

Premier Inn Uxbridge Bedroom Extension Energy Strategy

C9128-TLP-00-XX-XX-BP-100 P05 – Energy Strategy



Project

Premier Inn Uxbridge - Bedroom Extension

Document

Energy Strategy

Client

Premier Inn Hotels Ltd.

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Executive Summary

This Energy Strategy produced by Thornley & Lumb Partnership on behalf of Premier Inn details aspects of sustainable building design relating to energy and carbon emissions of the proposed 40-bedroom London Uxbridge Bedroom Extension development.

The building fabric first design philosophy and efficient building services analysis are combined with the available Low and Zero Carbon (LZC) technology to provide a methodology for achieving a sustainable low energy use development. This process is illustrated by following the Energy Hierarchy which details the measures included at each stage Be Lean, Be Clean, Be Green & Be Seen. The Energy Hierarchy helps qualify the carbon emissions due to various measures by reporting emission reductions at each stage calculated using the Part L 2021 methodology using dynamic simulation modelling software IES VE Compliance DSM.

Be Lean Measures

- Low external envelope U-values
- Low air permeability
- Low energy LED lighting with lighting controls
- Metering connected to BMS with auto monitoring and targeting of energy
- Mechanical ventilation with passive heat recovery (MVHR)

Be Clean Measures

- Same as Be Lean

Be Green Measures

- Air source heat pump (ASHP) providing space heating
- High efficiency air-to-water CO₂ Heat Pump for hot water services (HWS)
- Solar photovoltaic (PV) panels generating on site zero carbon electricity

This Energy Strategy therefore confirms that the overall development's carbon emissions will be reduced **34.5%** below the Part L 2021 baseline, almost meeting the London Plan Target of 35% reduction in carbon emissions. This will equate to a total carbon offset payment of £35,825 over 30 years.

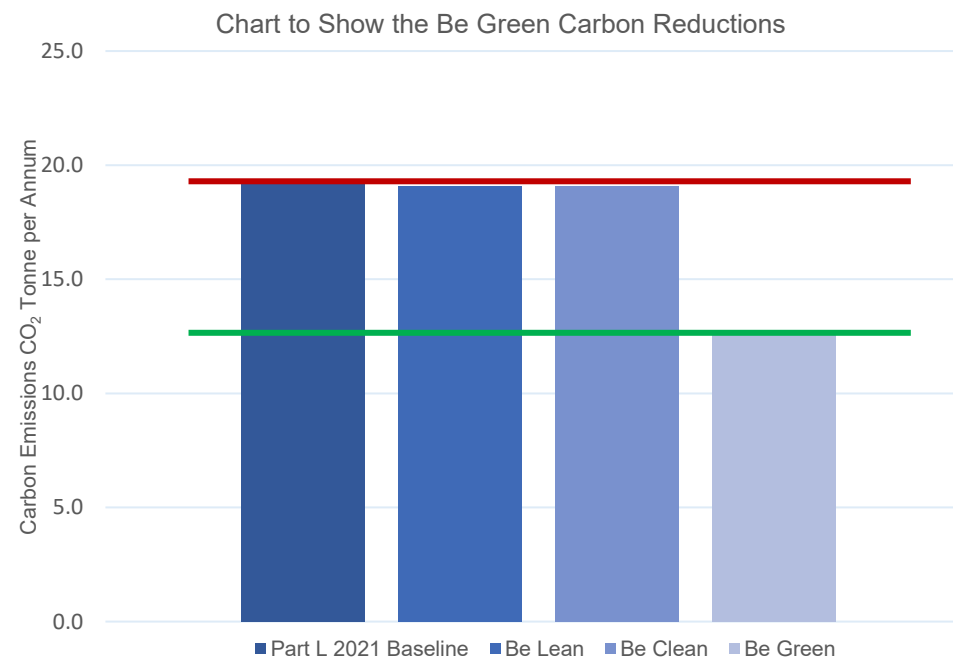


Chart to show the overall carbon reductions of the proposed extension

Carbon Dioxide Emissions Per Annum

	Regulated CO ₂ Tonnes per annum	Unregulated CO ₂ Tonnes per annum
Baseline Part L (2021)	19.2	2.57
Including Be Lean Measures	19.1	2.57
Including Be Clean Measures	19.1	2.57
Including Be Green Measures	12.6	2.57

A Table to show the carbon emissions at each stage of the energy hierarchy.

Carbon Offset	£95 per tonne for 30 years
Residual Carbon Emissions (Be Green)	12.6 tonnes per annum
Carbon Offset Payment	£35,825

A Table to show the carbon offset payment based on Part L 2021 Part L 2021 electricity grid carbon factors.

Regulated Carbon Dioxide Savings Per Annum

	Tonnes CO ₂ Per annum	Percentage Reduction %
Savings from Be Lean Measures	0.10	0.54
Savings from Be Clean Measures	0.00	0.00
Savings from Be Green Measures	6.52	34.2
Reduction Compared to Baseline	6.62	34.5

A Table to show the carbon reduction when using Part L 2021 electricity grid carbon factors.

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1.0 Introduction

The proposed Premier Inn Uxbridge bedroom extension will consist of a three-storey extension for hotel use. The development will involve an extension that provides an additional 40 bedrooms with a refurbished restaurant and associated commercial kitchen area, as well as a plant room and linen store found on the ground floor.

The proposed development will be designed with sustainability as the principal design metric and accordingly this Energy Strategy will detail how energy usage and carbon emissions have been minimised using the energy hierarchy Be Lean Be Clean Be Green as developed by the Greater London Authority (GLA).

The Energy Strategy considers future electricity grid decarbonisation and uses this to influence the proposed design principles.

With the update of building regulations, Part L 2021, the decarbonisation of the Electricity Grid is now reflected in current carbon emissions calculations for Part L within accredited software, and hence grid decarbonisation will be considered when developing this Energy Strategy.

The carbon reductions detailed in this Energy Strategy have been calculated using Part L accredited compliance dynamic simulation modelling (DSM) software IES VE Compliance DSM. This ensures that the proposed development's carbon emissions have been calculated using a more sophisticated carbon calculations methodology, as opposed to the more simplistic standard SBEM methodology.

Accordingly, this Energy Strategy will detail how the proposed development will be a low carbon sustainable development by following the four energy strategy design principles as detailed in Section 1.1 Sustainable Low Carbon Design.

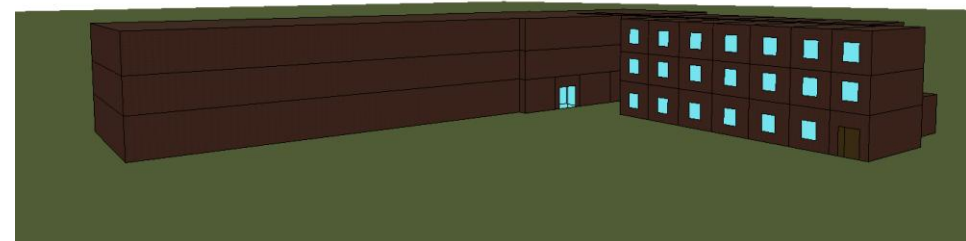
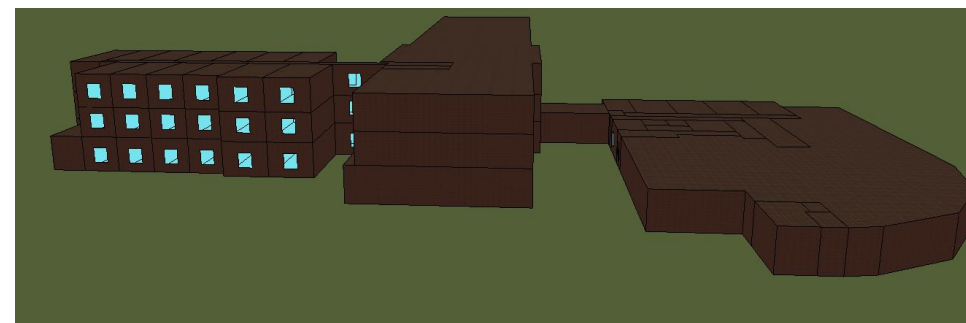


Figure 1.0 - The proposed development building energy model

1.1 Sustainable Low-Carbon Design

Thornley and Lumb will consider the sustainability of the proposed development and the building's energy usage throughout the design process by developing an energy strategy design philosophy. This will consist of four underlying design principles which will be implemented to ensure the sustainability of the proposed development. The principles used to develop the energy strategy are:

- Reduce demand
- Meet demand efficiently
- Supply from low carbon sources
- Supply from renewables.

Energy Strategy Design Principles

Reduce Demand

The energy demand of the building is intrinsically linked to the design of the building envelope and its services. Therefore, ensuring a thermally efficient and relatively air-tight building envelope will enable reduction in energy usage.

Meet Demand Efficiently

The application of building services which improve upon the minimum efficiencies detailed in the government's document the Non-Domestic Building Services Compliance Guide (NDBSCG), will ensure that where energy is used for servicing the building, it is used efficiently with minimal wastage.

Supply from Low Carbon Sources

Where energy is used to service the building, the carbon emissions of the source will be considered as part of the design process. This involves using carbon factors of energy sources to calculate potential carbon emissions.

Supply from Renewable Sources

The further reduction of carbon emissions will be met with energy supply from renewable sources. These are zero carbon energy sources which provide servicing for the building without increasing the carbon emissions of the building.



2.0 Design Considerations

This section discusses the design considerations for the proposed Premier Inn Uxbridge Bedroom Extension. It will detail the design methodology and detail the planning criteria established by national and local policy.

2.1 Design Methodology

The energy usage figures used in this Energy Strategy have all been calculated using industry recognised software. The geometry of the building is modelled in the software and then all fixed building service efficiencies are integrated with the model to provide energy usage figures.

2.1.1 Energy Modelling Software

The IES VE software is a dynamic building simulation modelling (DSM) application which includes industry standard thermal modelling and Part L compliance software.

The dynamic simulation model utilises partial differential equations which are based on first-principles models of conductive, convective, and radiative heat transfer. The equations used in the software are then driven by real weather data, using local climate and weather data for the specific locations. This information is then combined with the proposed building geometry and fixed building services efficiencies to calculate an hourly annual analysis of the building's energy usage.

This dynamic simulation modelling of the building allows the operational energy to be predicted at design stage. Carbon factors are then used to convert this annual operational energy into future carbon emissions of the building.

2.1.2 Carbon Emissions Calculations

Following annual energy rate calculations, the carbon factors for each fuel type then allow for a prediction of the annual carbon emission of the development. This Energy Strategy uses variable carbon factors from Part L 2021, which references Table 29 / Table 30 and Table 31 of the NCM Modelling Guide 2021 edition for Part L 2021 and is detailed in Table 2.0.

	Carbon Factor kgCO ₂ .kWh ⁻¹	Primary Energy kWhPE.kWh ⁻¹
January	0.163	1.602
February	0.160	1.593
March	0.153	1.568
April	0.143	1.53
May	0.132	1.487
June	0.120	1.441
July	0.111	1.410
August	0.112	1.410
September	0.112	1.413
October	0.136	1.449
November	0.151	1.504
December	0.163	1.558

Table 2.0 - Carbon Factor / Primary Energy Table

The carbon factors have changed in recent years due to the increasing amount of zero carbon and renewables generation used to provide grid electricity. In 2022, low and zero carbon electricity generation was 56.1% of total grid electricity.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1174283/UK_Energy_in_Brief_2023.pdf

2.2 National Planning Policy

The National Planning Policy Framework (NPPF) was revised in December 2024. The document details that “the purpose of the planning system is to contribute to the achievement of sustainable development”. Applications for planning permission are determined in accordance with the development plan and local planning policy. Achieving sustainable development means that the planning system has three overarching objectives, which are independent and need to be pursued in mutually supportive ways.

2.2.1 Economic

Contributing to help building a strong, responsive, and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth, innovation, and improved productivity; and by identifying and coordinating the provision of infrastructure.

2.2.2 Social

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

2.2.3 Environmental

Contributing to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

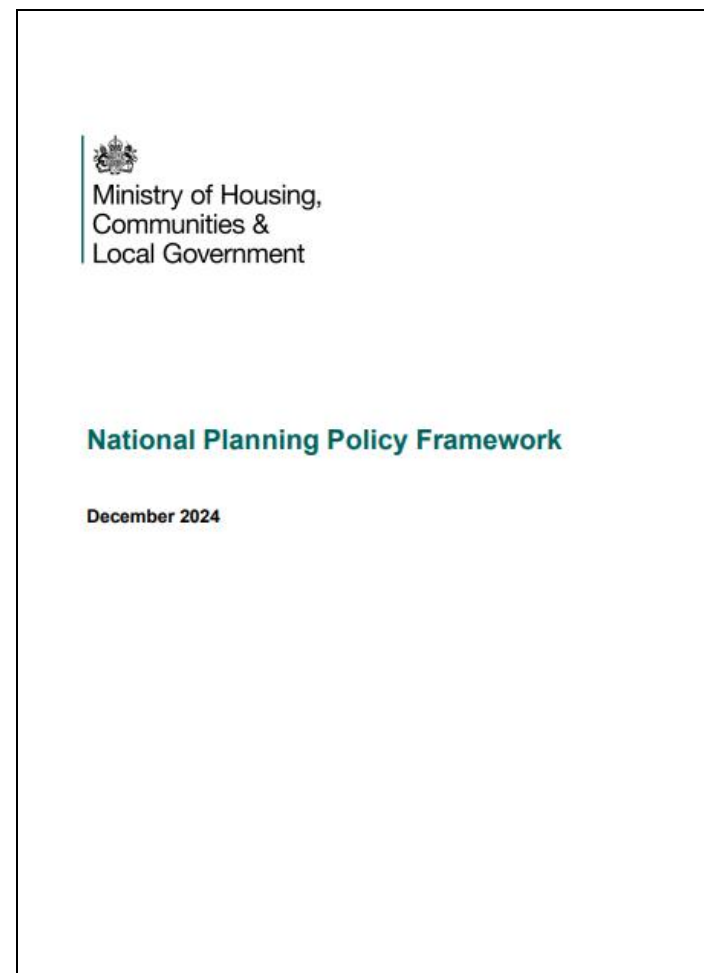
2.2.4 Planning for Climate Change

As well as the three overarching objectives above the National Planning Policy Framework includes a section entitled 'Planning for Climate Change' which states 'Plans should take a proactive approach to mitigating and adapting to climate change...'. New development should be planned for in ways that avoid increased vulnerability to the range of impacts arising from climate change and can help reduce greenhouse gas emissions.

In determining planning applications, local planning authorities should expect new development to comply with any development plan policies on local requirements for decentralised energy supply unless

it can be demonstrated by the applicant that this is not feasible and take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

Local planning authorities should give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic.



2.3 Local Planning Policy

Hillingdon Council adopted the A Vision For 2026 Local Plan in November 2012. It is the key document in Hillingdon's Local Development Framework. The Plan sets out a vision for how Mid Sussex wants to evolve and a delivery strategy for how that will be achieved. The Plan identifies how the borough will guide future development in terms of the right amount and choice of housing, jobs and supporting infrastructure such as schools, health, leisure and community facilities, and also ensuring that our town centres become vibrant, safe and welcoming places.

2.3.1 Policy DMEI 3 – Decentralised Energy

The aim of Policy DMEI 3 outlines all new development aim to improve and maintain the quality of the built environment to create successful and sustainable neighbourhoods. Developments must maximise the opportunities for all new homes to contribute to tackling and adapting to climate change by meeting the following targets:

- All major developments are required to be designed to be able to connect to a Decentralised Energy Network (DEN).
- Major developments located within 500 metres of an existing DEN, and minor new-build developments located within 100 metres, will be required to connect to that network.
- The Council will support the development of DENs and energy centres in principle, subject to meeting the wider policy requirements of this plan and on design and air quality.

2.3.2 Policy EM1 – Climate Change Adaptation and Mitigation

Policy EM1 states that new developments must makes the best use of resources and increases the sustainability of communities within Hillingdon, and its ability to adapt to climate change. The Policy also notes that developments must at least make sure that 20% of energy needs must be provided by renewable sources (or any other targets set by Government). We can confirm that our current design meets the target of 20% from renewable with heat pumps making up 68.7% of the regulated energy load for the extension.



2.4 Local Planning Policy: The London Plan

The mayor states that 'This London Plan is different to those that have gone before it. It is more ambitious and focused than any previous London Plans. The concept of Good Growth, growth that is socially and economically inclusive and environmentally sustainable, underpins the London Plan and ensures that it is focused on sustainable development'.

2.4.1 Policy SI 2 Minimising Greenhouse Gas Emissions

The policy SI 2 demonstrates that the mayor is committed to London being a zero-carbon city with policies aimed as facilitating zero carbon development.

- A. Major development should be net-zero carbon following the Energy Hierarchy Be Lean, Be Clean, Be Green, Be Seen.
- B. Major development proposals should include an Energy Strategy
- C. A minimum on site carbon reduction of 35% below building regulations Part L 2021
- D. Boroughs must establish and administrator a carbon offset fund.
- E. Major development should calculate and minimise carbon emissions from unregulated sources not covered by building regulations
- F. Referable proposals should calculate the whole life-cycle carbon emissions.

MAYOR OF LONDON

THE LONDON PLAN



THE SPATIAL DEVELOPMENT
STRATEGY FOR GREATER LONDON
MARCH 2021

2.5 The London Plan Energy Assessment Guidance

The Mayor of London has updated the Energy Assessment Guidance to reflect the Part L 2021 update to building regulations. The Energy Assessment Guidance details how to meet the London Plan carbon reduction targets and details the calculation methodology.

Be Lean

The Be Lean stage details the reduction of the proposed building's passive design measures relative to the Part L 2021 Baseline. The proposed heating and hot water systems are set to be equivalent to the notional systems. For Part L 2021 for a non-residential building proposing heat pumps, the TER for the Part L 2021 baseline would include heat pumps with 2.86 seasonal generator efficiency for hot water and 2.64 seasonal system coefficient of performance for space heating. The CO2 emission savings increases in performance over the notional value would then be accounted for under the 'be green' element of the energy hierarchy.

Be Clean

The Be Clean stage uses the heating hierarchy to assess the feasibility of CHP or a district heating connection and the use of clean heat sources.

Be Green

The Be Green stage includes all renewables and details how opportunities for producing, storing, and using renewable energy will be maximised.

Be Seen

The be seen stage presents contextual performance data at Planning and As Built stage; then includes measured energy performance data at In Use stage.

MAYOR OF LONDON

Energy Assessment Guidance

Greater London Authority guidance on preparing energy assessments as part of planning applications (June 2022)

3.0 Be Lean: Reducing Energy Demand

Consideration of energy usage is an integral part of any proposed development, and each aspect of the Low Energy Building Design includes methods for conserving energy and promoting sustainability. This section of the Energy Strategy looks at how demand has been reduced by the minimum required efficiency defined by building regulations, known as the 'limiting parameter'. This minimum efficiency or limiting parameter is then compared with the Low Energy Building Design to assess the energy use of the proposed Premier Inn Uxbridge Bedroom Extension.

3.1 Building Envelope and Fabric

The energy usage of a building is intrinsically linked to the efficiency of the building envelope design, accordingly this section details how energy use is minimised by limiting conductive heat loss through following energy strategy design principles in Section 1.1 and using a Passivhaus influenced fabric first design philosophy.

The reduction of conductive heat loss through the building fabric is the most effective method of passively reducing energy usage. This can be achieved by increasing the insulation in floors, walls and roofs whilst also specifying glazing which has a high thermal resistance and by proxy a low U-value.

Building services will be replaced multiple times over the life of the building but it is less likely that the building fabric will be upgraded. Building fabric could potentially remain as built for over sixty years and as such these measures will likely payback multiple times whereas building services will generally need to be replaced much more frequently. Therefore, the reduction of U-values and the adoption of the Passivhaus design philosophy is the most effective method of reducing energy usage and carbon emissions over the full life cycle of the building.

3.1.1 Thermal Properties of Building Fabric

The energy usage of the building services associated with controlling the space temperature is dependent on the building envelope. The efficiency of the building envelope significantly affects energy usage as this is essentially a measure of how efficiently the internal building environment is thermally isolated from the external environment. The more efficient the isolation of internal from external environment, the less energy will be required for use in servicing the internal environment to meet optimum comfort levels.

3.1.2 Thermal Bridging

The proposed development has been designed to use construction details which will limit thermal bridging or cold bridges which have less resistance to heat transfer than the surrounding building envelope. Cold bridges can be the result of interruptions to the insulation in the building envelope. Where these specifically relate to windows and doors etc they are known as non-repeating or linear thermal bridges. A reduction in cold bridges through construction detailing can significantly reduce conductive heat loss through the building envelope.

3.1.3 Proposed Fabric

For this development we propose the following U Values as detailed below in Table 3.1

	Limiting Fabric Parameters W m ⁻² k ⁻¹	Proposed Low Energy Design Parameters W m ⁻² k ⁻¹	Percentage Improvement %
External Walls	0.26	0.15	42
Ground Floor	0.18	0.10	44
Roof	0.18	0.10	44
External Glazing	1.60	1.10	31

Table 3.1 Comparing the limiting fabric from Part L of the 2021 building regulations with the proposed Low Energy Design

3.1.4 Airtightness of Structure

The energy usage of the building services associated with controlling internal environment are heavily dependent on the airtightness of the building, which is essentially a measure of how efficient the building envelope is at resisting ingress of air from the external environment.

All buildings experience external air entering the building due to infiltration which is mainly due to the stack effect resulting for internal air buoyancy or external wind. These phenomena create a pressure differential over the building fabric which can result in infiltration or exfiltration through the building fabric, infiltration of external air can lead to exfiltration of internal conditioned air at another point in the building fabric reducing the ability of the building envelope to retain heat.

Ingress of air from the external environment will need to be conditioned by the building services to ensure the internal environment stays at the optimum level of comfort. Poor air tightness can result in higher operational energy costs and poor thermal comfort. Passivhaus standards specifically target very low air leakage rates associated with air-tight building to ensure operational energy is lowered and thermal comfort is improved.

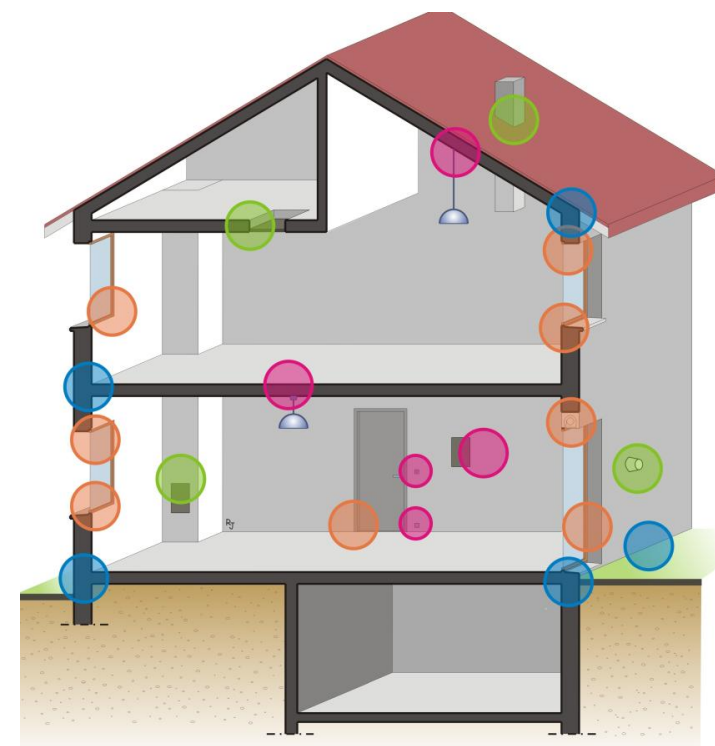
Accordingly, the reduction in air permeability and thereby external air ingress will reduce the demand upon the building services conditioning the area and proportionally reduce energy usage.

3.1.5 Proposed Air Permeability

For this development we propose the following U Values as detailed below in Table 3.2

	Limiting Air Permeability $m^3 hr^{-1} m^{-2}$	Proposed Low Energy Design Permeability $m^3 hr^{-1} m^{-2}$	Percentage Improvement %
Air Permeability	8.0	4.0	50

Table 3.2 Comparing the limiting air permeability from Part L 2021 with the proposed design.



- Junctions between walls and other walls and floors
- Junctions between window frames and wall
- Electrical equipment
- Access doors and other penetrations

Common air leakage pathways indicated on a typical residential development

3.1.6 Mechanical Ventilation

Premier Inn bedrooms will use the Vectaire heat recovery ventilation unit, which ensures the heat remains in the building internal environment, despite bringing in external atmospheric 'fresh' air to improve indoor air quality for the occupants.

The heat recovery unit uses an air-to-air heat exchanger to transfer heat from the internal spaces to the incoming external air. The air paths do not cross and there is no mixing of the air. The heat exchanger enables heat recovery between air streams thereby passively warming the external air and reducing the need for mechanical heating services to use energy to increase the temperature. This can reduce the heating energy required for the building by 80%, reducing waste by ensuring less energy demand is placed on the space heating system. Air handling units use a thermal wheel (also known as a rotary heat exchanger) as an air-to-air heat exchanger. A thermal wheel consists of a circular honeycomb-like matrix of heat-absorbing material, which is rotated within the supply and exhaust streams of an air handling unit.

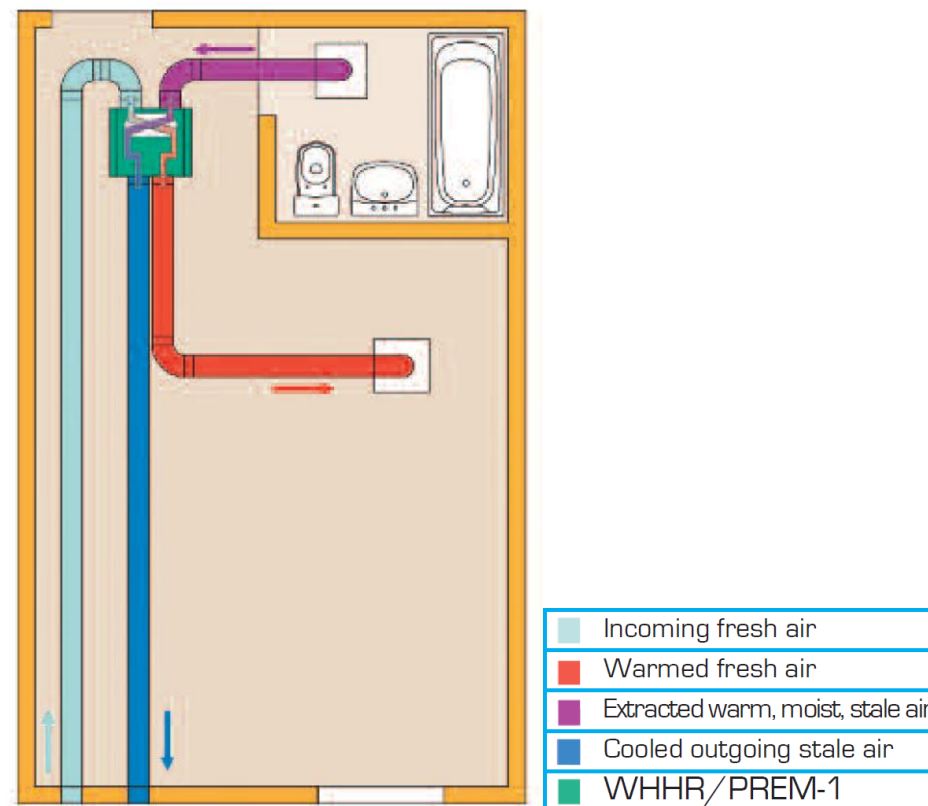
The Specific Fan Power (SFP) of the heat recovery ventilation unit is a measure of how efficiently the unit can supply air to the space. This consists of a ratio of electrical absorbed power to volumetric airflow rate, creating the specific fan power metric in which a lower number is more efficient.

3.1.7 Proposed Ventilation SFPs

For this development we propose the following SFPs as detailed below in Table 3.3

	Part L Limiting Values	Low Energy Design	Percentage Improvement %
Specific Fan Power (SFP) $W l^{-1} s^{-1}$	1.90	1.10	42
Heat Recovery Efficiency %	50	80	60

Table 3.3 Comparing the limiting ventilation efficiencies with the proposed Design.



A standard bedroom combined with a heat recovery ventilation unit.

3.1.8 Low Energy Lighting & Control

The energy required to illuminate the spaces of the development can be minimised by using low energy LED light fittings. These will minimise the energy and carbon emission used in artificial lighting. The artificial lighting has also been designed to incorporate lighting controls which will ensure that no electricity used for artificial lighting is wasted. This will ensure that carbon emissions are not created unnecessarily and that the building is a sustainable development.

The lighting controls

- Bedroom bathrooms – on / off control
- Circulation – Auto on / off control
- Plant – on / off control
- Store – Auto on / off control
- Toilet – Auto on / off control
- Reception – Auto on / off control
- Glass Wash – Auto on / off control
- Linen – Auto on / off control
- Bar – on / off control
- Shower – on / off control

3.1.9 Proposed Lighting Efficiency

For this development we propose the following lighting efficiency as detailed below in Table 3.4

	Limiting Lumens per Circuit Watt Lm.W ⁻¹	Low Energy Design Value Lm.W ⁻¹	Percentage Improvement %
Lighting Efficiency	95	110	16

Table 3.4 Comparing the limiting lighting efficiency with the proposed Low Energy Design Value



4.0 Be Clean: Analysis of Decentralised Energy

Decentralising the energy supply is important for high density developments, where the per flat or apartment application of renewable and LZC technology may have practical restrictions or offer poor lifecycle costs. The annual carbon emissions are dependent on the energy sources of the district energy scheme and each development's annual carbon emissions calculations are required to determine whether decentralised energy or grid electricity would produce lower carbon emissions.

4.1 Heat Distribution Network

Figure 4.1 shows the location of the site in relation to proposed and existing heat networks on the Heat Networks Planning Database Interactive Map. The Premier Inn Uxbridge Bedroom Extension development is located to the South of Uxbridge at coordinates 51.54240,-0.49020 situated on Riverside Way just off the A4007.

The location of the development is encircled in blue on Figure 4.1. Typically, the Heat Networks Planning Database Interactive Map is marked with various dots which denote the location of proposed and existing heat networks across the UK, the energy source for these Heat Networks are determined by the colour of dot shown on the Interactive Map.

As Figure 4.1 shows, there are not any proposed or existing heat networks near or around Uxbridge, let alone close enough to the development to viably facilitate a connection. However, in the future if a suitable heat network were established a connection to the development may be feasible. This feasibility would need to be investigated in the future, as would the merits of connecting to a heat network compared to utilising the on-site energy generation through low zero carbon technology air source heat pumps.

Facilitating a connection to an off-site air source heat pump network, that may not have the capacity to support the development, could potentially add a high level of cost while achieving the same result as the specified on-site counterpart.

Any future investigation into the feasibility of a connection to a network should give the appropriate weight to the energy source of the heat network in question, with particular thought given to NOx emissions caused by CHP units

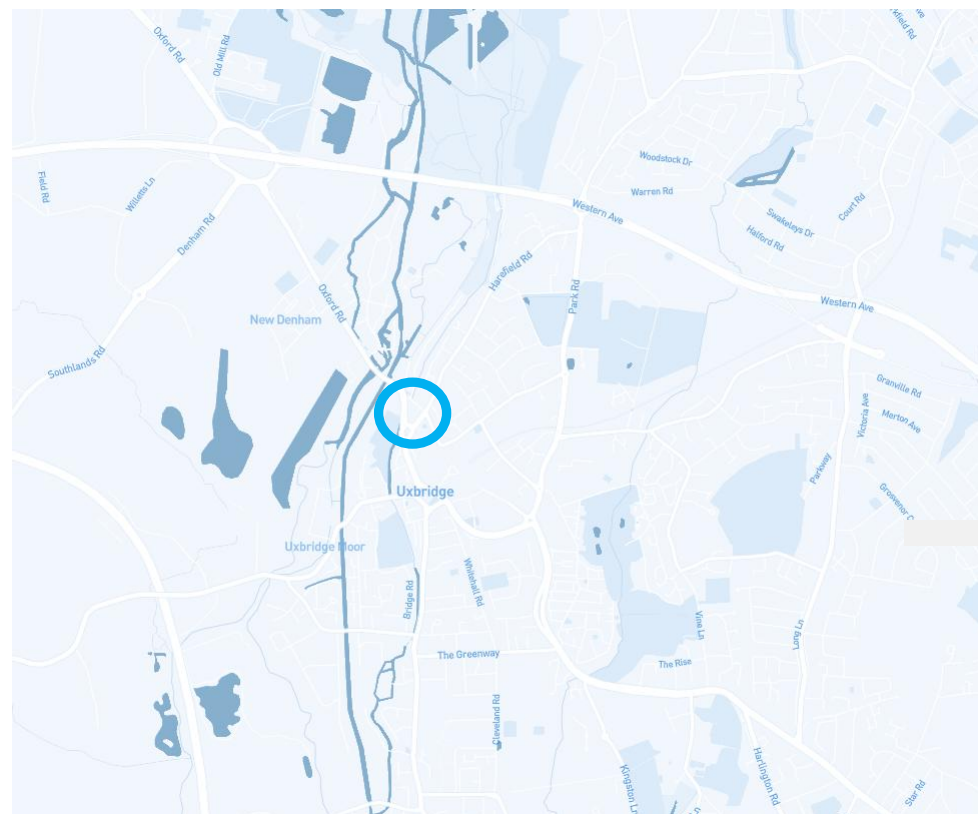


Figure 4.1 Location of the development on the Heat Networks Planning Database Interactive Map

5.0 Be Green: Analysis of Renewable Technology

5.1 Analysis of Available Renewable Technology

The available renewable technology which will be considered for the proposed Premier Inn Uxbridge Bedroom Extension is detailed in the table below, along with potential benefits and any foreseeable issues. This table (Table 5.1) is provided to give a visual overview of the appropriate renewable technology and hence determine suitable renewable technology.

Technology Type	Description of Technology	Potential Benefits	Potential Issues	Valid for Application
PV Panels (Photovoltaic)	<p>Photovoltaic solar arrays use solar radiation to create electricity, using a similar process to photosynthesis.</p> <p>Electrons are freed from atoms and the subsequent flow of electrons results in electric current.</p>	<p>Zero carbon emissions, 100% renewable technology</p> <p>Potential income via the SEG scheme</p> <p>Relatively maintenance free as no moving parts</p> <p>Visual impact can be low as can be placed out of sight.</p> <p>Noise free operation</p>	<p>Panels should face south and have sufficient angle to maximise capture</p> <p>Shadowing and detritus can lower performance over time</p> <p>Structure must be able to accommodate the weight of the panels.</p> <p>Roof access required for cleaning panels</p>	<p>Yes (Valid but not recommended)</p>
Wind Turbine Generation	<p>Wind turbines installed on or around the building can generate renewable electricity.</p> <p>This process utilises the kinetic energy of the wind to drive electricity generating alternators.</p>	<p>Zero carbon emissions, 100% renewable technology</p> <p>Potential income via the SEG scheme</p>	<p>Visual impact potentially high due to ideal location of installation</p> <p>Potential planning issues</p> <p>Air turbulence generates a significant amount of noise</p> <p>May require an impact assessment for feasibility</p>	<p>No (Not valid for development)</p>
Solar Thermal Solar water heating	<p>Solar thermal installations use solar radiation to heat water.</p> <p>Evacuated tubes are installed in an area of maximum solar radiation. The heat is then transferred to the water and the heated water is then used to supplement the hot water requirement of the building.</p>	<p>Zero carbon emissions, 100% renewable technology</p> <p>Relatively low maintenance as few moving parts</p> <p>Visual impact can be low as can be placed out of sight.</p> <p>Noise free operation</p>	<p>Tubes should face south and have sufficient angle to maximise capture</p> <p>Shadowing can affect energy generation performance</p> <p>The structure of the building must be able to accommodate the weight of the filled tubes.</p> <p>More benefit seen during the summer months</p>	<p>Yes (Valid but not recommended)</p>
Air Source Heat Pump (ASHP) Hot Water Heating	<p>Air source heat pumps transfer low grade thermal energy in the atmosphere for use in heating spaces or water heating.</p>	<p>Efficient operation utilising the low-grade heat in the atmosphere.</p> <p>Proven and reliable technology</p>	<p>Potential for leak of refrigerant with high GWP relative to CO₂</p> <p>Specialist maintained due to refrigerant handling laws</p> <p>External condenser fans create noise.</p>	<p>Yes (Valid and recommended)</p>

Technology Type	Description of Technology	Potential Benefits	Potential Issues	Valid for Application
Air Source Heat Pump (ASHP) Space Heating	Air source heat pumps transfer low grade thermal energy in the atmosphere for use in heating spaces or water heating.	Efficient operation utilising the low-grade heat in the atmosphere. Proven and reliable technology	Potential for leak of refrigerant with high GWP relative to CO ₂ Specialist maintained due to refrigerant handling laws External condenser fans create noise.	Yes (Valid and recommended)
Ground Source Heat Pump (GSHP) Hot Water and Space Heating	Ground source heat pumps use the Earth as a heat sink and transfer low grade thermal energy from the ground for use in the building. This energy can then be used for space heating/cooling or water heating.	Efficient operation utilising low grade heat in the ground Noise free operation	Ground survey required to determine feasibility of installation.	No (Not valid for this site)
(C)CHP (Cogeneration)	A cogeneration plant is a combustion engine using natural gas or biogas fuel to drive an alternator which produces electricity. The combustion process is cooled using water as a refrigerant. Trigeneration, or combined cooling, heat and power (CCHP), is the process by which waste heat produced by the cogeneration plant is used to generate chilled water for air conditioning or refrigeration, using an absorption chiller to provide this functionality.	Efficient generation of energy, minimising losses. Potential income via the SEG scheme	Need to have sufficient, constant heat, cooling and electrical load Needs to operate for a majority percentage of the year	Yes (Valid but not recommended due carbon factor of grid electricity being significantly lower than gas fired CHP electricity generation and the NOx emissions negative impact on air quality)

Table 5.1 Detailing the Low and Zero carbon technology options available for the proposed development

6.0 Be Seen

The Be Seen Section of the energy hierarchy has been introduced to address the issue of the building performance gap. Part L software includes assumptions and omissions which can be included when using dynamic building simulation software and following the CIBSE TM54 method for evaluating operational energy use at the design stage. Part L models use the assumptions detailed in the National Calculation Methodology NCM and hence should be used as a building comparison tool. In addition, Part L models do not include unregulated energy or small power such as lifts, cooking equipment and home entertainment. Contrarywise CIBSE TM54 methodology models include all unregulated energy equipment and also can be tailored to the real building occupancy profile, equipment profile and gains.

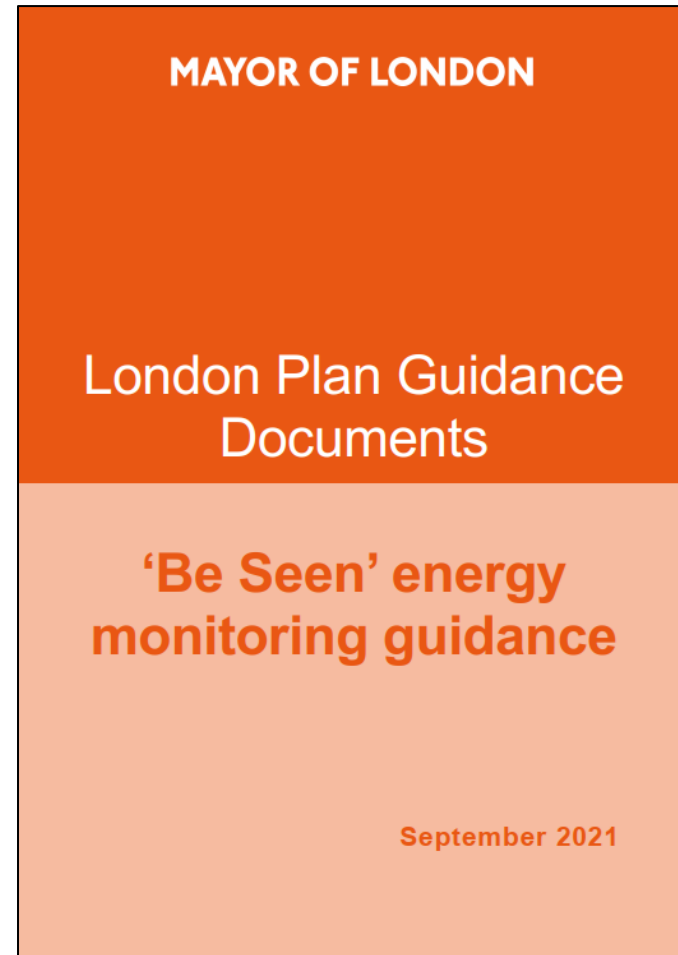
The Be Seen energy monitoring guidance states that for non-residential uses, energy consumption kWh.m⁻² and carbon emissions tonnes CO₂.m⁻² estimates should be informed and then reported using two separate methodologies.

Methodology 1

This Energy Strategy details the energy performance results for the Building Regulations Part L compliant figures. This is in line with London's existing planning approach, these are as per the data included in the GLA's Energy Assessment Guidance.

Methodology 2

Analysis guided by CIBSE TM54, which recommends using a tailored Part L model for the estimates of regulated and unregulated loads, should be undertaken and its findings should be reported in the 'be seen' reporting webform. The TM54 analysis gives more accurate predictions of building's energy use and aligns with the reporting requirements under the GLA's Whole Life-Cycle Carbon (WLC) Assessment.



7.0 Carbon Emissions Reductions Energy

7.1 Low Energy Building Design and Energy Hierarchy

The Low Energy Building Design building and services design process uses the design principles outlined in Section 1.1 to ensure the energy use of the proposed development is as low as possible and that where energy is used, as little as possible is wasted.

The design concepts used in the Low Energy Building Design has taken elements of the Passivhaus fabric first approach to the building design process. This approach significantly lowers the energy demand before the building services are considered in the design process by applying passive zero energy usage measures.

Once the energy use of the building is sufficiently minimised, low energy building services and LZC technology are then utilised in the design. This ensures the carbon targets can be met and that energy needed to provide services and control the building internal environment is minimised.

The energy strategy has shown passive and active carbon reduction measures as part of the low energy building design. The carbon reductions for these measures will now be illustrated using the Energy Hierarchy. The energy hierarchy has been developed by the GLA for The London Plan and helps illustrate carbon reductions throughout each step of the low energy building design process.

The sustainability principles outlined in Section 1.1 are used to drive the low energy design philosophy. The energy hierarchy is used to present and visualise carbon reductions. This is a carbon reduction methodology consisting of three main stages: Be Lean, Be Clean, Be Green which highlight carbon emissions from passive measures through to LZC technology.

Be Lean

The first stage in the energy hierarchy is 'Be Lean' which includes demand reduction measures designed to reduce energy usage passively.

Be Clean

The second stage in the energy hierarchy is 'Be Clean' assessment of clean energy sources district heating and CHP.

Be Green

The third and final stage is the application of renewable energy technologies.



7.2 Establishing Baseline Emissions

The baseline carbon emissions are determined by assessing the proposed development against the building regulations Part L compliance software. The regulated carbon emissions for this project have been calculated using Part L compliance software IES VE 2021 VE Compliance DSM.

This software uses the design information for the proposed development to create a notional 'target building'. The carbon emissions for the notional building are then compared with the actual building's carbon emissions. Accordingly, a compliant development is then deemed to be one which the actual emissions BER is less than or equal to the notional 'target building' carbon emissions TER.

The notional building uses standard building fabric and typical efficiency building services as detailed in the non-domestic building services compliance guide and further details in the national calculation methodology NCM for energy assessment.

The regulated carbon emissions are calculated for Part L compliance while unregulated carbon emissions for small power items like laptops, televisions and chargers are not currently assessed for Part L building regulations compliance. However, for new buildings with a total useful floor area over 1,000m² information handed over to the building owner should include a forecast of the actual energy use of the building. The energy forecast should include all metered energy uses, including unregulated loads.

The baseline carbon emissions are qualified by multiplying the TER generated using Part L compliance software and the floor area of the development. The TER has been calculated using a notional baseline development which includes heating provided by heat pumps. This will provide the baseline metric, for which all additional carbon emissions reductions are calculated against.

The baseline emissions for this building are detailed within Figure 6.1

The proposed baseline carbon emissions

The baseline carbon emission are 19.2 tonnes per annum and detailed in Figure 6.1 below and taken from Table 6.1

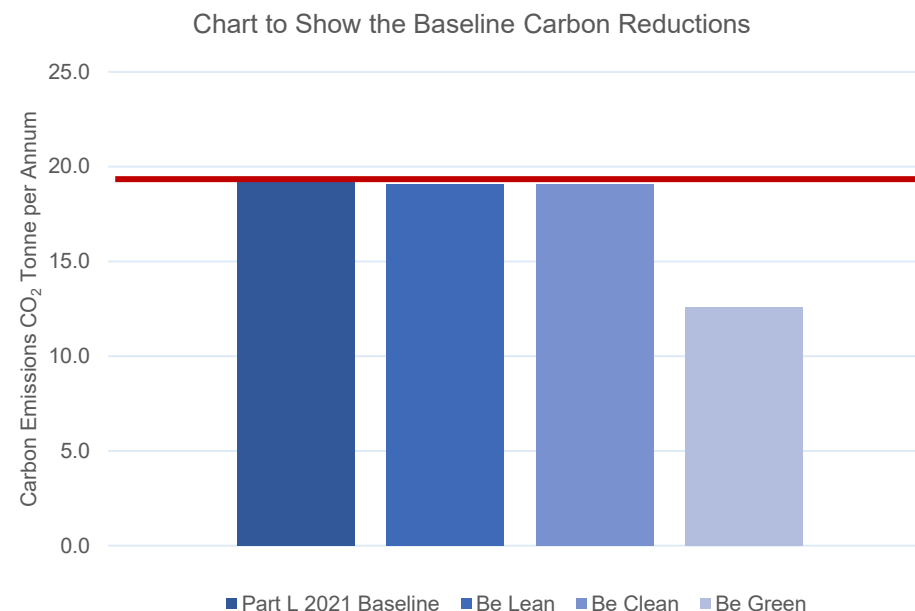


Figure 6.1 The baseline carbon emissions of the proposed development

The red line shows the baseline building carbon emissions TER

7.3 Be Lean

The carbon emissions baseline has been calculated as detailed in Figure 6.1. The Demand reduction phase of the energy hierarchy now uses the measures discussed in Section 3.0 to illustrate the passive measures which have enabled the development to reduce carbon emissions.

The passive measures used in the proposed development are designed to reduce energy demand without using fuel in the process. Passive measures are applied before building services or low and zero carbon technology or renewable energy are applied.

These include passive architectural design measures such as low u-value external element building fabric and low air permeability to reduce air ingress.

Passive heat recovery ventilation can keep heat in the building by recovering heat from the external air using a plate heat exchanger. This heat can then be transferred to the incoming air without mixing of air streams or increase in energy usage of the building.

Low energy LED lighting can reduce energy usage and lighting controls can further reduce energy wastage by only utilising energy for the lighting services when they are needed.

The [Passive Measures](#) included in the development design are summarised below and detailed in Figure 6.2

- Low external envelope U-values
- Low air permeability
- Low energy LED lighting with lighting controls
- Mechanical ventilation with passive heat recovery (MVHR)

The carbon reductions due to the Be Lean measures

Due to the nature of the development the Be Lean measures achieve a carbon reduction of **0.54%** detailed in Figure 6.2 below and taken from Table 6.1

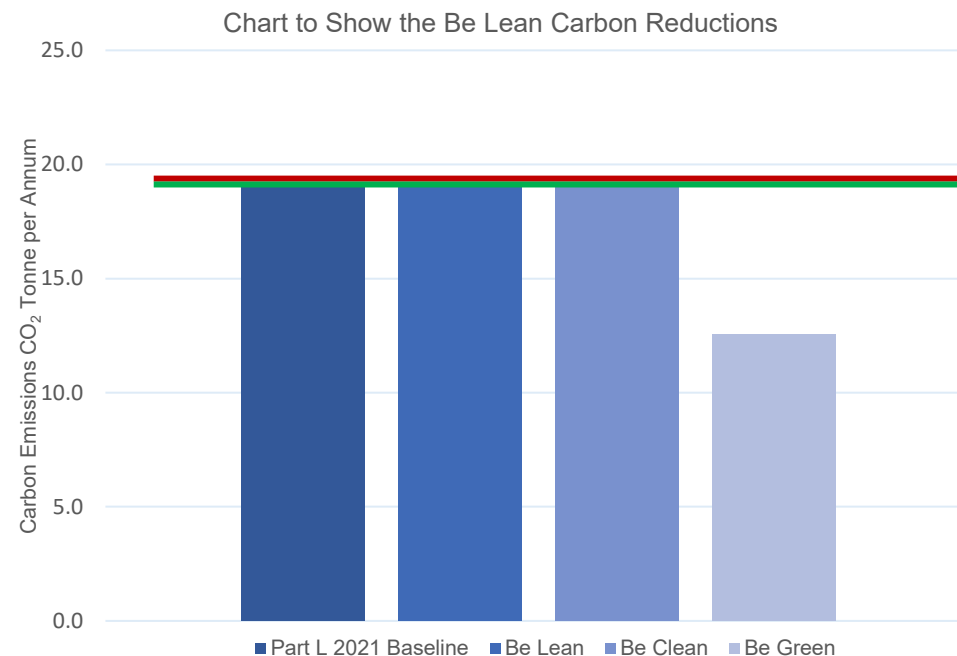


Figure 6.2 The Be Lean carbon emissions reductions of the proposed development

The red line shows the baseline building carbon emissions TER

The green line shows the actual building carbon emissions BER

7.3.1 Demand Reduction Measures

The Demonstrating CO₂ savings from demand reduction measures section of the GLA's Energy Assessment Guidance details metrics which illustrate the Energy Use Intensity EUI and Space Heating Demand.

7.3.2 Reporting Energy Unit Intensity EUI and Space Heating Demand

	Energy Usage Intensity EUI (kWh.m ⁻² .y ⁻¹)	Space Heating Demand (kWh.m ⁻² .y ⁻¹)	Methodology Used	Explanatory Notes
Building Type: Hotel	92.7	2.86	Level 5 Dynamic Simulation Model DSM	The dynamic simulation model has been used to calculate the EUI

7.3.3 Glazed Area Percentage

The glazed area percentage is given below for Premier Inn Uxbridge Bedroom Extension.

	Glazing Percentage
Glazing Percentage	11.0%

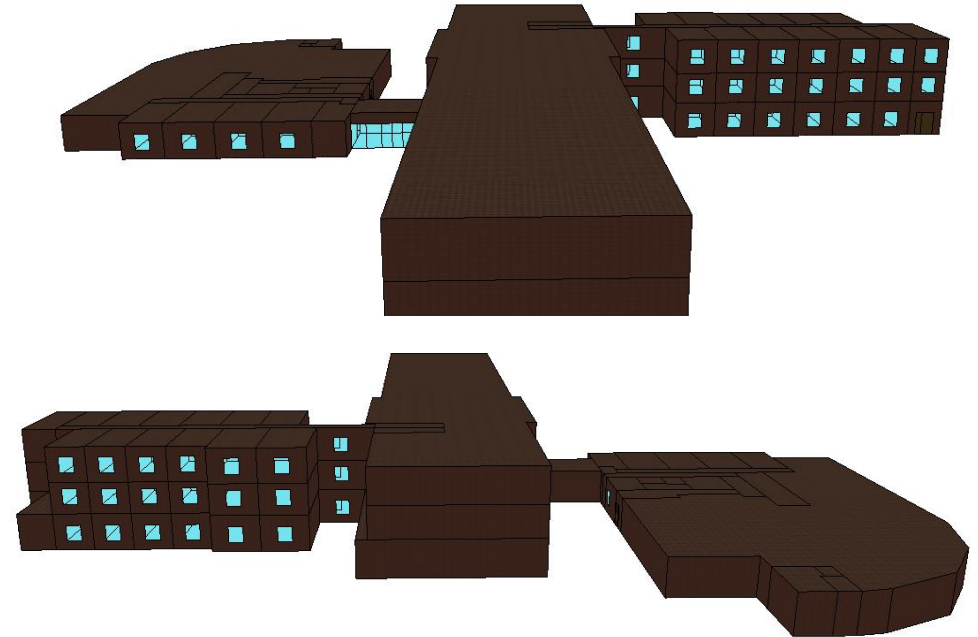


Image to show the building simulation model in IES VE software.

7.4 Cooling and Overheating

The Cooling Hierarchy is detailed with measures below, please see the standalone Overheating Risk Report for the full details on the Overheating risk calculation CIBSE TM52 and Part O.

1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure.

The building has been designed to maximise the effects of external solar shading, there is a significant amount of topographical shading from surrounding developments.

2. Minimise internal heat generation through energy efficient design

Premier Inn bedrooms and communal areas are served by air source heat pump ASHP units providing space heating and cooling. A high efficiency CO₂ air source heat pump ASHP provides hot water services by serving hot water cylinders located in the plant room. As well as the location, the cylinder is well insulated ensuring internal heat gains remain low. Hot water distribution pipework has been designed in a such a way to minimise the amount of distribution pipework present in each bedroom.

3. Manage the heat within the building through exposed internal thermal mass and high ceilings

The management of heat in the building has been achieved with embodied carbon in mind, the construction is designed to be low embodied carbon and low thermal mass.

4. Provide passive ventilation

Premier Inn Uxbridge Bedroom Extension includes natural ventilation via openable windows to manage the risk of overheating.

5. Provide mechanical ventilation

Premier Inn Uxbridge Bedroom Extension bedrooms will have a mechanical ventilation MVHR unit which will provide ventilation and help to improve IAQ as well as contributing to the management of the risk of overheating.

6. Provide active cooling systems

Premier Inn Uxbridge Bedroom Extension bedrooms and several communal areas are served by typical roof mounted indoor air source heat pump units and therefore PI Uxbridge will have an actual and notional cooling demand.

	Area weighted average non-domestic cooling demand (MJ.m ⁻²)	Total area weighted non-domestic cooling demand (MJ.y ⁻¹)
Actual	7.9	8,213
Notional	9.6	10,068

The g-value has been designed at 0.40 to reduce cooling energy.

7.5 Be Clean

The analysis presented in Section 4.0 detailed the availability of heat networks which are currently in the vicinity of the proposed Premier Inn Uxbridge Bedroom Extension.

The feasibility of utilising CHP for providing the hot water services in the proposed development has been assessed at part of the preliminary building services design. CHP can facilitate energy and cost saving by generating heat and power on site in one simultaneous process. The hotel would have a sufficient simultaneous demand for both heating for hot water services HWS and electricity demand of electrical baseload and given the low cost of natural fossil gas, this could provide low running costs. However, UK Electricity Grid decarbonisation is reducing the carbon emissions which previously would be gained from applying CHP as LZC technology.

Utilising on site CHP for reducing carbon emissions was not deemed to be the most appropriate method of meeting the carbon reduction targets, due to minimal carbon reductions and the adverse effect on NOx emissions and hence air quality in the area.

The application of a district heating network will have no effect on local air quality if the development could connect to an existing local network, it is feasible that the hot water services design could be provided by a district heat network. However, the hotel is not situated close enough to an existing heat network which would make connection unfeasible.

There are therefore no carbon reductions between the Be Lean and Be Clean stages of the energy hierarchy and the Energy Strategy will focus on on-site renewable energy generation to facilitate further carbon reductions for the proposed development ie Be Green

The **Be Clean** measures included in the development design are summarised below and detailed in Figure 6.2

- None

The carbon reductions due to the Be Clean measures

As there are no **Be Clean** measures employed there will be 0.0% improvement in the carbon emissions reduction, therefore the carbon reduction emission for Be Lean & Be Clean will remain at 19.1 tonnes per annum a reduction of 0.54% as detailed in Figure 6.3 below and taken from Table 6.1

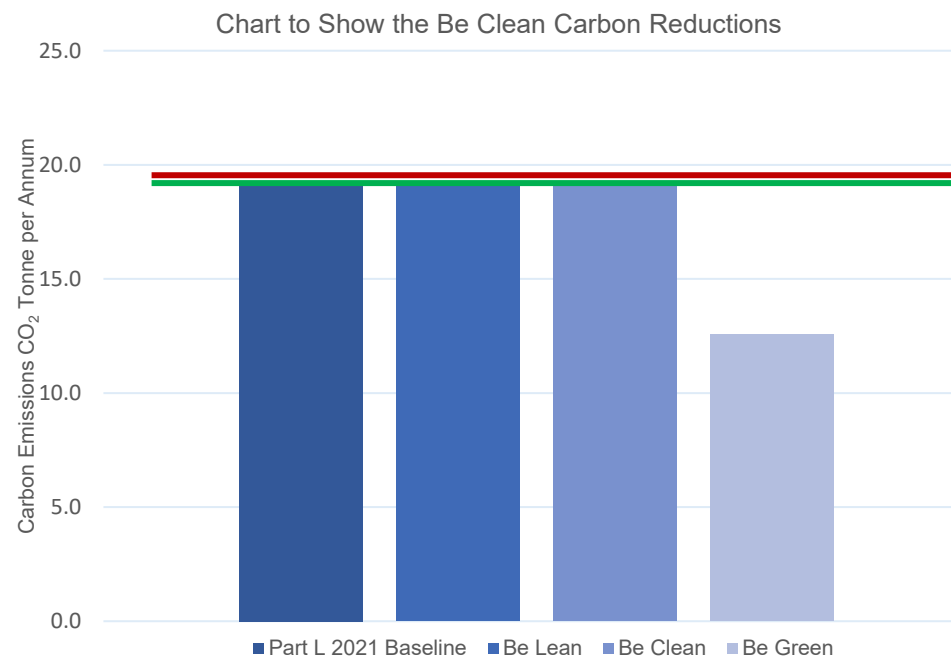


Figure 6.3 The Be Clean carbon emissions reductions of the proposed development

The red line shows the baseline building carbon emissions TER

The green line shows the actual building carbon emissions BER

7.6 Be Green

The final stage of the energy hierarchy utilises renewable technology to further lower the carbon emissions of the development. Given that the measures in the Be Clean stage are unfeasible or would have an adverse effect on the air quality in the area, the carbon emissions reductions have been achieved using measures detailed as part of the Be Green stage of the energy hierarchy.

The building services design for the proposed Premier Inn Uxbridge Bedroom Extension enables a significant reduction in carbon emissions by utilising Heat pumps for HWS and space heating of bedrooms and communal areas.

The application of space heating air source heat pumps (ASHP) will allow space heating system to have efficiencies of 467%, meaning that for every kWh of electricity used, 4.67 kWh of heat energy will be transferred from the external atmosphere into the building for use as space heating. The space heating air source heat pumps will be heat recovery heat pumps which can transfer energy between indoor units. This allows the air source heat pumps to transfer heat to other areas of the building, rather than constantly rejecting it into the external atmosphere. The use of heat recovery ASHP will allow heat transfer between areas of the building which have different activities and or solar gains lowering energy demand.

An air source heat pump ASHP is to provide 100% of the hot water services, this enables a seasonal efficiency 410% using bin weather data. The high seasonal efficiency 4.1 SCOP of the heat pumps ensure that these are the lowest carbon method of providing hot water services. The high efficiency of the air source heat pumps reduces the energy demand for the hot water services, grid electricity usage and operational energy.

As part of the Part L compliance strategy, the calculations incorporate the inclusion of 175m² of photovoltaic (PV) panels installed on-site. These panels significantly contribute to the building's renewable energy generation, thereby reducing reliance on grid electricity. This measure not only lowers the overall carbon footprint of the development but also contributes to long-term reductions in operational energy costs, supporting both environmental sustainability and economic efficiency.

The energy mix of the UK Electricity Grid is currently made up by low carbon sources which supply over 50% of annual electricity generation. Over the lifecycle of the building carbon emissions are expected to be reduced further than detailed in this Energy Strategy as the electricity grid continues to be decarbonised towards a fully net zero carbon UK Electricity Grid which is proposed for 2035.

The **Be Green** measures included in the development design are summarised below and detailed in Figure 6.4 below and taken from Table 6.1

- ASHP Heating
- ASHP Hot Water
- Photovoltaic Panels

The carbon reductions due to the Be Green measures

The **Be Green** measures achieve a further carbon reduction emission to 12.6 tonnes per annum a further reduction of 34.2 % and detailed in Figure 6.4 below and taken from Table 6.1

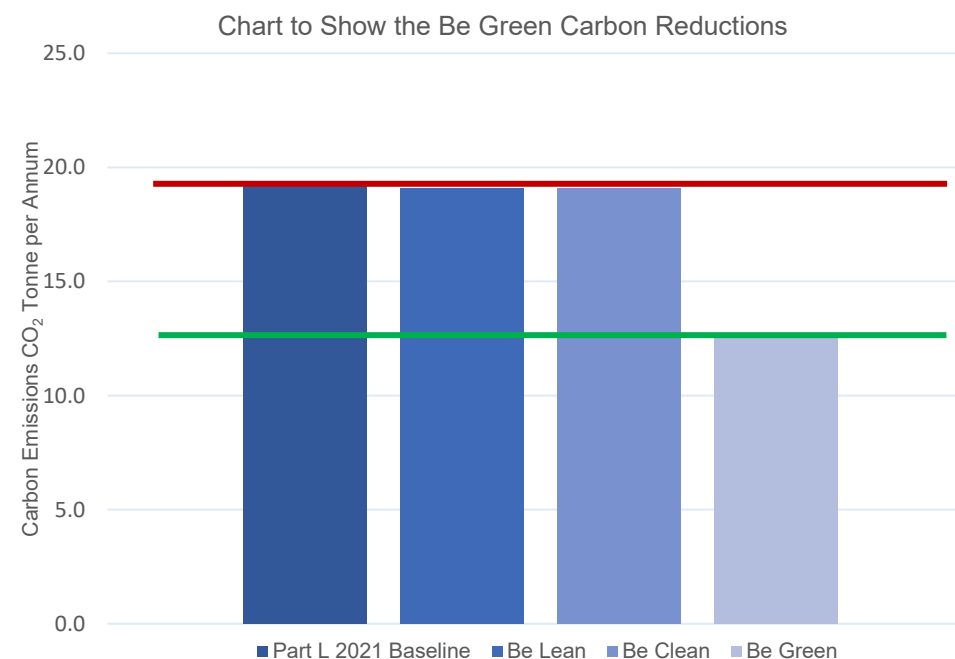


Figure 6.4 The Be Green carbon emissions reductions of the proposed development

The red line shows the baseline building carbon emissions TER
The green line shows the actual building carbon emissions BER



7.7 Overall Carbon Reductions

Carbon Dioxide Emissions Per Annum

	Regulated CO ₂ Tonnes per annum	Unregulated CO ₂ Tonnes per annum
Baseline Part L (2021)	19.2	2.57
Including Be Lean Measures	19.1	2.57
Including Be Clean Measures	19.1	2.57
Including Be Green Measures	12.6	2.57

A Table to show the carbon emissions at each stage of the energy hierarchy.

Carbon Offset	£95 per tonne for 30 years
Residual Carbon Emissions (Be Green)	12.6 tonnes per annum
Carbon Offset Payment	£35,825

A Table to show the carbon offset payment based on Part L 2021 Part L 2021 electricity grid carbon factors.

Regulated Carbon Dioxide Savings Per Annum

	Tonnes CO ₂ Per annum	Percentage Reduction %
Savings from Be Lean Measures	0.10	0.54
Savings from Be Clean Measures	0.00	0.00
Savings from Be Green Measures	6.52	34.2
Reduction Compared to Baseline	6.62	34.5

A Table to show the carbon reduction when using Part L 2021 electricity grid carbon factors.

8.0 Conclusion

The proposed Premier Inn Uxbridge Bedroom Extension development has followed the GLA's Energy Hierarchy to qualify the carbon emissions reduction targets have been met. This process has involved calculation of carbon emissions at each stage of the hierarchy using Part L 2021 approved building simulation software.

The carbon reductions detailed in this Energy Strategy have been calculated using Part L accredited compliance dynamic simulation modelling software IES VE Compliance DSM. This ensures that the proposed development's carbon emissions have been calculated using a more sophisticated carbon calculations methodology, as opposed to the more simplistic SBEM methodology.

The first stage **Be Lean** of the energy hierarchy incorporates the below measures

- Low external envelope U-values
- Low air permeability
- Low energy LED lighting with lighting controls
- Mechanical ventilation with passive heat recovery (MVHR)

The **Be Lean** measures facilitate a carbon reduction of **0.54%**

The **Be Clean** second stage is detailed in Section 7.5.

Third stage **Be Green** of the energy hierarchy includes

- Air source heat pump (ASHP) providing space heating
- Air source heat pump (ASHP) providing space heating for hot water services (HWS)
- Solar photovoltaic (PV) panels generating on site zero carbon electricity

The **Be Green** measures facilitate a carbon reduction of **34.2%**

This Energy Strategy proposes an all-electric building services strategy due to the adverse effect on local air quality proposed by decentralised or on-site combustion building services. Accordingly, this Energy Strategy confirms that the overall development's carbon emissions will be reduced **34.5%** below the Part L 2021 Baseline, almost meeting the London Plan Target of 35% reduction in carbon emissions. This will equate to a total carbon offset payment of £35,825 over 30 years.

The energy hierarchy carbon reduction methodology has minimised energy usage and carbon emissions of the proposed Premier Inn Uxbridge Bedroom Extension development to provide a sustainable low energy building.

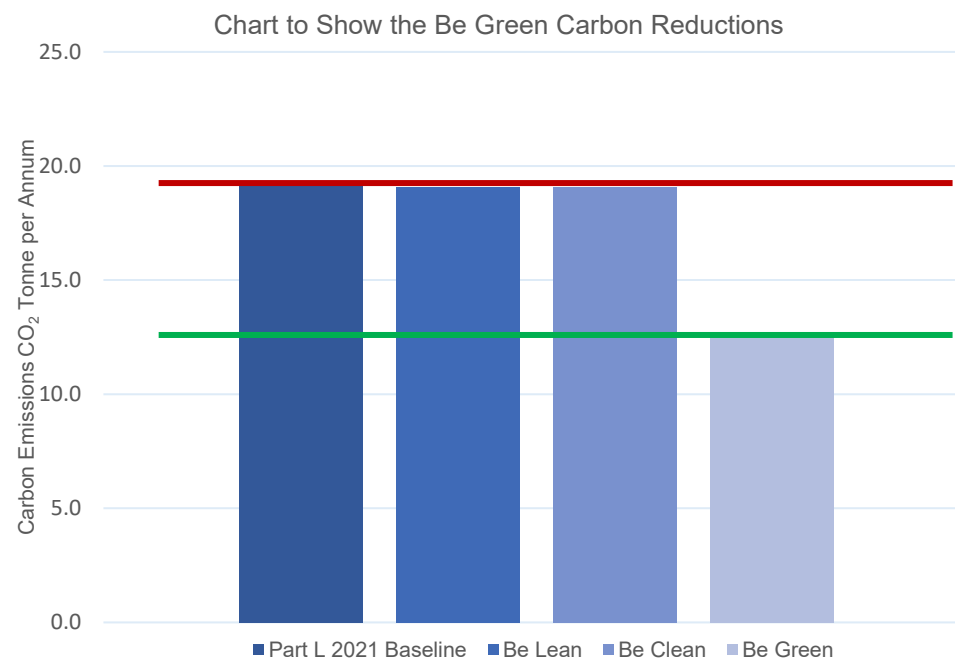


Figure 6.5 As designed carbon emissions reductions of the proposed development

Appendices

[Appendix A Part L BRUKL report 2021 Baseline/Be Lean](#)

[Appendix B Part L BRUKL report 2021 Be Green](#)

[Appendix C Carbon Emissions Reporting Spreadsheet 2022](#)

[Appendix D Indicative PV Layout](#)

[Appendix E ASHP Datasheet Schematic](#)

Project name

C9128 PI London Uxbridge Be Lean

As designed

Date: Thu Jan 08 15:00:22 2026

Administrative information

Building Details

Address: Phase, Uxbridge, UB8 2YF

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.29

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.29

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 347.83The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	13.04
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	12.97
Target primary energy rate (TPER), kWh _{PE} /m ² annum	141.45
Building primary energy rate (BPER), kWh _{PE} /m ² annum	141.1
Do the building's emission and primary energy rates exceed the targets?	BER =< TER BPER =< TPER

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

Fabric element	U _{a-Limit}	U _{a-Calc}	U _{i-Calc}	First surface with maximum value
Walls*	0.26	0.15	0.15	L0000002:Surf[8]
Floors	0.18	0.1	0.1	L0000002:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	L0000002:Surf[1]
Windows** and roof windows	1.6	1.1	1.1	L0000002:Surf[3]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors [^]	1.6	1.22	1.3	L0000009:Surf[2]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

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

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

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

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

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

1- xxxBe Lean Reception: ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.68	3.61	0	1.5	0.8
Standard value	2.5*	N/A	N/A	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- xxxBe Lean Bedroom: ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.68	6.08	0	1.1	0.8
Standard value	2.5*	N/A	N/A	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

3- xxxBe Lean Restaurant: ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.68	5.9	0	1.5	0.8
Standard value	2.5*	N/A	N/A	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- xxxBe Lean Office/Team Room: ASHP

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.68	5.9	0	-	0.8
Standard value	2.5*	5	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.					

1- xxxBe Lean DHW: ASHP

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	2.86	-
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	General luminaire		Display light source	
	Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
L00: Connector Entrance		71	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
L00: Reception		106	110	1.227
L00: Main Entrance		117	-	-
L00: Circulation 4		110	-	-
L00: Linen 1		122	-	-
L00: Acc Wc		176	-	-
L00: Toilet Lobby		197	-	-
L00: Toilet		110	-	-
L00: Circulation 1		129	-	-
L00: Circulation 2		116	-	-
L00: Linen 2		103	-	-
L00: Ensuite - Bedroom		107	-	-
L00: Ensuite - Bedroom		108	-	-
L00: Ensuite - Bedroom		106	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Bar		124	110	1.364
L00: Circulation 3		119	-	-
L00: Glass Wash		117	-	-
L00: BOH Circulation		99	-	-
L00: Bottle Store		98	-	-
L00: Team Room		109	-	-
L00: Staff Shower		151	-	-
L00: Staff Toilet		164	-	-
L00: Staff UA		134	-	-
L00: Plant room		97	-	-
L00: Ensuite - Bedroom		114	-	-
L00: Ensuite - Bedroom		113	-	-
L00: Ensuite - Bedroom		113	-	-
L00: Ensuite - Bedroom		112	-	-
L00: Ensuite - Bedroom		105	-	-
L00: Ensuite - Bedroom		105	-	-
L00: Staircase		111	-	-
L00: Circulation 5		127	-	-
L00: Ensuite - Bedroom		113	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L01: Staircase		105	-	-
L01: Circulation 2		110	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		104	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		107	-	-
L01: Ensuite - Bedroom		101	-	-
L01: Ensuite - Bedroom		101	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Circulation 1		95	-	-
L01: Linen		106	-	-
L02: Staircase		109	-	-
L02: Circulation 2		121	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Ensuite - Bedroom		104	-	-
L02: Ensuite - Bedroom		104	-	-
L02: Ensuite - Bedroom		110	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Circulation 1		102	-	-
L02: Linen		114	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00: Reception	NO (-80.5%)	NO
L00: Ensuite - Bedroom	NO (-68.3%)	NO
L00: Ensuite - Bedroom	NO (-66.9%)	NO
L00: Ensuite - Bedroom	NO (-69.1%)	NO
L00: Ensuite - Bedroom	NO (-78%)	NO
L00: Bar	N/A	N/A
L00: Team Room	NO (-76.7%)	NO
L00: Ensuite - Bedroom	NO (-57.3%)	NO
L00: Ensuite - Bedroom	NO (-58.3%)	NO
L00: Ensuite - Bedroom	NO (-58.3%)	NO
L00: Ensuite - Bedroom	NO (-59.5%)	NO
L00: Ensuite - Bedroom	NO (-87.7%)	NO
L00: Ensuite - Bedroom	NO (-71.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00: Ensuite - Bedroom	NO (-60.1%)	NO
L00: Ensuite - Bedroom	NO (-63.9%)	NO
L00: Ensuite - Bedroom	NO (-63.9%)	NO
L00: Ensuite - Bedroom	NO (-63.9%)	NO
L00: Ensuite - Bedroom	NO (-63.5%)	NO
L00: Ensuite - Bedroom	NO (-86.8%)	NO
L01: Ensuite - Bedroom	NO (-60.1%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-86.7%)	NO
L01: Ensuite - Bedroom	NO (-85.7%)	NO
L01: Ensuite - Bedroom	NO (-71.1%)	NO
L01: Ensuite - Bedroom	NO (-87.7%)	NO
L01: Ensuite - Bedroom	NO (-59.6%)	NO
L01: Ensuite - Bedroom	NO (-58.3%)	NO
L01: Ensuite - Bedroom	NO (-58.3%)	NO
L02: Ensuite - Bedroom	NO (-60.1%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-86.7%)	NO
L02: Ensuite - Bedroom	NO (-85.7%)	NO
L02: Ensuite - Bedroom	NO (-71.1%)	NO
L02: Ensuite - Bedroom	NO (-87.7%)	NO
L02: Ensuite - Bedroom	NO (-59.5%)	NO
L02: Ensuite - Bedroom	NO (-58.3%)	NO
L02: Ensuite - Bedroom	NO (-58.3%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	1471.9	1471.9
External area [m ²]	2458.2	2458.2
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	3
Average conductance [W/K]	399.6	871.71
Average U-value [W/m ² K]	0.16	0.35
Alpha value* [%]	25	10

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

Building Use

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	4.93	7.52
Cooling	1.55	1.9
Auxiliary	10.42	13.1
Lighting	11.62	8.85
Hot water	64.61	64.27
Equipment*	19.73	19.73
TOTAL**	93.13	95.64

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>0</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	60.08	106.84
Primary energy [kWh _{PE} /m ²]	141.1	141.45
Total emissions [kg/m ²]	12.97	13.04

HVAC Systems Performance

System Type	Heat dem MJ/m ²	Cool dem MJ/m ²	Heat con kWh/m ²	Cool con kWh/m ²	Aux con kWh/m ²	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	65.6	10.3	7.5	0.7	9.5	2.44	3.92	2.68	6.08
Notional	114.8	31.3	11.5	1.9	15.5	2.78	4.63	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	178.1	115.8	19.8	7.7	0	2.5	4.19	2.68	5.9
Notional	352.1	129.7	35.2	7.8	0	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	7.9	122.7	0.9	14.8	10.9	2.48	2.3	2.68	3.61
Notional	6.5	142.1	0.6	8.5	10.4	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	42.3	100.5	4.7	7.4	18.5	2.48	3.75	2.68	5.9
Notional	40.2	132.9	4	8	14.7	2.78	4.63	----	----
[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/m ²]	= Heating energy demand
Cool dem [MJ/m ²]	= Cooling energy demand
Heat con [kWh/m ²]	= Heating energy consumption
Cool con [kWh/m ²]	= Cooling energy consumption
Aux con [kWh/m ²]	= 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

Project name

C9128 PI London Uxbridge Be Green

As designed

Date: Thu Jan 08 14:50:50 2026

Administrative information

Building Details

Address: Phase, Uxbridge, UB8 2YF

Certifier details

Name: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.29

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.29

BRUKL compliance module version: v6.1.e.1

Foundation area [m²]: 347.83The CO₂ emission and primary energy rates of the building must not exceed the targets

Target CO ₂ emission rate (TER), kgCO ₂ /m ² annum	13.04
Building CO ₂ emission rate (BER), kgCO ₂ /m ² annum	8.54
Target primary energy rate (TPER), kWh _{PE} /m ² annum	141.45
Building primary energy rate (BPER), kWh _{PE} /m ² annum	91.91
Do the building's emission and primary energy rates exceed the targets?	BER =< TER BPER =< TPER

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

Fabric element	U _a -Limit	U _a -Calc	U _i -Calc	First surface with maximum value
Walls*	0.26	0.15	0.15	L0000002:Surf[8]
Floors	0.18	0.1	0.1	L0000002:Surf[0]
Pitched roofs	0.16	-	-	No pitched roofs in building
Flat roofs	0.18	0.1	0.1	L0000002:Surf[1]
Windows** and roof windows	1.6	1.1	1.1	L0000002:Surf[3]
Rooflights***	2.2	-	-	No roof lights in building
Personnel doors [^]	1.6	1.22	1.3	L0000009:Surf[2]
Vehicle access & similar large doors	1.3	-	-	No vehicle access doors in building
High usage entrance doors	3	-	-	No high usage entrance doors in building

U_a-Limit = Limiting area-weighted average U-values [W/(m²K)]U_i-Calc = Calculated maximum individual element U-values [W/(m²K)]U_a-Calc = Calculated area-weighted average U-values [W/(m²K)]

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

** Display windows and similar glazing are excluded from the U-value check. *** Values for rooflights refer to the horizontal position.

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

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

Air permeability	Limiting standard	This building
m ³ /(h.m ²) at 50 Pa	8	4

Building services

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

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

1- AC Reception: ASHP [SCOP: 4.12, SEER:3.61, EER: 3.61]

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.12	3.61	0	1.5	0.8
Standard value	2.5*	N/A	N/A	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

2- AC Bedroom: ASHP [SCOP: 4.67, SEER:6.08, EER: 5.29]

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.67	6.08	0	1.1	0.8
Standard value	2.5*	N/A	N/A	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

3- AC Restaurant: ASHP [SCOP: 4.05, SEER:5.90, EER: 3.97]

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.05	5.9	0	1.5	0.8
Standard value	2.5*	N/A	N/A	2^	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.					
^ Limiting SFP may be increased by the amounts specified in the Approved Documents if the installation includes particular components.					

4- AC Office/Team Room: ASHP [SCOP: 3.90, SEER:5.90, EER: 3.83]

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.9	5.9	0	-	0.8
Standard value	2.5*	5	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.					

1- HWS: ASHP [SCOP: 4.3]

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	4.3	0.005
Standard value	2*	N/A
* Standard shown is for all types except absorption and gas engine heat pumps.		

"No zones in project where local mechanical ventilation, exhaust, or terminal unit is applicable"

General lighting and display lighting	General luminaire		Display light source	
	Zone name	Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
L00: Connector Entrance		71	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
L00: Reception		106	110	1.227
L00: Main Entrance		117	-	-
L00: Circulation 4		110	-	-
L00: Linen 1		122	-	-
L00: Acc Wc		176	-	-
L00: Toilet Lobby		197	-	-
L00: Toilet		110	-	-
L00: Circulation 1		129	-	-
L00: Circulation 2		116	-	-
L00: Linen 2		103	-	-
L00: Ensuite - Bedroom		107	-	-
L00: Ensuite - Bedroom		108	-	-
L00: Ensuite - Bedroom		106	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Bar		124	110	1.364
L00: Circulation 3		119	-	-
L00: Glass Wash		117	-	-
L00: BOH Circulation		99	-	-
L00: Bottle Store		98	-	-
L00: Team Room		109	-	-
L00: Staff Shower		151	-	-
L00: Staff Toilet		164	-	-
L00: Staff UA		134	-	-
L00: Plant room		97	-	-
L00: Ensuite - Bedroom		114	-	-
L00: Ensuite - Bedroom		113	-	-
L00: Ensuite - Bedroom		113	-	-
L00: Ensuite - Bedroom		112	-	-
L00: Ensuite - Bedroom		105	-	-
L00: Ensuite - Bedroom		105	-	-
L00: Staircase		111	-	-
L00: Circulation 5		127	-	-
L00: Ensuite - Bedroom		113	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L00: Ensuite - Bedroom		110	-	-
L01: Staircase		105	-	-
L01: Circulation 2		110	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		104	-	-

General lighting and display lighting		General luminaire	Display light source	
Zone name		Efficacy [lm/W]	Efficacy [lm/W]	Power density [W/m ²]
	Standard value	95	80	0.3
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		104	-	-
L01: Ensuite - Bedroom		107	-	-
L01: Ensuite - Bedroom		101	-	-
L01: Ensuite - Bedroom		101	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Ensuite - Bedroom		106	-	-
L01: Circulation 1		95	-	-
L01: Linen		106	-	-
L02: Staircase		109	-	-
L02: Circulation 2		121	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		108	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Ensuite - Bedroom		104	-	-
L02: Ensuite - Bedroom		104	-	-
L02: Ensuite - Bedroom		110	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Ensuite - Bedroom		111	-	-
L02: Circulation 1		102	-	-
L02: Linen		114	-	-

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00: Reception	NO (-80.5%)	NO
L00: Ensuite - Bedroom	NO (-68.3%)	NO
L00: Ensuite - Bedroom	NO (-66.9%)	NO
L00: Ensuite - Bedroom	NO (-69.1%)	NO
L00: Ensuite - Bedroom	NO (-78%)	NO
L00: Bar	N/A	N/A
L00: Team Room	NO (-76.7%)	NO
L00: Ensuite - Bedroom	NO (-57.3%)	NO
L00: Ensuite - Bedroom	NO (-58.3%)	NO
L00: Ensuite - Bedroom	NO (-58.3%)	NO
L00: Ensuite - Bedroom	NO (-59.5%)	NO
L00: Ensuite - Bedroom	NO (-87.7%)	NO
L00: Ensuite - Bedroom	NO (-71.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00: Ensuite - Bedroom	NO (-60.1%)	NO
L00: Ensuite - Bedroom	NO (-63.9%)	NO
L00: Ensuite - Bedroom	NO (-63.9%)	NO
L00: Ensuite - Bedroom	NO (-63.9%)	NO
L00: Ensuite - Bedroom	NO (-63.5%)	NO
L00: Ensuite - Bedroom	NO (-86.8%)	NO
L01: Ensuite - Bedroom	NO (-60.1%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-63.9%)	NO
L01: Ensuite - Bedroom	NO (-86.7%)	NO
L01: Ensuite - Bedroom	NO (-85.7%)	NO
L01: Ensuite - Bedroom	NO (-71.1%)	NO
L01: Ensuite - Bedroom	NO (-87.7%)	NO
L01: Ensuite - Bedroom	NO (-59.6%)	NO
L01: Ensuite - Bedroom	NO (-58.3%)	NO
L01: Ensuite - Bedroom	NO (-58.3%)	NO
L02: Ensuite - Bedroom	NO (-60.1%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-63.9%)	NO
L02: Ensuite - Bedroom	NO (-86.7%)	NO
L02: Ensuite - Bedroom	NO (-85.7%)	NO
L02: Ensuite - Bedroom	NO (-71.1%)	NO
L02: Ensuite - Bedroom	NO (-87.7%)	NO
L02: Ensuite - Bedroom	NO (-59.5%)	NO
L02: Ensuite - Bedroom	NO (-58.3%)	NO
L02: Ensuite - Bedroom	NO (-58.3%)	NO

Regulation 25A: Consideration of high efficiency alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Floor area [m ²]	1471.9	1471.9
External area [m ²]	2458.2	2458.2
Weather	LON	LON
Infiltration [m ³ /hm ² @ 50Pa]	4	3
Average conductance [W/K]	399.6	871.71
Average U-value [W/m ² K]	0.16	0.35
Alpha value* [%]	25	10

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

Building Use

% Area Building Type

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.86	7.52
Cooling	1.55	1.9
Auxiliary	11.01	13.1
Lighting	11.62	8.85
Hot water	46	64.27
Equipment*	19.73	19.73
TOTAL**	73.04	95.64

* Energy used by equipment does not count towards the total for consumption or calculating emissions.

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

Energy Production by Technology [kWh/m²]

	Actual	Notional
Photovoltaic systems	12.73	0
Wind turbines	0	0
CHP generators	0	0
Solar thermal systems	0	0
<i>Displaced electricity</i>	<i>12.73</i>	<i>0</i>

Energy & CO₂ Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m ²]	60.08	106.84
Primary energy [kWh _{PE} /m ²]	91.91	141.45
Total emissions [kg/m ²]	8.54	13.04

HVAC Systems Performance

System Type	Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEFF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	65.6	10.3	4.3	0.7	9.5	4.26	3.92	4.67	6.08
Notional	114.8	31.3	11.5	1.9	15.5	2.78	4.63	----	----
[ST] Split or multi-split system, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	178.1	115.8	13.6	7.7	0	3.63	4.19	3.9	5.9
Notional	352.1	129.7	35.2	7.8	0	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	7.9	122.7	0.6	14.8	10.9	3.82	2.3	4.12	3.61
Notional	6.5	142.1	0.6	8.5	10.4	2.78	4.63	----	----
[ST] Variable refrigerant flow, [HS] ASHP, [HFT] Electricity, [CFT] Electricity									
Actual	42.3	100.5	3.1	7.4	18.5	3.75	3.75	4.05	5.9
Notional	40.2	132.9	4	8	14.7	2.78	4.63	----	----
[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

Residential

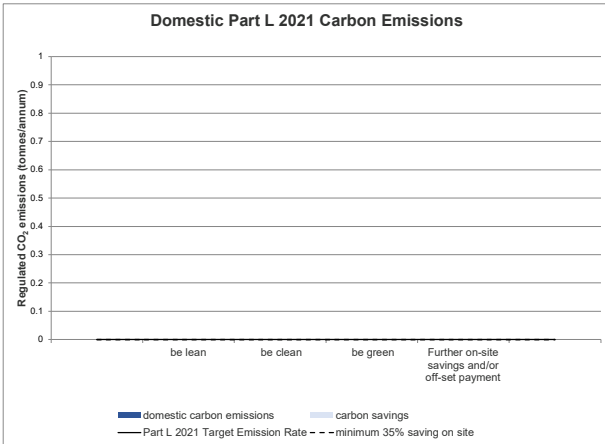
Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for residential buildings

	Carbon Dioxide Emissions for residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	0.0	
After energy demand reduction (be lean)	0.0	
After heat network connection (be clean)	0.0	
After renewable energy (be green)	0.0	

Table 2: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for residential buildings

	Regulated residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.0	0%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	0.0	0%
Cumulative on site savings	0.0	0%
Annual savings from off-set payment	0.0	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	0	-
Cash in-lieu contribution (£)	0	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



Non-residential

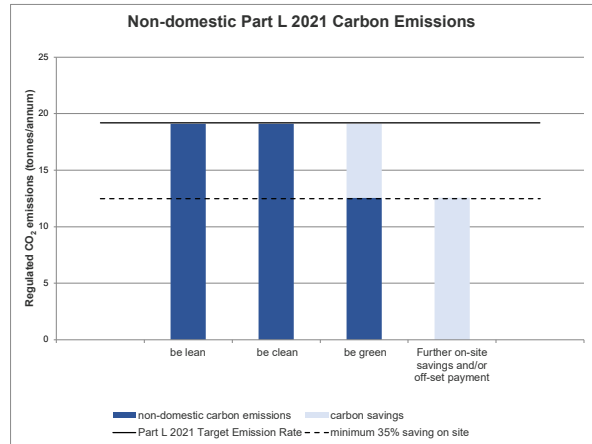
Table 3: Carbon Dioxide Emissions after each stage of the Energy Hierarchy for non-residential buildings

	Carbon Dioxide Emissions for non-residential buildings (Tonnes CO ₂ per annum)	
	Regulated	Unregulated
Baseline: Part L 2021 of the Building Regulations Compliant Development	19.2	2.6
After energy demand reduction (be lean)	19.1	2.6
After heat network connection (be clean)	19.1	2.6
After renewable energy (be green)	12.6	2.6

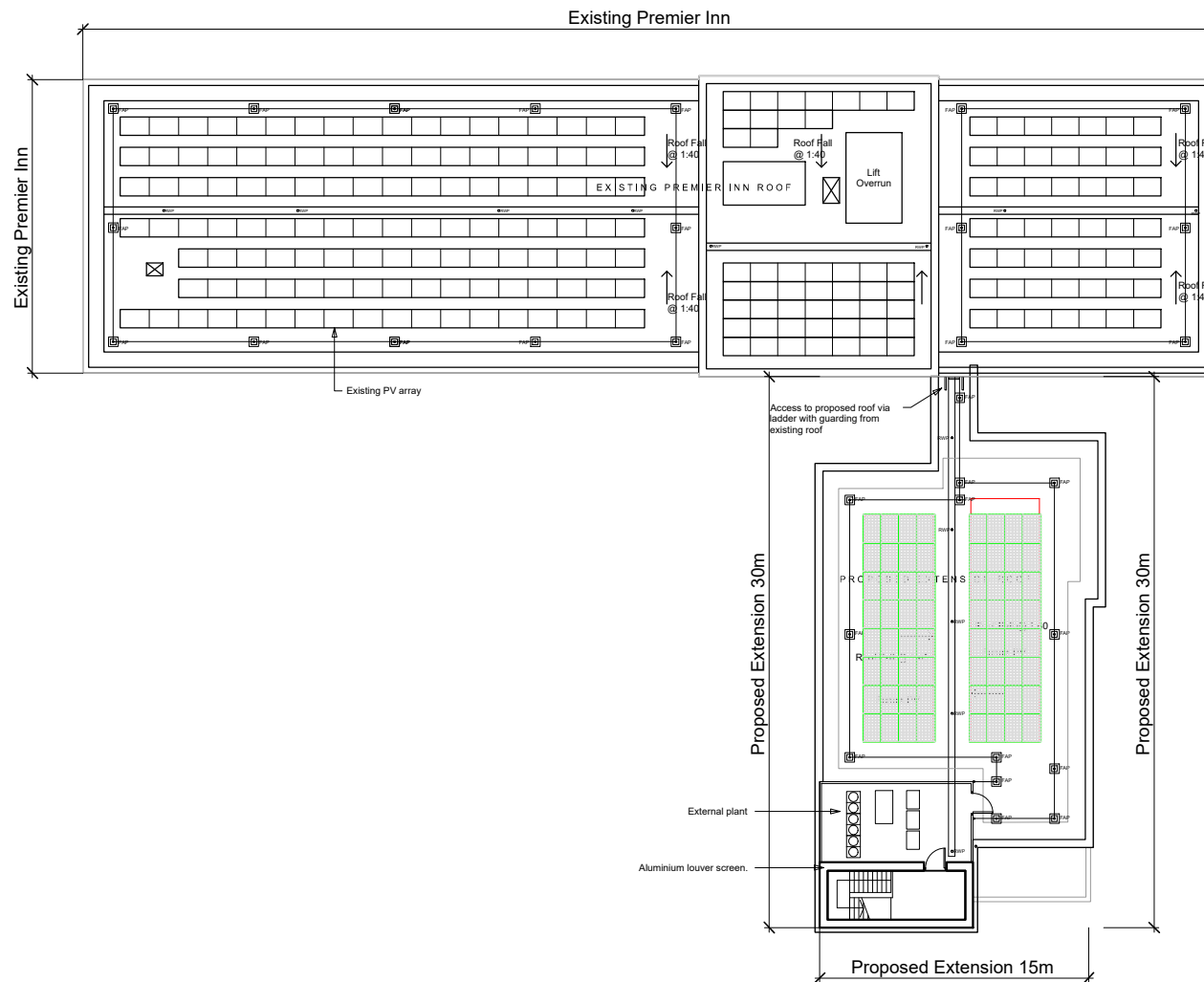
Table 4: Regulated Carbon Dioxide savings from each stage of the Energy Hierarchy for non-residential buildings

	Regulated non-residential carbon dioxide savings	
	(Tonnes CO ₂ per annum)	(%)
Be lean: savings from energy demand reduction	0.1	1%
Be clean: savings from heat network	0.0	0%
Be green: savings from renewable energy	6.5	34%
Total Cumulative Savings	6.6	35%
Annual savings from off-set payment	12.6	-
	(Tonnes CO ₂)	
Cumulative savings for off-set payment	377	-
Cash in-lieu contribution (£)	35,825	

*carbon price is based on GLA recommended price of £95 per tonne of carbon dioxide unless Local Planning Authority price is inputted in the 'Development Information' tab



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Rev	Date	Description	By	CHK
A	19/12/25	Plant area size updated		SC

Address: Addlepool Business Centre
 02nd St George
 Exeter, EX3 0NR
 Tel: 01392 368426
 www.axiomarchitects.co.uk



Client: WHITBREAD GROUP PLC

Project: PREMIER INN LONDON UXBRIDGE
 500 RIVERSIDE WAY
 UXBRIDGE, UB8 2YF

Drawing: Proposed Roof Plan Extension

Scale	Date	Drawn	Checked
1:250@A3	05/12/25	SC	RW

Drawing No. Revision

6505-PL- 114 A

Status: PLANNING

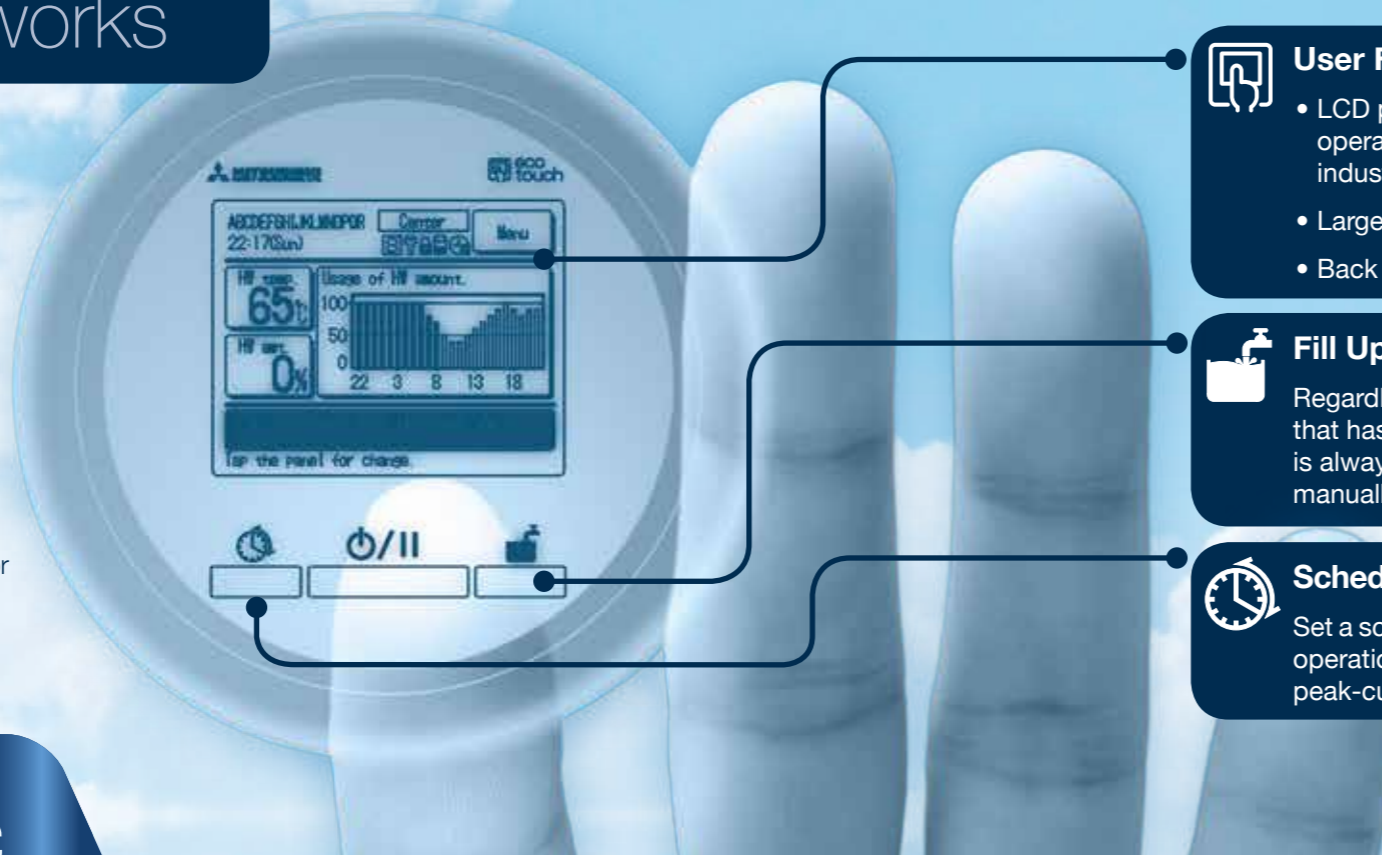


How Q-ton works



Easy operation

- Advanced touch screen remote controller panel.
- Full dot liquid crystal display.
- Allows finely adjusted operation for energy savings.



User Friendly

- LCD panel with light tap operation introduced as the industry's first.
- Large 3.8 inch full dot display.
- Back light function.

Fill Up Operation

Regardless of the setting that has been applied, there is always the functionality to manually refill the tank.

Schedule Setting

Set a schedule such as a weekly operation pattern, day off or a peak-cut timer.

Q-ton absorbs 'free' heat from outdoor air and amplifies it to generate hot water swiftly and efficiently. It generates hot water up to 90°C without the requirement for an additional electric immersion heater.

The **Q-ton** heat pump uses a coil of cold refrigerant that absorbs 'free' heat from the outside air and a 2-stage compressor that puts the refrigerant under high pressure in order to raise its temperature. An on-board heat exchanger uses heat from the refrigerant to generate the sanitary hot water.

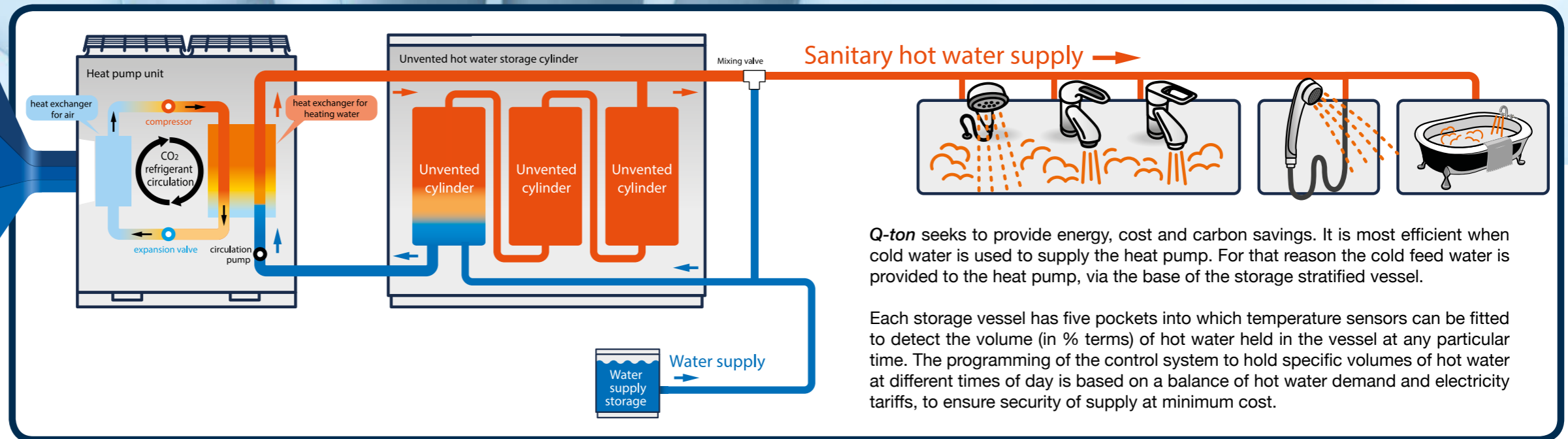
Hot water can be produced during off peak tariff electricity which is then stored in a tank for daytime use. **Q-ton** efficiently produces high-volume hot water using just ambient air heat and a small amount of electricity.

Q-ton is usually used for direct boiler replacement as it controls the water supply and storage temperature as well as the output capacity.

PERFORMANCE
-25°C → 90°C
90°C water supply even in extremely cold regions with temps as low as -25°C

CAPACITY
-7°C → 100
Keeping 100% capacity down to -7°C

EFFICIENCY
COP 4.3
The industry's highest COP level COP4.3 [intermediate season]



Q-ton seeks to provide energy, cost and carbon savings. It is most efficient when cold water is used to supply the heat pump. For that reason the cold feed water is provided to the heat pump, via the base of the storage stratified vessel.

Each storage vessel has five pockets into which temperature sensors can be fitted to detect the volume (in % terms) of hot water held in the vessel at any particular time. The programming of the control system to hold specific volumes of hot water at different times of day is based on a balance of hot water demand and electricity tariffs, to ensure security of supply at minimum cost.

Environmental Credentials

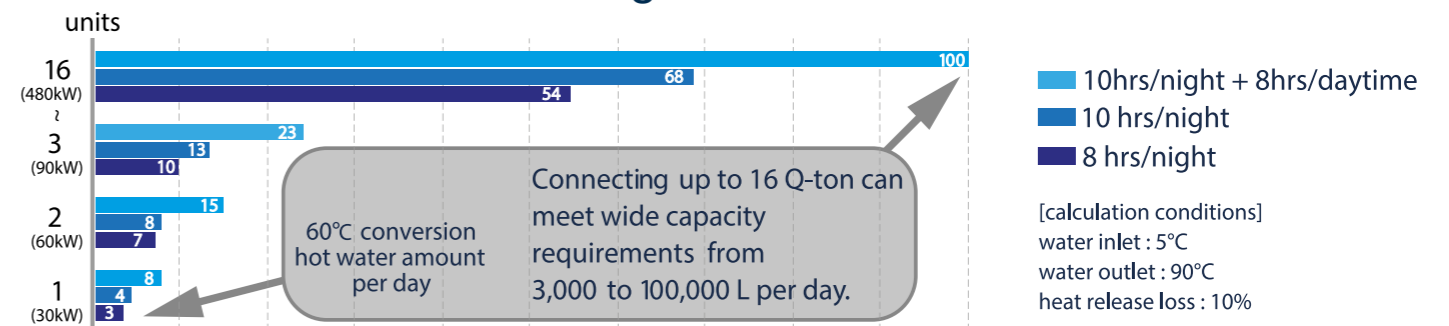
Q-ton heat pumps can be configured as stand-alone units or run with up to 16 units in tandem, providing anything from 3,000 to 100,000 litres of safe hot water daily. Whether single or multiple units are used, the **Q-ton** system is controlled from a single, simple control panel that can be remotely installed for ease of access and operation. **Q-ton** can be installed as a replacement, addition or whole new system, according to your needs.

Refrigerant such as carbon dioxide (R744) preserves the ozone layer (ODP = 0) and has the lowest Global Warming Potential (GWP = 1). **Q-ton** fits extremely well with the latest building regulations reaching the "excellent" mark from BREEAM.



Q-ton meets the stringent requirements of world's foremost environmental assessment method and rating system BREEAM.

Q-ton Sizing Guidance



Connect up to **16 units** with **1 remote control**

Specifications

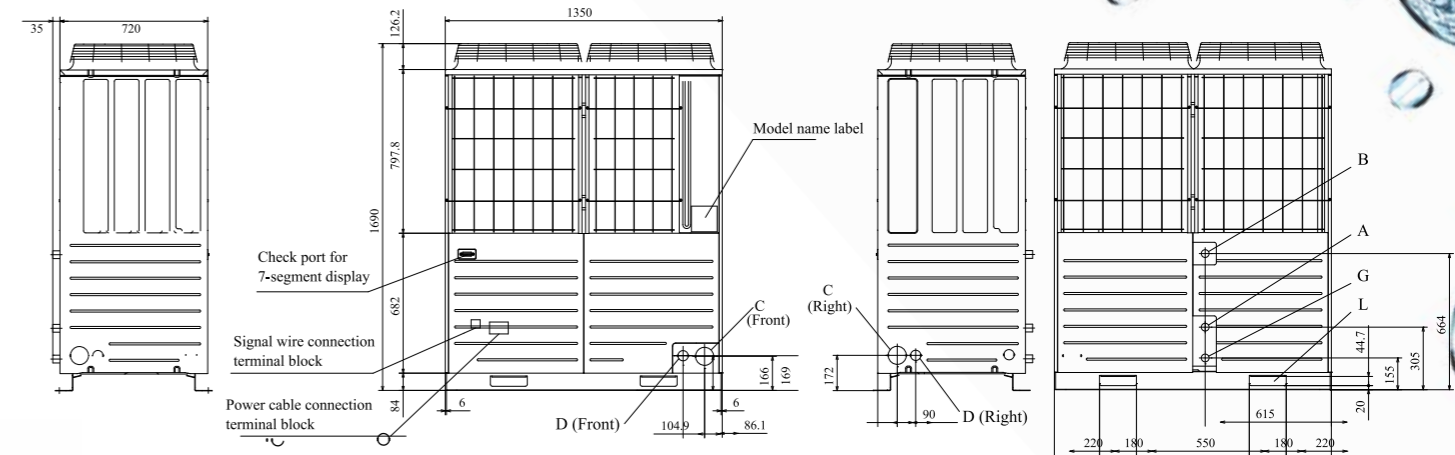
Item	Model	ESA30E-25
Power supply		3-phase 380V ±5%, 400V ±5%, 415V ±5% 50Hz
Operation to top up (In intermediate season)*1	Heating capacity	kW 30
	Water amount	Liter/min 8.97
	Power consumption	kW 6.98
	COP	- 4.3
Operation to top up (In cold region)*2	Heating capacity	kW 30
	Water amount	Liter/min 5.06
	Power consumption	kW 10.73
	COP	- 2.8
Operating sound*3	dB(A)	58
Outside dimension	Height	mm 1,690
	Width	mm 1,350
	Depth	mm 720 + 35 (Water pipe connection)
Current	Max	A 21
	Starting	A 5
Unit weight	kg	375 (During operation 385)
Color		Stucco white (4.2Y7.5/1.1 approx.)
Compressor	Type × Pcs	Hermetic inverter compressor × 1
	Nominal output	kW 6.4
Refrigerant	Type	R744 (CO2)
	Charged amount	kg 8.5
Refrigerant oil	Type	MA68
	Charged volume	cc 1200
Crankcase heater	W	20
Anti-freezing heater	for water pipe	W 48 × 3
	for drain pan	W 40 × 2
	for drain hose	W 40 × 2 + 48
Heat exchanger, Air side		Copper pipe straight fin type
Heat exchanger, Water side(Gas cooler)		Copper pipe coil type
Fan	Type	Axial flow type (direct coupled motor) × 2
	Output × Pcs	W 386 × 2
	Air volume	m ³ /min 260
Water pump	Type × output	Non-self-suction spiral type inverter pump × 100W
	Materials contacting to water	Bronze, SCS13
	Actual pump head	m (kPa) 5m (49kPa) @ 17Liter/min
Usage temp range	Outdoor air temp	°C -25 to +43
	Feed water inlet temp	°C 5-63
	Hot water outlet temp	°C 60-90
Water pressure range	kPa	500 or lower
Defrost		Hot gas type
Vibration and sound proofing devices		Compressor: placed on anti-vibration rubber and wrapped with sound insulation High pressure switch, over current protection, power transistor overheat protection and anomalous high pressure protection
Pipe size	Feed water inlet	Rc3/4 (Copper 20A)
	Hot water outlet	Rc3/4 (Copper 20A)
	Drain water outlet	Rc3/4 (Copper 20A)
Electric wiring	Earth leakage breaker	30A, 30mA, 0.1sec
	Power cable size	□14 × 4 (Length 40m)
	Moulded-case circuit breaker	Rated current: 30A, switch capacity: 30A
	Grounding wire size	M6
	Remote controller wire size	0.3mm ² × 2cores shielding wire (MVVS)
Design pressure	MPa	High pressure: 14.0, Low pressure: 8.5
IP code		IP24

(Note)

- Performance of operation to top up in intermediate season shows the capacity measured under the conditions that outdoor air temp is 16°C DB/12°C WB, water inlet temp is 17°C and hot water outlet temp is 65°C.
- Performance of operation to top up in cold region shows the capacity measured under the conditions that outdoor air temp is -7°C DB/-8°C WB, water inlet temp is 5°C and hot water outlet temp is 90°C excluding heater for anti-freezing water (345W).
- Operating sound shows a value measured at 1m in front of the unit and 1m above the floor in anechoic room where the sound is resonated a little. Accordingly if the unit is installed on actual site, it is normal that the measured sound there is higher than the value shown above, because it is influenced by surrounding noise and echo in the room.
- The actual hot water outlet temp may vary ±3°C from target temp according to the change of outdoor air temp and water inlet temp. And then if feed water inlet temp is 30°C or higher and outdoor air temp is 25°C or higher, hot water outlet temp may be controlled not to increase too high.
- Please use the clean water. The water quality should follow a guideline of JRA-GL. 02:1994.
If the water quality is out of the standard, it may cause troubles such as scale buildup and/or corrosion.
- These articles mentioned above may vary without any notice according to the development status.

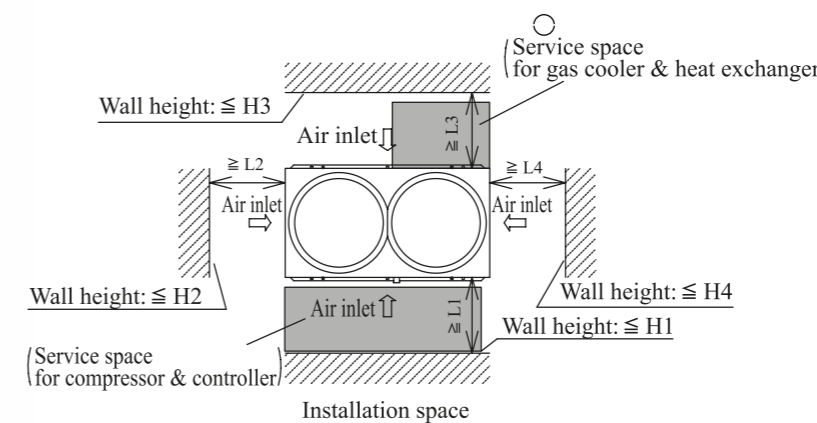
Dimensions

Model : ESA30E



Symbol	Contents	
A	Feed water inlet port	RC3/4 (Copper tube 20A)
B	Hot water outlet port	RC3/4 (Copper tube 20A)
C	Heat pump unit-Tank unit connecting wire outlet port	φ 88 (or φ100)
D	Power cable inlet port	φ 50 (right, front) Long hole 40x80 (bottom)
G	Drain water pipe outlet port	RC3/4 (Copper tube 20A)
L	Hole for carrying in or hanging	180 × 44.7

Installation space (Service space)



Dimension	Installation example	
	1	2
L1	800	800
L2	10	10
L3	800	800
L4	100	500
H1	500	1500
H2	No limit	No limit
H3	1000	1000
H4	No limit	No limit

Note

- Be sure to fix the unit with anchor bolts
- Be sure to keep space above the unit at least 2m
- The connection of water pipes (Feed water inlet, Hot water outlet, Drain water outlet) should be done on site locally.
- The holes for power cable inlet, and connection wire outlet from heat pump unit to tank unit are half-blanked. Therefore please punch out the hole by cutting the residual portion and use it.
- In heavy snow region, please take following measures in order for the air inlet/outlet port and the bottom part of unit not to be covered with snow
 - Place the unit on the rack in order to make the bottom of unit higher than the snow surface.
 - Install a snow prevention hood on the outlet port of the unit.
 - Install the unit at the space under the eaves or the snow prevention roof.
- If ambient temp becomes below 0°C, it may cause break of water pipes and damage on the unit due to freezing. Be sure to apply anti-freezing heater to feed water piping, hot water piping and drain water piping in order to prevent from freezing.
- Be sure to keep enough service spaces of more than 800mm in front of the unit service panel for easy inspection of the unit and replacement of components. When piping work is done, be sure not to interfere the pipes with the unit service space. If the service space cannot be kept, please install the piping below the unit by placing the unit on the rack.



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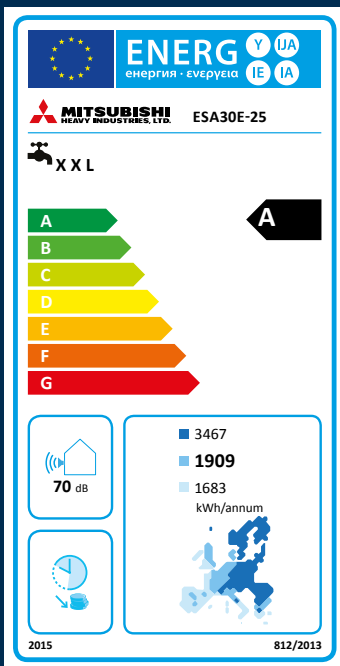
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