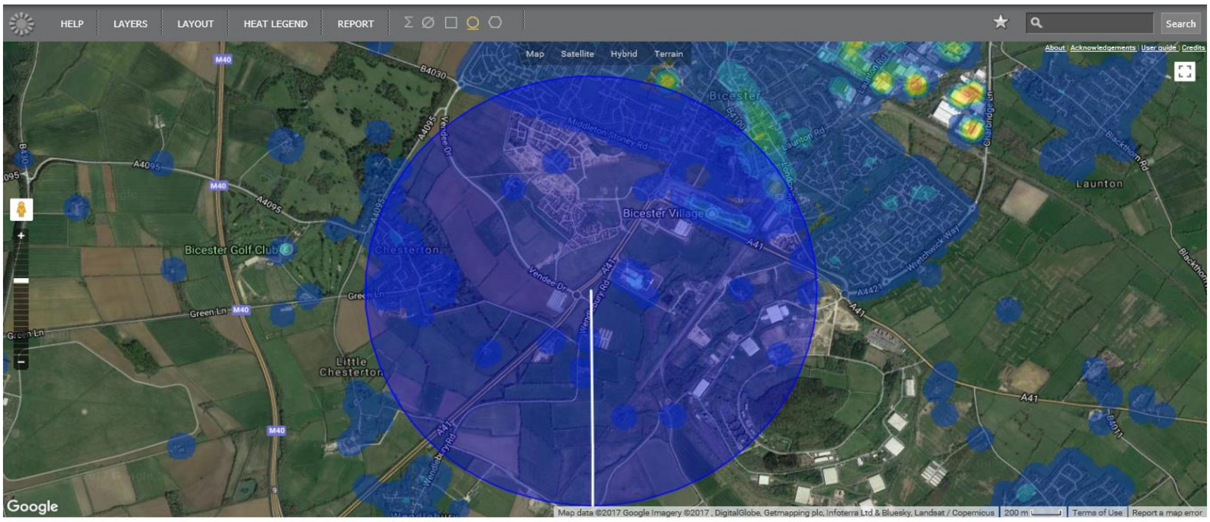
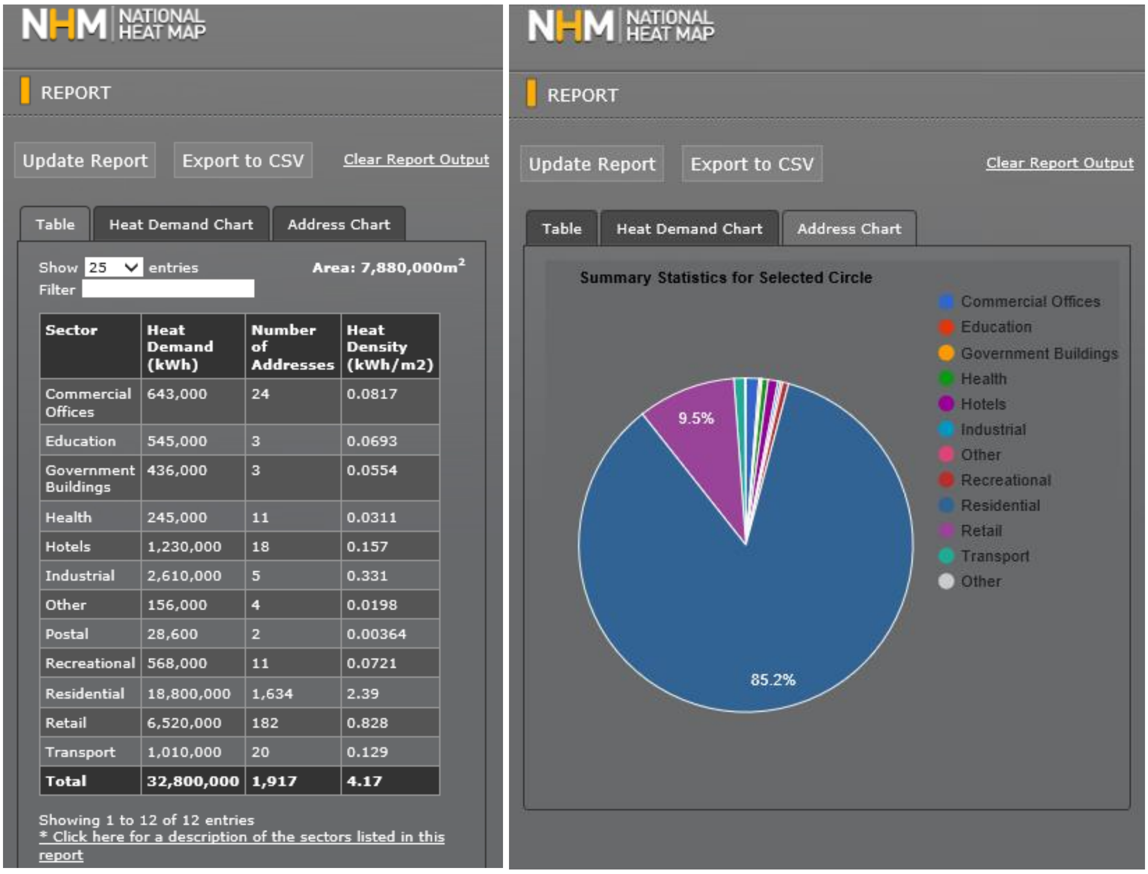


Figure 6: National Heat Map showing heat density of the proposed site and surrounding areas



Sector	Heat Demand (kWh)	Number of Addresses	Heat Density (kWh/m2)
Commercial Offices	643,000	24	0.0817
Education	545,000	3	0.0693
Government Buildings	436,000	3	0.0554
Health	245,000	11	0.0311
Hotels	1,230,000	18	0.157
Industrial	2,610,000	5	0.331
Other	156,000	4	0.0198
Postal	28,600	2	0.00364
Recreational	568,000	11	0.0721
Residential	18,800,000	1,634	2.39
Retail	6,520,000	182	0.828
Transport	1,010,000	20	0.129
Total	**32,800,000**	**1,917**	**4.17**

Figure 7: National Heat Map heat density report and heat demand chart for the proposed site and surrounding areas

There are not any existing or proposed district energy networks in close proximity to the development site.

Due to the absence of district energy networks near proposed development and low heat density of the site district heating is not deemed feasible on this site.

6.2 Combined Heat & Power Unit

As an alternative to Option 1 (District Heating), the development could incorporate Combined Heat and Power (CHP) engines as part of a decentralised energy concept.

The use of CHP results in the highly efficient use of fuel, with primary energy savings of 30-45% compared with the conventional separate generation to achieve the same quantity of heat and power. Due to the efficiency of CHP, emissions to the environment are approximately 30% less than in separate generation of electricity and heat.

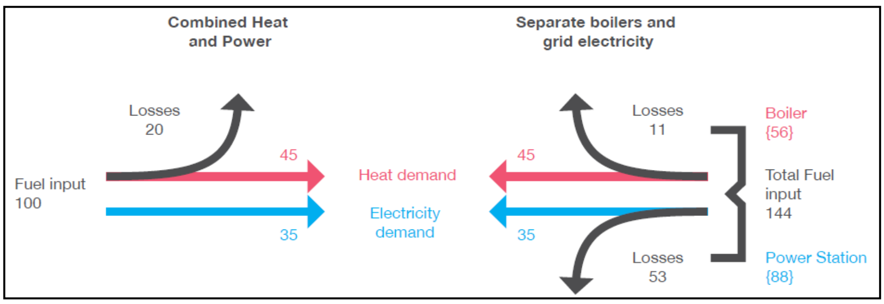


Figure 8: The benefits of Combined Heat and Power

CHP cannot be used as a stand-alone system; it requires effective integration with other energy systems on site. It is unlikely that all the power and heat requirements will be supplied by the CHP plant, additional heat and/or power from conventional sources will be required.

By introducing a CHP unit the running costs and carbon dioxide emissions are significantly reduced when compared to running a separate generator and boiler. However, the CHP plant should always operate as the lead heat source to maximise savings.

CHP systems require predictable and relatively constant loads all year round for best performance, which is normally found in applications with high domestic hot water loads such as hotels or leisure centres. For the proposed scheme a heat-led radiator-less micro-CHP in combination with a gas-fired boiler is **proposed** to cover energy demand for Domestic Hot Water (DHW).

Micro-CHP will be included in the final energy simulations of the proposed building. The results of the simulation are presented in Section 8 of this report.

7.0 REVIEW OF RENEWABLE AND LOW/ZERO CARBON TECHNOLOGIES

The purpose of this section is to estimate site energy requirements and to analyse feasibility of each of the different renewable or low/zero carbon technologies for the site. Not all of these technologies will be appropriate however and the most suitable one should be applied in order to meet required energy and CO_2 reduction.

7.1 Site Energy Requirements

Condition 27 of the outline planning permission specifies that significant on-site renewable energy provision should be incorporated into the development except where such on-site renewable energy provision is robustly demonstrated to be unfeasible or unviable. The total annual energy demand for the site is **1,670.54 MWh**

With these figures in mind, the sections below analyse opportunities to produce some amount of energy from various renewable sources.

7.2 Biomass

Biomass boilers provide heat with a very low resulting net carbon emission taken over the life cycle of the fuel; CO_2 emitted in the combustion process is nearly balanced by the CO_2 absorbed by photosynthesis during the growth of the biomass vegetation.

Embedded CO_2 emissions result from the processing and transportation of the fuel. Therefore, as part of a carbon reduction strategy a wood pellet or wood fuelled boiler would have a significant positive impact on CO_2 reductions. Biomass fuel is generally regarded as a zero carbon emission fuel over the lifetime of the plant material although there will be a residual carbon footprint relating to collecting, processing and transporting the fuel. This figure is in the order of 5% in most cases.

However, typical small scale biomass units have a high NO_X emissions and particle content of the exhaust gases and other technologies investigated within this section would avoid these types of issue.

In light of the above considerations, biomass boilers are not technically or financially suited to the site and so are considered not to be a viable option for the proposed development.

7.3 Wind Turbines

The Department of Energy & Climate Change (DECC) wind speed database estimated average wind speeds at this location in the UK are:

Height, m	Wind speed, m/s
10	4.9
25	5.7
45	6.1

A typical horizontal axis turbine with a **5.5 m** diameter rotor would generate approximately **14,600 kWh** of energy per year at a wind speed of **6.1 m/s** (hub height), which would offset **6,300 kg of CO_2** by displacement of grid electricity. Therefore, at least **six** wind turbines of this size will be required to produce 5% of total energy demand for the site.

However, the wind speed database does not take into account local topographical features, which will cause turbulent air flow resulting in significantly reduced output. This is likely to result in the wind turbines under performing and not delivering the required energy or carbon savings. Also wind turbines can increase turbulence to incoming and ongoing aircrafts from airbases nearby.

The size / number of wind turbines required to generate significant energy for the site could not be realistically accommodated on this site.

7.4 Solar Domestic Hot Water

Solar thermal collectors absorb direct solar radiation and transfer it to circulating water which exchanges the heat obtained with a hot water cylinder for pre-heating domestic hot water and heating systems.

Solar thermal collectors take advantage of natural source of heat, have a long life, can be integrated into the building, and require low maintenance.

There are two types of collectors, glazed flat plates and evacuated tubes. Evacuated tubes are more efficient however they do come at an additional cost, there are also unglazed collectors but those are more suited for swimming pools.

It shall be also noted that storage tanks and collectors should be located at a close proximity. Additionally, the temperature of stored domestic hot water should be elevated to a minimum of 60 ^{o}C on a daily basis to protect against Legionnaires disease. As well, an antifreeze fluid should be used such as glycol to provide protection to the system in winter.

The application of solar panels is for the heating of domestic hot water and these could be incorporated to provide solar heat to supply hot water points in the bathrooms.

Solar Domestic Hot Water could be a feasible option for this development, however a micro-CHP was already specified in the previous section to cover DHW load, thus Solar Hot Water system will not be included in the final energy simulation.

7.5 PV Solar panels

Photovoltaic modules convert sunlight directly to DC electricity. They can be integrated into buildings in numerous ways including sloping and flat roofs, building façades, glass roof structures, and solar shading devices. There are mainly three types of PV cells; polycrystalline silicon, amorphous silicon, and mono-crystalline silicon with the latter being the most efficient.

In order to generate energy from renewable sources, photovoltaic panels may be installed on the shallow pitched (<5°) roof of the hotel.

For a 90 m^2 array of mono-crystalline silicon panels, with an average efficiency of 15%, the annual energy generated would be **10,820 kWh**, which represents a carbon emission reduction of **5.6 Tonnes CO_2 per year**.

However, due to the servicing requirements of the hotel, the heat pumps and ventilation plant are located at roof level, within a screened plant area. Distribution to the various risers serving the building is therefore required at roof level. The screening of plant is required for planning and acoustic reasons. A parapet wall is to be provided, around the perimeter of the building at roof level, for health and safety, screening and acoustic reasons. As a result of the plant, equipment, distribution, screening and parapet wall requirements there is insufficient unshaded roof space to accommodate an effective number of PV panels to achieve significant renewable energy generation and reduction in carbon dioxide emissions. Alternative renewable and Low/Zero Carbon energy sources are investigated later in the following sections of this report. In combination with micro-CHP they will provide greater savings in CO_2 emissions.

7.6 Ground Source Heat Pumps

A Ground Source Heat Pump (GSHP) is a central heating and/or cooling system that pumps heat to or from the ground. During the winter season it uses the earth as a heat source, whereas during the summer season it can use the earth as a heat sink. The design increases the efficiency and reduces the operational costs of the heating and cooling systems by taking advantage of the moderate constant temperature in the ground.

Below a certain depth, the ground maintains a constant temperature of 10-12°C winter and summer. A heat pump extracts some of this energy and increases it to a temperature suitable for space heating; this is achieved by circulating water or glycol through either a horizontal matrix of PVC pipework or via a series of boreholes.

The number of boreholes depends on the size of the heating/cooling plant, the type of formation, the depth of the boreholes and the presence or otherwise of any water table. If this technology were to be employed for this project, a desktop study of the local geology would be required to assess the heat transfer properties of the ground below and around the site.

The ground source heat pump performance is significantly higher than the equivalent air source heat pump and, providing the flow and return water temperatures in the heating/cooling circuit can be kept relatively low, seasonal coefficients of performance (COP's) of 3.5 to 4.0 can be achieved.

For this development, there would be insufficient area which would be suitable for the location of boreholes to provide the necessary heat transfer area to the ground. In light of the above considerations, ground source heat pumps are considered not to be a viable option for the proposed development.

7.7 Air Source Heat Pumps

Liquid through the evaporator side of the Air Source Heat Pumps (ASHP) absorbs heat from the outside air which is then passed through a compressor where its temperature is increased. The higher temperature heat is then transferred at the condenser side of the ASHP to the heating and hot water circuits of the development.
There are two main types of air source heat pump systems:

- An air to water system which distributes the heat via a wet central heating system
- An air to air system which circulates the heat by fans to heat the development

A further variation to the main types of ASHP presented above is VRF/VRV (Variable Refrigerant Flow/Variable Refrigerant Volume) units. The main difference between the systems presented above and the VRF/VRV units is that the VRF/VRV units make use of a refrigerant as a cooling and heating medium.

In a VRV/VRF scheme, a large outdoor unit serves multiple indoor units. Each indoor unit uses an electronic liquid expansion valve to control its refrigerant supply to match the communal demand of the space it serves.
The efficiency of a VRV/VRF system is usually defined by the Coefficient of Performance (COP) which is the ratio of the electrical energy input versus the thermal (heating or cooling) energy output.

The proposed building will use Air Source Heat Pumps as preferred renewable source for heating/cooling for the guest rooms, back of house areas and meeting / conference facilities.

8.0 ENERGY PERFORMANCE OF THE PROPOSED BUILDING

8.1 Proposed fixed building services for IES thermal model.

The following assumptions were incorporated in the final building simulation:

- HWS generated by heat-led radiator-less CHP with back-up gas-fired boilers to instantaneous plate heat exchangers
- Central station air conditioning to Great Room/Bar/Reception from packaged DX AHU with thermal wheel heat recovery and economiser cycle free cooling
- Guest rooms, corridors, conference/meeting and back of house heated/cooled with heat recovery high-COP VRF systems
- Back of House ventilated with single ceiling void-mounted Loss-nay-type HRU running 24/7
- Guest rooms ventilated with central rooftop packaged heat recovery heated/cooled AHU
- Conference/meeting ventilated with Loss-nay-type HRUs dedicated to each space with occupancy control
- LED lighting throughout, occupancy control in guest rooms, BOH and meeting/conference.

8.2 IES results for Energy Consumption and Carbon Dioxide Emissions of the Proposed Building

The following is a breakdown of the energy consumption of the proposed building by the type of use:

Date	Heating energy (MWh)	Cooling energy (MWh)	Auxiliary energy (MWh)	Lighting energy (MWh)	DHW energy (MWh)	Equipment energy (MWh)	Total energy (MWh)	CHP generated electricity (MWh)	Total Energy Ex. Renewables (MWh)
Jan 01-31	9.25	0.00	18.79	3.98	86.47	12.22	130.72	-11.60	119.12
Feb 01-28	7.74	0.01	16.98	3.60	78.10	11.04	117.46	-10.47	106.99
Mar 01-31	7.27	0.03	18.79	3.98	86.47	12.22	128.77	-11.60	117.18
Apr 01-30	4.19	0.19	18.19	3.85	83.68	11.82	121.93	-11.22	110.71
May 01-31	1.79	1.15	18.79	3.98	86.47	12.22	124.40	-11.60	112.81
Jun 01-30	0.58	2.68	18.19	3.85	83.68	11.82	120.80	-11.22	109.58
Jul 01-31	0.10	3.92	18.79	3.98	86.47	12.22	125.48	-11.60	113.89
Aug 01-31	0.29	3.24	18.79	3.98	86.47	12.22	125.00	-11.60	113.40
Sep 01-30	1.36	1.19	18.19	3.85	83.68	11.82	120.10	-11.22	108.88
Oct 01-31	4.04	0.19	18.79	3.98	86.47	12.22	125.69	-11.60	114.09
Nov 01-30	6.88	0.01	18.19	3.85	83.68	11.82	124.44	-11.22	113.22
Dec 01-31	9.23	0.00	18.79	3.98	86.47	12.22	130.69	-11.60	119.10
Summed total	**52.72**	**12.61**	**221.29**	**46.87**	**1018.13**	**143.87**	**1495.49**	**-136.53**	**1358.97**

Table 2 - Proposed Building Energy Consumption by the type of use

The following table shows the amount of energy saved by combination of passive design techniques, inclusion of micro-CHP and air-source heat pumps as low carbon energy source.

Site Energy Demand, MWh	Site Energy Consumption, MWh	Energy saved, MWh
1,670.54	1,358.97	311.57

Table 3 – Energy by Low / Zero Carbon Source

The annual CO_2 emissions of the building (Building Emission Rate, BER) is compared to a target (Target Emission Rate, TER) that is derived from the annual CO_2 emissions of a building designed and constructed in accordance with a Building Regulations 2013 Notional Building. The following is a summary of the assessment results for the **Holiday Inn Express, Bicester Gateway.**

Notional and Target Emission Rate (TER) **69.7** kg $CO_2.m^{-2}$.year

Building Emission Rate (BER) **61.9** kg $CO_2.m^{-2}$.year

Reduction in CO_2 emissions **11.2**%

8.3 Summary of the Energy and Carbon Dioxide Emissions estimation of the proposed Building

Total estimated energy demand for the site is **1,670.54 MWh per annum**.

Total estimated energy consumption for the site is **1,358.97 MWh per annum.**

Total energy savings for the site is **1,670.54 MWh – 1,343.37 MWh = 311.57 MWh** or **18.7%** of total site energy demand.

Estimated Carbon Dioxide emission of the Notional Building is **69.7 kg $CO_2.m^{-2}$.year**.

Estimated Carbon Dioxide emissions of the proposed building is **61.9 kg $CO_2.m^{-2}$.year.**

Total reduction in regulated Carbon Dioxide emissions for the site is **11.2%**.

9.0 CONCLUSION

A summary of the planning requirements by The Cherwell Local Plan 2011 – 2031 (Adopted July 2015) for the proposed **Holiday Inn Express, Bicester Gateway** is presented below:

- Reduce site energy demand by incorporating sustainable design and construction methods;
- Reduce carbon dioxide emissions and energy use in the proposed development (reduction target has not been specified by the local council);
- Achieve BREEAM rating of 'Very Good' (BREEAM assessment is covered by a separate document);
- Provide a higher level of water efficiency than required in the Building Regulations, with developments achieving a limit of 110 litres/person/day;
- Reflect high quality design and high environmental standards, demonstrating sustainable construction methods;
- Conduct a feasibility assessment for District Heating / CHP installations opportunities;
- Conduct a feasibility assessment for the onsite renewable energy provision.

The energy assessment incorporates the review of passive design measures, feasibility assessment for District Heating / CHP installations and feasibility assessment for the onsite renewable energy generation options. The proposed development will incorporate renewable energy generation in the form of Air Source Heat Pumps (ASHP) for space heating and Low/Zero Carbon energy generation in the form of micro-CHP for the DHW services. The report shows that the combination of these measures and systems can achieve energy savings of **18.7%** of total site energy demand as well as **11.2%** reduction in Carbon Dioxide emissions.

Water efficiency measures and sustainable construction methods have been referenced in the separate report: "BREEAM Pre-assessment Report - Holiday Inn Express Bicester Gateway"

APPENDIX A BRUKL OUTPUT DOCUMENT

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Holiday Inn Express

As designed

Date: Mon Dec 11 10:06:55 2017

Administrative information

Building Details

Address: Bicester,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.7

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.7

BRUKL compliance check version: v5.3.a.0

Owner Details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Oliver Hanson

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2$.annum	69.7
Target CO_2 emission rate (TER), $kgCO_2/m^2$.annum	69.7
Building CO_2 emission rate (BER), $kgCO_2/m^2$.annum	61.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a-Limit}$	U_{a-Calc}	U_{i-Calc}	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	GH000000:Surf[1]
Floor	0.25	0.22	0.22	GH000000:Surf[0]
Roof	0.25	0.18	0.18	GH000017:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.44	1.44	GH000000:Surf[2]
Personnel doors	2.2	2.2	2.2	GH000010:Surf[4]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

Air Permeability	Worst acceptable standard	This building
m³/(h.m²) at 50 Pa	10	5

Page 1 of 29

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	<0.9

1- 03_Conference/Meeting/BoH

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.46	4.84	0	0	0.7
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

2- 04_Kitchen

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.7	3.4	0	0	-
Standard value	2.5*	3.2	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

3- 02_Great room / Bar / Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	-	0	1.9	0.65
Standard value	2.5*	N/A	N/A	1.5^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

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

4- 01_Guest Rooms

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.46	4.84	0	2	0.65
Standard value	2.5*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					NO

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

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

"No HWS in project, or hot water is provided by HVAC system"

1- CHECK2-CHP

	CHPQA quality index	CHP electrical efficiency
This building	105	0.33
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I	Zone	Standard
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1		
00_Large Meeting room	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Meeting room_01	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Flexible conference_02	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Meeting room_02	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Meeting room_03	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Toilet_female	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Toilet_disable	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Toilet_male	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Kitchen	-	-	-	1.2	-	-	-	-	-	-	N/A
00_Changing_male	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Changing_female	-	-	0.5	-	-	-	-	-	-	-	N/A
00_Staff dining	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Managers office	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Office	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Flexible conference_01	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Meeting room_04	-	1.9	0	-	-	-	-	-	-	-	N/A
00_Linen store	-	-	0.5	-	-	-	-	-	-	-	N/A
01_Bath_122	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_122	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_121	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_121	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_120	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_120	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_138	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_138	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_137	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_137	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_136	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_136	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_135	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_135	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Bath_134	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_134	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_133	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_133	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_132	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_132	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_131	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_131	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_130	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_130	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_129	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_129	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_128	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_128	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_127	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_127	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_126	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_126	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_125	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_125	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_124	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_124	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_123	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_123	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_101	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_101	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_102	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_102	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_103	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_103	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_104	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_104	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_105	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_105	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_106	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_106	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_107	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_107	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_108	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_108	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_109	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_109	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_110	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
01_Room_110	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_111	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_111	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_112	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_112	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_113	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_113	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_114	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_114	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_115	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_115	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_116	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_116	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_117	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_117	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_118	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_118	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Room_119	-	-	-	-	-	-	-	0.5	-	-	N/A
01_Bath_119	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_221	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_221	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_220	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_220	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_219	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_219	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_237	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_237	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_236	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_236	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_235	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_235	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_234	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_234	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_233	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_233	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_232	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_232	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_231	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_231	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_230	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_230	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_229	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_229	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
02_Bath_228	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_228	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_227	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_227	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_226	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_226	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_225	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_225	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_224	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_224	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_223	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_223	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_222	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_222	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_201	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_201	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_202	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_202	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_203	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_203	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_204	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_204	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_205	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_205	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_206	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_206	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_207	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_207	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_208	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_208	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_209	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_209	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_210	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_210	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_211	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_211	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_212	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_212	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_213	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_213	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_214	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_214	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_215	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
02_Bath_215	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_216	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_216	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_217	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_217	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Bath_218	-	-	-	-	-	-	-	0.5	-	-	N/A
02_Room_218	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_321	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_321	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_320	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_320	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_319	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_319	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_337	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_337	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_336	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_336	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_335	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_335	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_334	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_334	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_333	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_333	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_332	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_332	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_331	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_331	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_330	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_330	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_329	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_329	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_328	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_328	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_327	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_327	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_326	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_326	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_325	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_325	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_324	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_324	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_323	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_323	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
03_Bath_322	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_322	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_301	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_301	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_302	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_302	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_303	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_303	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_304	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_304	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_305	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_305	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_306	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_306	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_307	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_307	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_308	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_308	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_309	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_309	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_310	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_310	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_311	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_311	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_312	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_312	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_313	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_313	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_314	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_314	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_315	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_315	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_316	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_316	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_317	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_317	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Bath_318	-	-	-	-	-	-	-	0.5	-	-	N/A
03_Room_318	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_421	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_421	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_420	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_420	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_419	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
04_Bath_419	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_437	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_437	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_436	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_436	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_435	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_435	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_434	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_434	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_433	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_433	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_432	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_432	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_431	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_431	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_430	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_430	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_429	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_429	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_428	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_428	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_427	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_427	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_426	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_426	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_425	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_425	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_424	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_424	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_423	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_423	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_422	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_422	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_401	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_401	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_402	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_402	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_403	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_403	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_404	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_404	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_405	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_405	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
04_Bath_406	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_406	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_407	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_407	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_408	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_408	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_409	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_409	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_410	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_410	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_411	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_411	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_412	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_412	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_413	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_413	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_414	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_414	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_415	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_415	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_416	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_416	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_417	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_417	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Bath_418	-	-	-	-	-	-	-	0.5	-	-	N/A
04_Room_418	-	-	-	-	-	-	-	0.5	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00_Large Meeting room	46	-	-	238
00_Corridor_conference	-	110	-	31
00_Meeting room_01	54	-	-	127
00_Flexible conference_02	45	-	-	265
00_Meeting room_02	54	-	-	131
00_Meeting room_03	54	-	-	131
00_Toilet_female	-	80	-	30
00_Toilet_disable	-	149	-	7
00_Toilet_male	-	96	-	20
00_Lobby_toilet	-	110	-	11
00_Kitchen	-	62	-	380
00_Corridor_staff	-	137	-	25
00_Changing_male	-	87	-	82

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00_Changing_female	-	85	-	85
00_Staff dining	59	-	-	85
00_Managers office	59	-	-	85
00_Office	49	-	-	167
00_Bar store	63	-	-	57
00_Lift_linen	-	174	-	0
00_Lifts	-	83	-	0
00_Corridor_service	-	119	-	16
00_Water tank	46	-	-	136
00_Lobby	-	85	-	18
00_Stairs_01	-	77	-	57
00_Restaurant	-	57	55	801
00_Bar	-	60	55	488
00_Reception	-	60	55	462
00_Plantroom	55	-	-	69
00_LV switchroom	65	-	-	38
00_Bin store	65	-	-	38
00_Flexible conference_01	46	-	-	245
00_Meeting room_04	54	-	-	121
00_Stairs_02	-	80	-	46
00_Lobby_stairs	-	119	-	9
00_Linen store	47	-	-	137
01_Stairs_01	-	73	-	49
01_Lifts	-	77	-	0
01_Lift lobby	-	79	-	22
01_Bath_122	-	139	-	8
01_Room_122	-	81	-	32
01_Bath_121	-	139	-	8
01_Room_121	-	83	-	31
01_Room_120	-	81	-	32
01_Bath_120	-	139	-	8
01_Bath_138	-	139	-	8
01_Room_138	-	83	-	31
01_Bath_137	-	139	-	8
01_Room_137	-	81	-	32
01_Bath_136	-	139	-	8
01_Room_136	-	81	-	32
01_Bath_135	-	139	-	8
01_Room_135	-	81	-	32
01_Bath_134	-	139	-	8
01_Room_134	-	81	-	32
01_Bath_133	-	139	-	8
01_Room_133	-	81	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Bath_132	-	139	-	8
01_Room_132	-	81	-	32
01_Bath_131	-	139	-	8
01_Room_131	-	81	-	32
01_Bath_130	-	139	-	8
01_Room_130	-	81	-	32
01_Bath_129	-	139	-	8
01_Room_129	-	81	-	32
01_Bath_128	-	139	-	8
01_Room_128	-	81	-	32
01_Bath_127	-	139	-	8
01_Room_127	-	81	-	32
01_Bath_126	-	139	-	8
01_Room_126	-	81	-	32
01_Bath_125	-	139	-	8
01_Room_125	-	81	-	32
01_Bath_124	-	139	-	8
01_Room_124	-	81	-	32
01_Bath_123	-	109	-	12
01_Room_123	-	74	-	42
01_Lift_linen	-	174	-	0
01_Linen	82	-	-	26
01_Stairs_02	-	69	-	82
01_Corridor	-	95	-	133
01_Room_101	-	83	-	31
01_Bath_101	-	139	-	8
01_Room_102	-	81	-	32
01_Bath_102	-	139	-	8
01_Bath_103	-	139	-	8
01_Room_103	-	81	-	32
01_Bath_104	-	139	-	8
01_Room_104	-	82	-	32
01_Room_105	-	81	-	32
01_Bath_105	-	139	-	8
01_Bath_106	-	139	-	8
01_Room_106	-	81	-	32
01_Room_107	-	81	-	32
01_Bath_107	-	139	-	8
01_Bath_108	-	139	-	8
01_Room_108	-	81	-	32
01_Room_109	-	82	-	32
01_Bath_109	-	137	-	9
01_Bath_110	-	139	-	8

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01_Room_110	-	81	-	32
01_Room_111	-	81	-	32
01_Bath_111	-	139	-	8
01_Bath_112	-	139	-	8
01_Room_112	-	81	-	32
01_Room_113	-	81	-	32
01_Bath_113	-	139	-	8
01_Bath_114	-	139	-	8
01_Room_114	-	81	-	32
01_Room_115	-	81	-	32
01_Bath_115	-	139	-	8
01_Bath_116	-	139	-	8
01_Room_116	-	81	-	32
01_Room_117	-	81	-	32
01_Bath_117	-	139	-	8
01_Bath_118	-	109	-	12
01_Room_118	-	75	-	41
01_Room_119	-	78	-	29
01_Bath_119	-	104	-	13
02_Stairs_01	-	73	-	49
02_Lifts	-	77	-	0
02_Lift lobby	-	79	-	22
02_Bath_221	-	139	-	8
02_Room_221	-	81	-	32
02_Bath_220	-	139	-	8
02_Room_220	-	83	-	31
02_Room_219	-	81	-	32
02_Bath_219	-	139	-	8
02_Bath_237	-	139	-	8
02_Room_237	-	83	-	31
02_Bath_236	-	139	-	8
02_Room_236	-	81	-	32
02_Bath_235	-	139	-	8
02_Room_235	-	81	-	32
02_Bath_234	-	139	-	8
02_Room_234	-	81	-	32
02_Bath_233	-	139	-	8
02_Room_233	-	81	-	32
02_Bath_232	-	139	-	8
02_Room_232	-	81	-	32
02_Bath_231	-	139	-	8
02_Room_231	-	81	-	32
02_Bath_230	-	139	-	8

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
02_Room_230	-	81	-	32
02_Bath_229	-	139	-	8
02_Room_229	-	81	-	32
02_Bath_228	-	139	-	8
02_Room_228	-	81	-	32
02_Bath_227	-	139	-	8
02_Room_227	-	81	-	32
02_Bath_226	-	139	-	8
02_Room_226	-	81	-	32
02_Bath_225	-	139	-	8
02_Room_225	-	81	-	32
02_Bath_224	-	139	-	8
02_Room_224	-	81	-	32
02_Bath_223	-	139	-	8
02_Room_223	-	81	-	32
02_Bath_222	-	109	-	12
02_Room_222	-	74	-	42
02_Lift_linen	-	174	-	0
02_Stairs_02	-	69	-	82
02_Room_201	-	83	-	31
02_Bath_201	-	139	-	8
02_Room_202	-	81	-	32
02_Bath_202	-	139	-	8
02_Bath_203	-	139	-	8
02_Room_203	-	81	-	32
02_Bath_204	-	139	-	8
02_Room_204	-	82	-	32
02_Room_205	-	81	-	32
02_Bath_205	-	139	-	8
02_Bath_206	-	139	-	8
02_Room_206	-	81	-	32
02_Room_207	-	81	-	32
02_Bath_207	-	139	-	8
02_Bath_208	-	139	-	8
02_Room_208	-	81	-	32
02_Room_209	-	82	-	32
02_Bath_209	-	137	-	9
02_Bath_210	-	139	-	8
02_Room_210	-	81	-	32
02_Room_211	-	81	-	32
02_Bath_211	-	139	-	8
02_Bath_212	-	139	-	8
02_Room_212	-	81	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
02_Room_213	-	81	-	32
02_Bath_213	-	139	-	8
02_Bath_214	-	139	-	8
02_Room_214	-	81	-	32
02_Room_215	-	81	-	32
02_Bath_215	-	139	-	8
02_Bath_216	-	139	-	8
02_Room_216	-	81	-	32
02_Room_217	-	81	-	32
02_Bath_217	-	139	-	8
02_Bath_218	-	109	-	12
02_Room_218	-	75	-	41
02_Corridor	-	96	-	128
02_Linen	46	-	-	116
03_Stairs_01	-	73	-	49
03_Lifts	-	77	-	0
03_Lift lobby	-	79	-	22
03_Bath_321	-	139	-	8
03_Room_321	-	81	-	32
03_Bath_320	-	139	-	8
03_Room_320	-	83	-	31
03_Room_319	-	81	-	32
03_Bath_319	-	139	-	8
03_Bath_337	-	139	-	8
03_Room_337	-	83	-	31
03_Bath_336	-	139	-	8
03_Room_336	-	81	-	32
03_Bath_335	-	139	-	8
03_Room_335	-	81	-	32
03_Bath_334	-	139	-	8
03_Room_334	-	81	-	32
03_Bath_333	-	139	-	8
03_Room_333	-	81	-	32
03_Bath_332	-	139	-	8
03_Room_332	-	81	-	32
03_Bath_331	-	139	-	8
03_Room_331	-	81	-	32
03_Bath_330	-	139	-	8
03_Room_330	-	81	-	32
03_Bath_329	-	139	-	8
03_Room_329	-	81	-	32
03_Bath_328	-	139	-	8
03_Room_328	-	81	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
03_Bath_327	-	139	-	8
03_Room_327	-	81	-	32
03_Bath_326	-	139	-	8
03_Room_326	-	81	-	32
03_Bath_325	-	139	-	8
03_Room_325	-	81	-	32
03_Bath_324	-	139	-	8
03_Room_324	-	81	-	32
03_Bath_323	-	139	-	8
03_Room_323	-	81	-	32
03_Bath_322	-	109	-	12
03_Room_322	-	74	-	42
03_Lift_linen	-	174	-	0
03_Stairs_02	-	69	-	82
03_Room_301	-	83	-	31
03_Bath_301	-	139	-	8
03_Room_302	-	81	-	32
03_Bath_302	-	139	-	8
03_Bath_303	-	139	-	8
03_Room_303	-	81	-	32
03_Bath_304	-	139	-	8
03_Room_304	-	82	-	32
03_Room_305	-	81	-	32
03_Bath_305	-	139	-	8
03_Bath_306	-	139	-	8
03_Room_306	-	81	-	32
03_Room_307	-	81	-	32
03_Bath_307	-	139	-	8
03_Bath_308	-	139	-	8
03_Room_308	-	81	-	32
03_Room_309	-	82	-	32
03_Bath_309	-	137	-	9
03_Bath_310	-	139	-	8
03_Room_310	-	81	-	32
03_Room_311	-	81	-	32
03_Bath_311	-	139	-	8
03_Bath_312	-	139	-	8
03_Room_312	-	81	-	32
03_Room_313	-	81	-	32
03_Bath_313	-	139	-	8
03_Bath_314	-	139	-	8
03_Room_314	-	81	-	32
03_Room_315	-	81	-	32

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
03_Bath_315	-	139	-	8
03_Bath_316	-	139	-	8
03_Room_316	-	81	-	32
03_Room_317	-	81	-	32
03_Bath_317	-	139	-	8
03_Bath_318	-	109	-	12
03_Room_318	-	75	-	41
03_Corridor	-	96	-	128
03_Linen	46	-	-	116
04_Stairs_01	-	77	-	49
04_Lifts	-	81	-	0
04_Lift lobby	-	84	-	22
04_Bath_421	-	155	-	8
04_Room_421	-	86	-	32
04_Bath_420	-	155	-	8
04_Room_420	-	88	-	31
04_Room_419	-	86	-	32
04_Bath_419	-	155	-	8
04_Bath_437	-	155	-	8
04_Room_437	-	88	-	31
04_Bath_436	-	155	-	8
04_Room_436	-	86	-	32
04_Bath_435	-	155	-	8
04_Room_435	-	86	-	32
04_Bath_434	-	155	-	8
04_Room_434	-	86	-	32
04_Bath_433	-	155	-	8
04_Room_433	-	86	-	32
04_Bath_432	-	155	-	8
04_Room_432	-	86	-	32
04_Bath_431	-	155	-	8
04_Room_431	-	86	-	32
04_Bath_430	-	155	-	8
04_Room_430	-	86	-	32
04_Bath_429	-	155	-	8
04_Room_429	-	86	-	32
04_Bath_428	-	155	-	8
04_Room_428	-	86	-	32
04_Bath_427	-	155	-	8
04_Room_427	-	86	-	32
04_Bath_426	-	155	-	8
04_Room_426	-	86	-	32
04_Bath_425	-	155	-	8

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
04_Room_425	-	86	-	32
04_Bath_424	-	155	-	8
04_Room_424	-	86	-	32
04_Bath_423	-	155	-	8
04_Room_423	-	86	-	32
04_Bath_422	-	119	-	12
04_Room_422	-	78	-	42
04_Lift_linen	-	174	-	0
04_Stairs_04	-	71	-	82
04_Room_401	-	88	-	31
04_Bath_401	-	155	-	8
04_Room_402	-	86	-	32
04_Bath_402	-	155	-	8
04_Bath_403	-	155	-	8
04_Room_403	-	86	-	32
04_Bath_404	-	155	-	8
04_Room_404	-	87	-	32
04_Room_405	-	86	-	32
04_Bath_405	-	155	-	8
04_Bath_406	-	155	-	8
04_Room_406	-	86	-	32
04_Room_407	-	86	-	32
04_Bath_407	-	155	-	8
04_Bath_408	-	155	-	8
04_Room_408	-	86	-	32
04_Room_409	-	87	-	32
04_Bath_409	-	153	-	9
04_Bath_410	-	155	-	8
04_Room_410	-	86	-	32
04_Room_411	-	86	-	32
04_Bath_411	-	155	-	8
04_Bath_412	-	155	-	8
04_Room_412	-	86	-	32
04_Room_413	-	86	-	32
04_Bath_413	-	155	-	8
04_Bath_414	-	155	-	8
04_Room_414	-	86	-	32
04_Room_415	-	86	-	32
04_Bath_415	-	155	-	8
04_Bath_416	-	155	-	8
04_Room_416	-	86	-	32
04_Room_417	-	86	-	32
04_Bath_417	-	155	-	8

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
04_Bath_418	-	119	-	12
04_Room_418	-	79	-	41
04_Corridor	-	104	-	128
04_Linen	47	-	-	116

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00_Large Meeting room	NO (-81.2%)	NO
00_Meeting room_01	NO (-80.3%)	NO
00_Flexible conference_02	NO (-40.5%)	NO
00_Meeting room_02	NO (-39.2%)	NO
00_Meeting room_03	NO (-39.5%)	NO
00_Toilet_female	NO (-46.2%)	NO
00_Toilet_disable	N/A	N/A
00_Toilet_male	NO (-68.1%)	NO
00_Kitchen	NO (-62.8%)	NO
00_Changing_male	NO (-52.4%)	NO
00_Changing_female	NO (-53.9%)	NO
00_Staff dining	NO (-53.9%)	NO
00_Managers office	NO (-53.9%)	NO
00_Office	NO (-53.5%)	NO
00_Restaurant	YES (+8.7%)	NO
00_Bar	NO (-2.6%)	NO
00_Reception	NO (-82.1%)	NO
00_Flexible conference_01	NO (-61.4%)	NO
00_Meeting room_04	NO (-53.8%)	NO
00_Linen store	N/A	N/A
01_Bath_122	N/A	N/A
01_Room_122	NO (-27%)	NO
01_Bath_121	N/A	N/A
01_Room_121	NO (-27.8%)	NO
01_Room_120	NO (-68.8%)	NO
01_Bath_120	N/A	N/A
01_Bath_138	N/A	N/A
01_Room_138	NO (-68.1%)	NO
01_Bath_137	N/A	N/A
01_Room_137	NO (-28.2%)	NO
01_Bath_136	N/A	N/A
01_Room_136	NO (-28.2%)	NO
01_Bath_135	N/A	N/A
01_Room_135	NO (-28.2%)	NO
01_Bath_134	N/A	N/A
01_Room_134	NO (-28.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Bath_133	N/A	N/A
01_Room_133	NO (-28.2%)	NO
01_Bath_132	N/A	N/A
01_Room_132	NO (-28.2%)	NO
01_Bath_131	N/A	N/A
01_Room_131	NO (-50.2%)	NO
01_Bath_130	N/A	N/A
01_Room_130	NO (-50.2%)	NO
01_Bath_129	N/A	N/A
01_Room_129	NO (-50.2%)	NO
01_Bath_128	N/A	N/A
01_Room_128	NO (-50.2%)	NO
01_Bath_127	N/A	N/A
01_Room_127	NO (-50.2%)	NO
01_Bath_126	N/A	N/A
01_Room_126	NO (-50.2%)	NO
01_Bath_125	N/A	N/A
01_Room_125	NO (-50.2%)	NO
01_Bath_124	N/A	N/A
01_Room_124	NO (-50.8%)	NO
01_Bath_123	N/A	N/A
01_Room_123	NO (-63.7%)	NO
01_Room_101	NO (-76%)	NO
01_Bath_101	N/A	N/A
01_Room_102	NO (-45.5%)	NO
01_Bath_102	N/A	N/A
01_Bath_103	N/A	N/A
01_Room_103	NO (-45.6%)	NO
01_Bath_104	N/A	N/A
01_Room_104	NO (-58.3%)	NO
01_Room_105	NO (-49.1%)	NO
01_Bath_105	N/A	N/A
01_Bath_106	N/A	N/A
01_Room_106	NO (-46.5%)	NO
01_Room_107	NO (-45.8%)	NO
01_Bath_107	N/A	N/A
01_Bath_108	N/A	N/A
01_Room_108	NO (-45.5%)	NO
01_Room_109	NO (-45.5%)	NO
01_Bath_109	N/A	N/A
01_Bath_110	N/A	N/A
01_Room_110	NO (-45.5%)	NO
01_Room_111	NO (-45.5%)	NO
01_Bath_111	N/A	N/A
01_Bath_112	N/A	N/A
01_Room_112	NO (-45.5%)	NO
01_Room_113	NO (-45.5%)	NO
01_Bath_113	N/A	N/A
01_Bath_114	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
01_Room_114	NO (-45.5%)	NO
01_Room_115	NO (-45.5%)	NO
01_Bath_115	N/A	N/A
01_Bath_116	N/A	N/A
01_Room_116	NO (-45.5%)	NO
01_Room_117	NO (-45.5%)	NO
01_Bath_117	N/A	N/A
01_Bath_118	N/A	N/A
01_Room_118	NO (-58.4%)	NO
01_Room_119	NO (-55.3%)	NO
01_Bath_119	N/A	N/A
02_Bath_221	N/A	N/A
02_Room_221	NO (-27%)	NO
02_Bath_220	N/A	N/A
02_Room_220	NO (-27.7%)	NO
02_Room_219	NO (-68.7%)	NO
02_Bath_219	N/A	N/A
02_Bath_237	N/A	N/A
02_Room_237	NO (-68.1%)	NO
02_Bath_236	N/A	N/A
02_Room_236	NO (-28.2%)	NO
02_Bath_235	N/A	N/A
02_Room_235	NO (-28.2%)	NO
02_Bath_234	N/A	N/A
02_Room_234	NO (-28.2%)	NO
02_Bath_233	N/A	N/A
02_Room_233	NO (-28.2%)	NO
02_Bath_232	N/A	N/A
02_Room_232	NO (-28.2%)	NO
02_Bath_231	N/A	N/A
02_Room_231	NO (-28.2%)	NO
02_Bath_230	N/A	N/A
02_Room_230	NO (-28.2%)	NO
02_Bath_229	N/A	N/A
02_Room_229	NO (-28.2%)	NO
02_Bath_228	N/A	N/A
02_Room_228	NO (-28.2%)	NO
02_Bath_227	N/A	N/A
02_Room_227	NO (-28.2%)	NO
02_Bath_226	N/A	N/A
02_Room_226	NO (-28.2%)	NO
02_Bath_225	N/A	N/A
02_Room_225	NO (-28.2%)	NO
02_Bath_224	N/A	N/A
02_Room_224	NO (-28.2%)	NO
02_Bath_223	N/A	N/A
02_Room_223	NO (-29.1%)	NO
02_Bath_222	N/A	N/A
02_Room_222	NO (-47.7%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02_Room_201	NO (-75.7%)	NO
02_Bath_201	N/A	N/A
02_Room_202	NO (-45.5%)	NO
02_Bath_202	N/A	N/A
02_Bath_203	N/A	N/A
02_Room_203	NO (-45.6%)	NO
02_Bath_204	N/A	N/A
02_Room_204	NO (-58.3%)	NO
02_Room_205	NO (-49.1%)	NO
02_Bath_205	N/A	N/A
02_Bath_206	N/A	N/A
02_Room_206	NO (-46.3%)	NO
02_Room_207	NO (-45.7%)	NO
02_Bath_207	N/A	N/A
02_Bath_208	N/A	N/A
02_Room_208	NO (-45.5%)	NO
02_Room_209	NO (-45.5%)	NO
02_Bath_209	N/A	N/A
02_Bath_210	N/A	N/A
02_Room_210	NO (-45.5%)	NO
02_Room_211	NO (-45.5%)	NO
02_Bath_211	N/A	N/A
02_Bath_212	N/A	N/A
02_Room_212	NO (-45.5%)	NO
02_Room_213	NO (-45.5%)	NO
02_Bath_213	N/A	N/A
02_Bath_214	N/A	N/A
02_Room_214	NO (-45.5%)	NO
02_Room_215	NO (-45.5%)	NO
02_Bath_215	N/A	N/A
02_Bath_216	N/A	N/A
02_Room_216	NO (-45.5%)	NO
02_Room_217	NO (-45.5%)	NO
02_Bath_217	N/A	N/A
02_Bath_218	N/A	N/A
02_Room_218	NO (-58.4%)	NO
03_Bath_321	N/A	N/A
03_Room_321	NO (-10.3%)	NO
03_Bath_320	N/A	N/A
03_Room_320	NO (-10.5%)	NO
03_Room_319	NO (-61.4%)	NO
03_Bath_319	N/A	N/A
03_Bath_337	N/A	N/A
03_Room_337	NO (-60.8%)	NO
03_Bath_336	N/A	N/A
03_Room_336	NO (-11.8%)	NO
03_Bath_335	N/A	N/A
03_Room_335	NO (-11.8%)	NO
03_Bath_334	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03_Room_334	NO (-11.8%)	NO
03_Bath_333	N/A	N/A
03_Room_333	NO (-11.8%)	NO
03_Bath_332	N/A	N/A
03_Room_332	NO (-11.8%)	NO
03_Bath_331	N/A	N/A
03_Room_331	NO (-11.8%)	NO
03_Bath_330	N/A	N/A
03_Room_330	NO (-11.8%)	NO
03_Bath_329	N/A	N/A
03_Room_329	NO (-11.8%)	NO
03_Bath_328	N/A	N/A
03_Room_328	NO (-11.8%)	NO
03_Bath_327	N/A	N/A
03_Room_327	NO (-11.8%)	NO
03_Bath_326	N/A	N/A
03_Room_326	NO (-11.8%)	NO
03_Bath_325	N/A	N/A
03_Room_325	NO (-11.8%)	NO
03_Bath_324	N/A	N/A
03_Room_324	NO (-11.8%)	NO
03_Bath_323	N/A	N/A
03_Room_323	NO (-12.9%)	NO
03_Bath_322	N/A	N/A
03_Room_322	NO (-35.8%)	NO
03_Room_301	NO (-70.2%)	NO
03_Bath_301	N/A	N/A
03_Room_302	NO (-33%)	NO
03_Bath_302	N/A	N/A
03_Bath_303	N/A	N/A
03_Room_303	NO (-33.2%)	NO
03_Bath_304	N/A	N/A
03_Room_304	NO (-48.8%)	NO
03_Room_305	NO (-37.3%)	NO
03_Bath_305	N/A	N/A
03_Bath_306	N/A	N/A
03_Room_306	NO (-33.6%)	NO
03_Room_307	NO (-33.2%)	NO
03_Bath_307	N/A	N/A
03_Bath_308	N/A	N/A
03_Room_308	NO (-33%)	NO
03_Room_309	NO (-33%)	NO
03_Bath_309	N/A	N/A
03_Bath_310	N/A	N/A
03_Room_310	NO (-33%)	NO
03_Room_311	NO (-33%)	NO
03_Bath_311	N/A	N/A
03_Bath_312	N/A	N/A
03_Room_312	NO (-33%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
03_Room_313	NO (-33%)	NO
03_Bath_313	N/A	N/A
03_Bath_314	N/A	N/A
03_Room_314	NO (-33%)	NO
03_Room_315	NO (-33%)	NO
03_Bath_315	N/A	N/A
03_Bath_316	N/A	N/A
03_Room_316	NO (-33%)	NO
03_Room_317	NO (-33%)	NO
03_Bath_317	N/A	N/A
03_Bath_318	N/A	N/A
03_Room_318	NO (-48.9%)	NO
04_Bath_421	N/A	N/A
04_Room_421	NO (-25.3%)	NO
04_Bath_420	N/A	N/A
04_Room_420	NO (-26%)	NO
04_Room_419	NO (-68.5%)	NO
04_Bath_419	N/A	N/A
04_Bath_437	N/A	N/A
04_Room_437	NO (-68.1%)	NO
04_Bath_436	N/A	N/A
04_Room_436	NO (-28.2%)	NO
04_Bath_435	N/A	N/A
04_Room_435	NO (-28.2%)	NO
04_Bath_434	N/A	N/A
04_Room_434	NO (-28.2%)	NO
04_Bath_433	N/A	N/A
04_Room_433	NO (-28.2%)	NO
04_Bath_432	N/A	N/A
04_Room_432	NO (-28.2%)	NO
04_Bath_431	N/A	N/A
04_Room_431	NO (-28.2%)	NO
04_Bath_430	N/A	N/A
04_Room_430	NO (-28.2%)	NO
04_Bath_429	N/A	N/A
04_Room_429	NO (-28.2%)	NO
04_Bath_428	N/A	N/A
04_Room_428	NO (-28.2%)	NO
04_Bath_427	N/A	N/A
04_Room_427	NO (-28.2%)	NO
04_Bath_426	N/A	N/A
04_Room_426	NO (-28.2%)	NO
04_Bath_425	N/A	N/A
04_Room_425	NO (-28.2%)	NO
04_Bath_424	N/A	N/A
04_Room_424	NO (-28.2%)	NO
04_Bath_423	N/A	N/A
04_Room_423	NO (-29%)	NO
04_Bath_422	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04_Room_422	NO (-47.6%)	NO
04_Room_401	NO (-75.7%)	NO
04_Bath_401	N/A	N/A
04_Room_402	NO (-45.5%)	NO
04_Bath_402	N/A	N/A
04_Bath_403	N/A	N/A
04_Room_403	NO (-45.6%)	NO
04_Bath_404	N/A	N/A
04_Room_404	NO (-58.3%)	NO
04_Room_405	NO (-46.9%)	NO
04_Bath_405	N/A	N/A
04_Bath_406	N/A	N/A
04_Room_406	NO (-45.5%)	NO
04_Room_407	NO (-45.5%)	NO
04_Bath_407	N/A	N/A
04_Bath_408	N/A	N/A
04_Room_408	NO (-45.5%)	NO
04_Room_409	NO (-45.5%)	NO
04_Bath_409	N/A	N/A
04_Bath_410	N/A	N/A
04_Room_410	NO (-45.5%)	NO
04_Room_411	NO (-45.5%)	NO
04_Bath_411	N/A	N/A
04_Bath_412	N/A	N/A
04_Room_412	NO (-45.5%)	NO
04_Room_413	NO (-45.5%)	NO
04_Bath_413	N/A	N/A
04_Bath_414	N/A	N/A
04_Room_414	NO (-45.5%)	NO
04_Room_415	NO (-45.5%)	NO
04_Bath_415	N/A	N/A
04_Bath_416	N/A	N/A
04_Room_416	NO (-45.5%)	NO
04_Room_417	NO (-45.5%)	NO
04_Bath_417	N/A	N/A
04_Bath_418	N/A	N/A
04_Room_418	NO (-58.4%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	NO
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
Area [m²]	5203.5	5203.5
External area [m²]	5418.4	5418.4
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	5	3
Average conductance [W/K]	2233.48	2830.98
Average U-value [W/m²K]	0.41	0.52
Alpha value* [%]	10	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	10.13	10.97
Cooling	2.42	3.78
Auxiliary	42.53	33.46
Lighting	9.01	17.36
Hot water	195.67	168.95
Equipment*	27.65	27.65
TOTAL**	233.52	234.52

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	26.24	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	166.31	152.58
Primary energy* [kWh/m²]	386.03	435.21
Total emissions [kg/m²]	61.9	69.7

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	193.1	29.1	13.8	2.1	59.4	3.9	3.93	4.46	5.42
	Notional	150	49.7	16.3	3.6	46.5	2.56	3.79	----	----
[ST] Central heating using air distribution, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	114.4	0	13.5	0	27.1	2.35	0	2.5	0
	Notional	28.2	0	3.1	0	15.7	2.56	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	91	101.1	6.1	7.3	14.6	4.16	3.85	4.46	5.42
	Notional	90.1	171.3	9.8	12.6	11.9	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	27.9	396.5	3.1	45.6	98.6	2.52	2.41	2.7	3.4
	Notional	0.1	632.6	0	46.4	95.9	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	U_{i-Typ}	U_{i-Min}	Surface where the minimum value occurs*
Wall	0.23	0.18	GH000000:Surf[1]
Floor	0.2	0.22	GH000000:Surf[0]
Roof	0.15	0.18	GH000017:Surf[1]
Windows, roof windows, and rooflights	1.5	1.44	GH000000:Surf[2]
Personnel doors	1.5	2.2	GH000010:Surf[4]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	5