Paddington Central

FIVE KINGDOM STREET

ENERGY ASSESSMENT

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ENERGY ASSESSMENT

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ENERGY ASSESSMENT

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	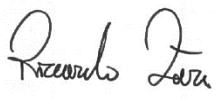	
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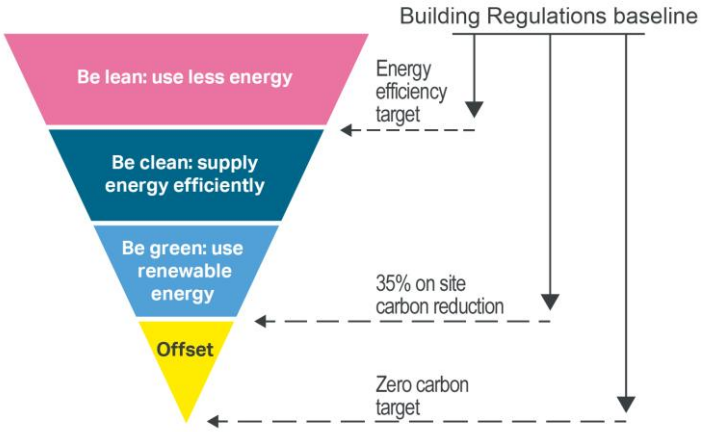
1. EXECUTIVE SUMMARY

This energy assessment statement has been prepared by Ramboll UK in support of the detailed Planning Application for 5 Kingdom Street (5KS) development on behalf of British Land. The development consists of an office building of ground floor with mezzanine + 18 stories + plant, and a three-storey base below Kingdom Street. This 'base' connects to the Kingdom Street basement level, and to the 'Crossrail box' below over two storeys. The gross total general internal area (GIA) of the proposed development is approximately 65,928 m2. This energy strategy includes the assessment of the office block element and retail areas at the podium and basement level of the proposed development, including the Crossrail Box.

The purpose of this Energy Assessment is to show how the operational energy consumption and associated CO2 emissions of the 5 Kingdom Street development have been reduced. The objective is to provide an optimised solution for the proposed development in order to achieve compliance with the Building Regulations and national and regional policies, subject to plot-specific constraints and opportunities.

The 5 Kingdom Street development has been designed to meet the requirements set up in the London Plan (2016) and Westminster City Plan (2016), with regard given to the emerging policies of the Draft New London Plan and draft new Local Plan. An operational performance monitoring role for the heat pump system has also been incorporated following guidance from ongoing correspondence with the GLA, in addition to several other pieces of supplementary information, which have been detailed in Section 3.2.3; GLA Guidance. The regulation and targets applicable to 5 Kingdom Street are listed below:

- Establish the Approved Document Part L 2A 2013 compliant baseline energy demand and associated CO2 emissions
- The design of the building is required to follow the energy hierarchy framework outlined by the Greater London Authority (GLA): Be Lean, Be Clean and Be Green
- The proposed development is to achieve a site-wide 35% reduction over the Part L baseline
- The proposed development is to achieve 15% carbon emission reduction through energy efficiency measures (Be Lean)
- The performance of the heat pump system shall be monitored for three years following completion of construction to ensure it is achieving the expected performance approved during planning
- The proposed development is to comply with Criterion 3: Limiting the effects of solar gains of Part L2A of the English Building Regulations (2013)



Source: Greater London Authority

Figure 1 GLA energy hierarchy

The below energy saving measures have been incorporated as part of the hierarchy:

Be Lean

- Highly efficient building fabric properties applied to 5KS, details provided in section 4. U-values and air permeability are beyond the standards set out in Part L of the Building Regulations 2013
- High-efficiency ventilation with heat recovery is applied in all parts of the proposed development
- Energy efficient light fittings, controls and metering are applied in all parts of the proposed development

Be Clean

- The potential for connection to nearby existing low carbon heat distribution networks was investigated. Based on the information shown by the London Heat Map and attempted communication with Westminster City Council, there are no existing district heating (DH) schemes close enough to the site to make connection feasible. Thus, the strategy of connection to DH networks is discounted from the proposed development.
- An on-site combined heat and power (CHP) option has also been investigated but was not proposed for 5 Kingdom Street development due to the concerns relevant to this technology in combination to low heat demand for the building type. CHP systems are not appropriate for this development for the following reasons:
    - They do not deliver the lowest carbon dioxide emissions, given electrical grid decarbonisation; and
    - They do not help to protect local air quality.

Be Green

- A heating/cooling system comprised of air and water source heat pumps (HP) in combination with hybrid air cooled chillers has been selected to provide heating cooling and domestic hot water (DHW) for the proposed development.

This report presents detailed calculations to estimate the carbon emissions for the scheme as per the GLA guidance on preparing Energy Assessments (October 2018). In this report, the future emission factors (SAP 10) have been used in the assessment, the calculated carbon emission results have been

justified by converting to the future SAP10 emissions factors. See details in section 4.2.3 and Appendix 6.

Energy Hierarchy Results

The tables below provide a summary of the total regulated and unregulated CO_2 emissions, CO_2 emissions savings and the percentage of carbon reduction over the baseline.

The results are also graphically demonstrated in the figure below, which illustrates the estimated regulated CO_2 emissions for the proposed development.

In summary, this Energy Assessment demonstrates that, by following the energy hierarchy, the proposed development has the potential to achieve a reduction from the baseline of **44%** in regulated CO_2 emissions.

Results of the proposed development

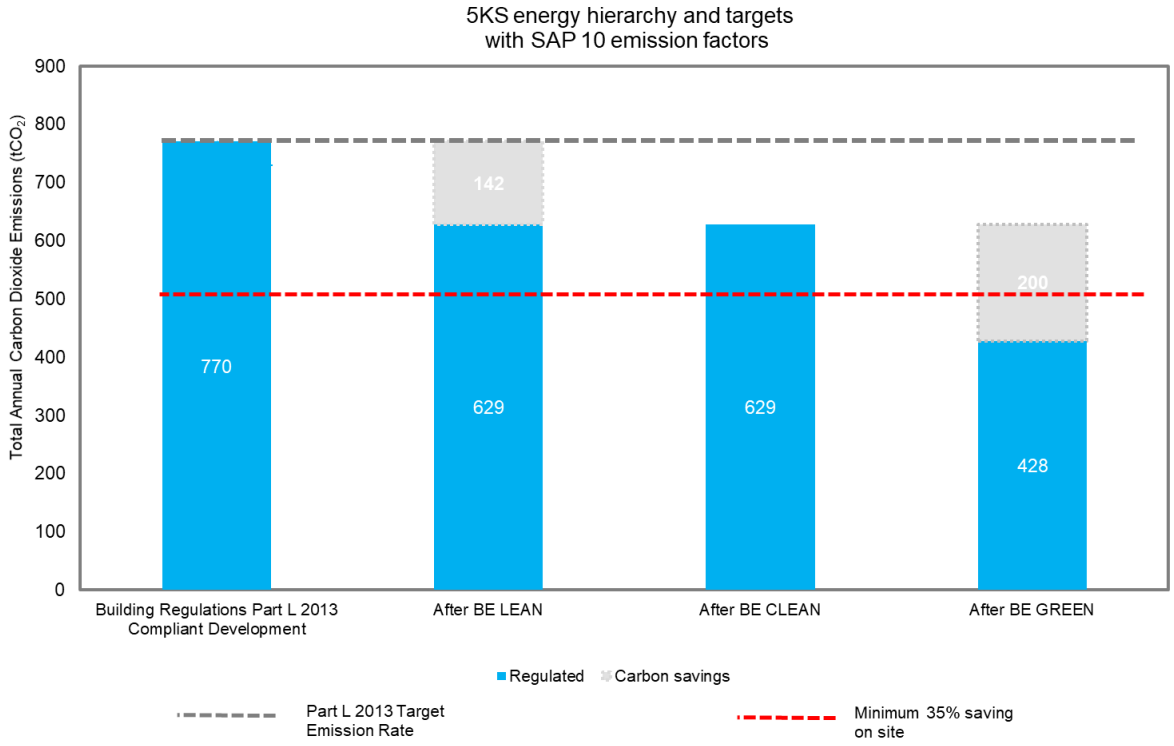


Figure 2 5KS development energy hierarchy results

Table 1 CO_2 emissions after each stage of the London Plan Energy Hierarchy

CO2 emissions after each stage of the energy hierarchy [Part L 2013]		
	CO_2 Emissions [Tonnes CO_2/annum]	
	Regulated	**Unregulated**
Building Regulations Part L 2013 Compliant Development	770	627
After BE LEAN	629	627
After BE CLEAN	629	627
After BE GREEN	**428**	**627**

Table 2 Regulated carbon dioxide savings from each stage of the energy hierarchy

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	Total Regulated CO_2 Emissions Savings	
	[Tonnes CO_2/annum]	
Be lean: Savings from energy demand reduction	142	19%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	200	26%
Cumulative on-site savings	**342**	**44%**

Results of the office element

Table 3 CO2 emissions after each stage of the London Plan Energy Hierarchy (office element)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	CO_2 Emissions	
	[Tonnes CO_2/annum]	
	Regulated	Unregulated
Building Regulations Part L 2013 Compliant Development	623	548
After BE LEAN	512	548
After BE CLEAN	512	548
After BE GREEN	**339**	**548**

Table 4 Regulated carbon dioxide savings from each stage of the energy hierarchy (office element)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	Total Regulated CO_2 Emissions Savings	
	[Tonnes CO_2/annum]	
Be lean: Savings from energy demand reduction	112	18%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	172	28%
Cumulative on-site savings	**284**	**46%**

Results of the Crossrail box

Table 5 CO2 emissions after each stage of the London Plan Energy Hierarchy (Crossrail box)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	CO_2 Emissions	
	[Tonnes CO_2/annum]	
	Regulated	Unregulated
Building Regulations Part L 2013 Compliant Development	146	79
After BE LEAN	118	79
After BE CLEAN	118	79
After BE GREEN	**89**	**79**

Table 6 Regulated carbon dioxide savings from each stage of the energy hierarchy (Crossrail box)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	Total Regulated CO_2 Emissions Savings	
	[Tonnes CO_2/annum]	
Be lean: Savings from energy demand reduction	29	20%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	29	19%
Cumulative on-site savings	**58**	**39%**

Part L Criterion 3 Assessment

The Building is generally compliant with Part L Criterion 3 (limiting the effects of solar gains), however the high proportion of glazing to the Public Garden from levels B2 to the podium is required for adequate daylighting to promote plant growth which is an essential feature of the scheme. Analysis shows that the Public Garden area does not comply with strict application of Criterion 3. The environment within the Public Garden will be operated as a mixed-mode space and will only be actively cooled during extreme summer conditions. The heating and cooling systems have been modelled within the energy assessment illustrating that the design solution is sustainable and environmentally friendly.

2. INTRODUCTION

The purpose of this energy assessment is to provide advice on how to reduce the energy consumption and associated CO_2 emissions of the 5 Kingdom Street development (herein referred to as the 'Proposed Development'). To do so, the designers have followed the principles of the London Plan 'Energy Hierarchy', as outlined in the sections below.

The proposed 5 Kingdom Street project is in Paddington Central. The building consists of an office building of ground floor with mezzanine + 18 stories + plant, and a three storey base below Kingdom Street. This 'base' connects to the Kingdom Street basement level, and to the 'Crossrail box' below over two storeys. The gross total general internal area (GIA) of the proposed development is approximately 65,928 m^2.

3. PLANNING POLICY AND BUILDING REGULATION CONTEXT

The proposed development (5KS) is in the City of Westminster. 5KS will be developed to achieve the required carbon reduction targets in line with the London Plan and the Local Plan. Monitoring of the actual operational performance of the heat pump system shall also be undertaken following recent guidance from the GLA.

This assessment was carried out in line with national, regional and local planning requirements which ensure that passive design, energy efficiency measures, low carbon and renewable energy technologies are incorporated into the building design of all new developments.

3.1 National Policy

The latest policies implemented by the Government with respect to combatting global warming and climate change include The Energy Act 2013, The National Planning Policy Framework (NPPF) 2019 and The Carbon Plan (2011).

3.2 Regional Policy

3.2.1 The current London Plan 2016 (the spatial development strategy for London consolidated with alterations since 2011, March 2016)

The London Plan is legally part of each of London's Local Planning Authorities' Development Plan and must be considered when planning decisions are taken in any part of London. Planning applications should be determined in accordance with it, unless there are sound planning reasons (other material considerations) which indicate otherwise. The plan provides the strategic, London-wide policy context for borough local development plan documents; all local development plan documents and Neighbourhood Plans must be 'in general conformity' with the London Plan. The London Plan issued by the Mayor of London provides guidance on minimising greenhouse emissions.

Policy 5.2 Minimising CO2 in accordance with the Energy Hierarchy for all new developments. This hierarchy outlines a framework under which the GLA requires sustainable building design to be approached.

1. Be Lean: use less energy and manage demand during operation
2. Be Clean: exploit local energy resources (such as secondary heat) and supply energy efficiency and cleanly
3. Be Green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site

Policy 5.2 (B) 'Zero carbon' target for residential buildings from October 1, 2016, which requires an on-site reduction in regulated CO_2 emissions of 35% against 2013 Building Regulations and the remaining carbon emissions to be off-set to 100%. The target (2016-2019) for non-domestic buildings is a 35% reduction compared to the 2013 Building Regulations requirements.

Policy 5.2 (C) states that all major development[1] proposals are expected to include a detailed energy assessment to demonstrate how these targets are to be met within the framework of the Energy Hierarchy (guidance is also given in Policy 5.2(D) on the content of Energy Assessments).

[1] Major developments (non-residential): floor space will be 1000 m^2 or more; or the site are is 1 hectare or more

Policy 5.6 (A) Decentralised Energy states that development proposals must evaluate the feasibility of installing a combined heat and power (CHP) system, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

Policy 5.6 (B) also requires the developments to select the energy systems in accordance with the hierarchy of 1) Connection to existing heating/cooling networks; 2) Site-wide CHP network; and 3) Communal heating/cooling.

Policy 5.6 (C) states that where future network opportunities are identified, developments should be designed to connect to these networks.

Policy 5.7: Renewable energy: expects that within the framework of the energy hierarchy, major development proposals will provide a reduction in CO_2 emissions using on-site renewable energy generation, where feasible.

Policy 5.9: Overheating and cooling: expects major development proposals to reduce potential overheating and reliance on air conditioning systems**.**

3.2.2 Draft New London Plan (2019)

The emerging Draft London Plan, which is likely to be adopted by the end of the summer of 2020, will set out a framework for the development of London over the next 20-25 years. It requires that all major developments are net zero-carbon; in meeting the zero-carbon target a minimum on-site reduction of at least 35 % beyond Building Regulations is expected and non-residential developments should achieve a 15% reduction through energy efficiency measures.

Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be offset either through cash-in-lieu contribution to the relevant borough's carbon offset fund and/or by providing an alternative proposal off-site.

The new Draft London Plan recommends a new carbon offset guidance price of £95 per tonne annually and last for 30 years, but a different cost will be applied if the Local Planning Authorities (LPAs) have set their own local price. According to the location of the proposed project, the City of Westminster's carbon offset price will be applied, which is £ 1800/tonne[2] (based on a price of £60 per tonne of carbon over a 30-year period). The net zero carbon requirement does not apply to non-domestic developments until the new London Plan is adopted.

Furthermore, the new Draft London Plan also requires comprehensive monitoring of energy usage and carbon emissions. Reporting on the operational performance of new developments to ensure the planning commitments are being delivered will be included in a new stage of the energy hierarchy know as 'Be seen'.

Following recent guidance from the GLA, A commitment to monitor the performance of the heat pump system post-construction to ensure it is achieving the expected performance approved during planning is recommended (as outlined in section 3.2.3 GLA Guidance). It should be noted that although this commitment is beyond the measures set out by the current London Plan, it is not a commitment to the 'Be seen' stage of the Draft New London Plan.

3.2.3 GLA Guidance

Details of certain aspects of the energy strategy have been developed through ongoing engagement and guidance from the GLA. The information gathered through this process has been consolidated into this report. The following requests from the GLA *(in italics)* are referenced to a section of the report where the information can be found.

[2] https://www.westminster.gov.uk/sites/default/files/westminster_carbon_offset_fund_guidance-jan2020.pdf

- *The applicant has carried out an investigation and there are no existing or planned district heating networks within the vicinity of the proposed development. However, they should make contact with Westminster City council and ask them to confirm whether any district heating schemes are coming forward in the area. Correspondence should be provided, and a connection to district heating schemes should be prioritised.*
  Section 7 details the allowance of future connections to a district heat network should one become available. Refer to Appendix 3 for plantroom layouts and schematics with future connection points highlighted.

- *The applicant is proposing to install a communal heating system. However, it should be confirmed that all non-domestic building uses will be connected to the communal heat network. A drawing showing the route of the heat network linking all uses on the site should be provided.*
  Refer to Appendix 3 for preliminary distribution layouts and heating/cooling schematics. Section 9 also describes the operation of the proposed communal heat network in detail.

- *Indicative information on the network's operating temperatures (flow and return temperatures) should be submitted as well as detailed information on the anticipated distribution heat losses. The applicant should design the system in such a way that losses are minimised as far as possible.*
  Section 9 describes the operation of the proposed communal heat network in detail, including the network's operating temperatures. Section 7.1.1 Describes the steps taken to minimise distribution heat losses.

- *The applicant should confirm that the communal heat network will be supplied from a single energy centre. Further information on the floor area, internal layout and location of the energy centre should be provided.*
  Section 9 describes the operation of the proposed communal heat network in detail. The energy centre's floor area, location and internal layout can be found in the heating/cooling layout drawings in Appendix 3.

- *Further information on the heat pumps should be provided including:*
  - *The heat pump's total capacity (kWth).*
    Section 9 describes the operation of the proposed communal heat network in detail, including the required capacity of the heat pump system.
  - *An estimate of the heating and cooling energy (MWh/annum) the heat pumps would provide to the development.*
    Section 9 describes the operation of the proposed communal heat network in detail including annual load profiles for heating and cooling.
  - *Details of how the Seasonal Coefficient of Performance (SCOP) and Seasonal Energy Efficiency ratio (SEER) has been calculated for the energy modelling. This should be based on a dynamic calculation of the system boundaries over the course of a year i.e. incorporating variations in source temperatures and the design sink temperatures (for space heat and hot water).*
    Section 9 describes the operation of the proposed heat pump system in detail, including the conditions used for the SCOP and SEER calculations. This information is supplemented by a diagram outlining the system's operation and example manufacturer's data sheets for heat pump units in Appendix 4.
  - *Manufacturer datasheets showing performance under test conditions for the specific source and sink temperatures of the proposed development and assumptions for hours spent under changing source temperatures. Whether any additional technology is required for hot water top up and how this has been incorporated into the energy modelling assumptions.*
    Refer to Appendix 4 for example manufacturers data sheets of heat pump units. Refer to Section 9 for a description of the domestic hot water strategy and its operation in relation to the heating/cooling heat pump system.

- *The expected heat source temperature and the heat distribution system temperature with an explanation of how the difference will be minimised to ensure the system runs efficiently.*
  Section 9 describes the operation of the proposed communal heat network in detail, including the heat source/sink temperature assumptions and network distribution temperatures.
- *A commitment to monitor the performance of the heat pump system post-construction to ensure it is achieving the expected performance approved during planning. It is recommended that boroughs condition this.*
  Refer to Section 10 for details of the commitment to monitor and report on the actual performance of the heat pump system. Appendix 5 contains correspondence with the GLA outlining the details of the commitment.

3.2.4 Energy Assessment Guidance – Greater London Authority (GLA) Guidance on Preparing Energy Assessment (October 2018)

This guidance provides details on how to address the energy hierarchy through the provision of an energy assessment to accompany strategic planning applications, including provision for a few key areas:

- Minimisation of the overheating risk and the demand for cooling;
- Consideration of site-wide networks with a single energy centre;
- Allowance for connection to existing or planned district heating networks.
- Air quality - a separate Air Quality Assessment report is provided within the Environmental Statement
- Sustainability Statement
- BREEAM requirements NC 2018
- Monitoring – on site monitoring, verifying and reporting of energy performance to be carried out on site after the building has been constructed

3.3 Other supplementary documents

The guidance illustrated in several supplementary documents has also been implemented in this report; these documents include but are not limited to the Sustainable Design and Construction Supplementary Planning Guidance (2014), Delivering London's Energy Future: The Mayor's Climate Change Mitigation and Energy Strategy (2011) and the London Heat Network Manual (2014). It should be noted that updated guidance on preparing energy assessments has been published, however will not be consulted until the adoption of the New London Plan.

3.3.1 The Local Plan

The Local Plan sets out Westminster's strategy for the sustainable development of its area, including the general amount, type and location of new developments it considers could take place and the policies to which applications for planning permission should conform in order to meet these objectives.

The Westminster City Plan (2016) contains the following policies related to energy and sustainability:

Policy S28 Design

Development must incorporate exemplary standards of sustainable and inclusive urban design and architecture. In the correct context, imaginative modern architecture is encouraged provided that it respects Westminster's heritage and local distinctiveness and enriches its world-class city environment.

Development should reduce energy use and emissions that contribute to climate change during the lifecycle of the development, in line with national and regional standards as a minimum;

Policy S39 Decentralised Energy Networks

Infrastructure that is or has previously been in use as part of a heating network will be protected.

Major development should be designed to link to and extend existing heat and energy networks in the vicinity, except where the council considers that it is not practical or viable to do so.

Where it is not possible to link to an existing heat and energy network, major development will be required to provide site-wide decentralised energy generation that minimises greenhouse gas emissions and has the potential to be extended to serve other development sites in the vicinity, except where the council considers that it is not practical or viable to do so, including where all available technologies would have an unacceptable impact on local air quality.

Smaller developments will be encouraged to be enabled to connect into heat and energy networks.

Policy S40 Renewable Energy

All major development throughout Westminster should maximise on-site renewable energy generation to achieve at least 20% reduction of carbon dioxide emissions, and where feasible, towards zero carbon emissions, except where the council considers that it is not appropriate or practicable due to the local historic environment, air quality and/or site constraints.

3.3.2 Draft Local Plan

An updated Draft City plan (2019-2040) is currently under examination and is available as a draft. Policy 37 'Energy' outlines that all development proposals should follow the principles of the Energy Hierarchy to minimise on site energy demand and maximise the use of low carbon energy sources.

3.4 Requirements summary for the proposed 5KS development

In summary, the proposed 5KS development meets the definition of major development as mentioned in the previous sections. The subsequent design of 5KS will meet the following requirements:

- Establish the Approved Document Part L 2A 2013 compliant baseline energy demand and associated CO2 emissions
- The design of the building is required to follow the energy hierarchy framework outlined by the GLA, which includes to Be lean, Be Clean and Be Green.
- Non-residential development to achieve a site-wide 35% reduction over the Part L baseline
- Non-residential development to achieve 15% carbon emission reduction through energy efficiency measures (Be Lean)
- A commitment to monitor the performance of the heat pump system for 3 years post-construction to ensure it is achieving the expected performance approved during planning
- The proposed development to meet the requirements of Criterion 3: Limiting the effects of solar gain
- The on-site renewable energy generation to contribute at least 20% carbon dioxide emission reduction

4. METHODOLOGY

4.1 GLA Methodology

The methodology followed to demonstrate compliance with the Building Regulations and local policies is in line with the Greater London Authority's (GLA's) Energy Hierarchy, refer to Figure 3, and targets are below:

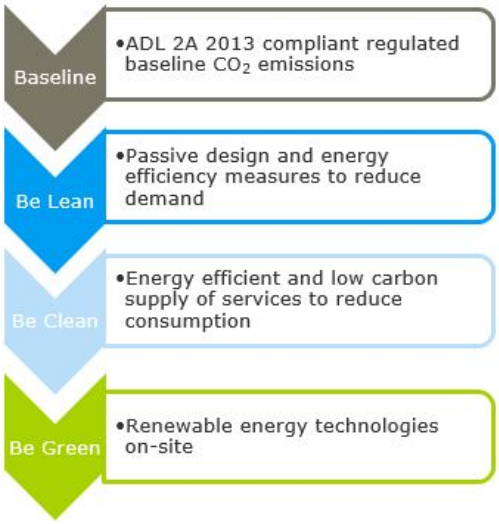


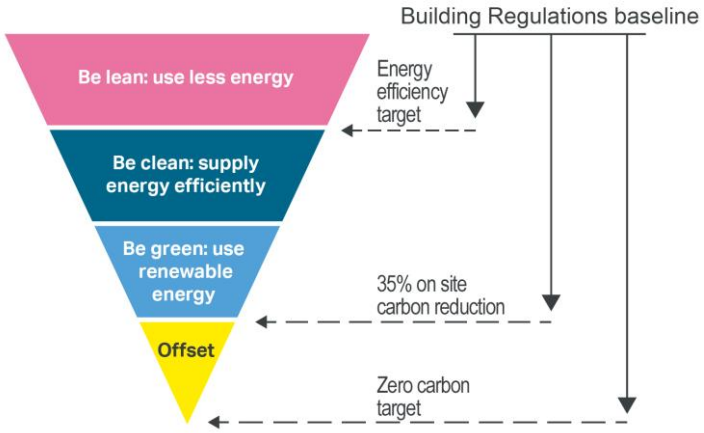
Figure 3 Assessment methodology in line with GLA's Energy Hierarchy

- Have the lowest feasible carbon dioxide emissions now
- Have low carbon dioxide emissions in the future
- Be flexible enough to allow new technologies to be adopted
- Protect local air quality
- Provide a resilient energy solution
- Achieve reasonable energy bills for the tenants
- Be ready to connect to future, low-carbon district heating

The energy strategy has explored various options for providing low carbon energy to 5KS, in line with Westminster City Council and GLA policies. This includes consideration of decentralised energy systems, combined heat and power and other technologies. Detailed analysis shows that in this case, CHP systems are not appropriate for this development for the following reasons:

- They do not deliver the lowest carbon dioxide emissions, given electrical grid decarbonisation
- They do not help to protect local air quality

The energy strategy and optimised energy solution is based on the hierarchy in the following diagram, which aligns with GLA policy and guidance from the GLA.



Source: Greater London Authority

Figure 4 GLA Energy Hierarchy

The energy strategy for the Proposed Development aligns with this approach

Considering the above mentioned hierarchies, the methodology identified for the Proposed Development includes the following measures:

- Establishing the Approved Document Part L2A 2013 compliant baseline energy demand and associated CO2 emissions;
- Identifying passive design and energy efficiency measures. These are then incorporated into the energy calculations, representing an enhanced baseline scheme. (‘**be lean’**);
- Identifying energy efficient and low carbon supply of services and incorporating them into the energy calculations (‘**be clean**’); and
- Identifying on-site renewable energy technologies to further reduce the CO2 emissions of the Proposed Development through on-site renewable sources (‘**be green**’).

The regulated (i.e. heating, cooling, ventilation, lighting and hot water generation) and unregulated energy consumption and associated CO_2 emissions of the Proposed Development have been estimated using dynamic simulation modelling (DSM) software IES Virtual Environment (VE) and are presented in the main body of this report.

4.2 Model Inputs and Assumptions

The proposed development has been modelled following the National Calculation Methodology (NCM) 2013. The IES virtual environment 2019 software version 2019.0.1.0 was used for the simulation using the Part L2A 2013 module VE compliance 7.0.12. The BRUKL reports for all stages of the energy hierarchy are provided in Appendix 1 of the report.

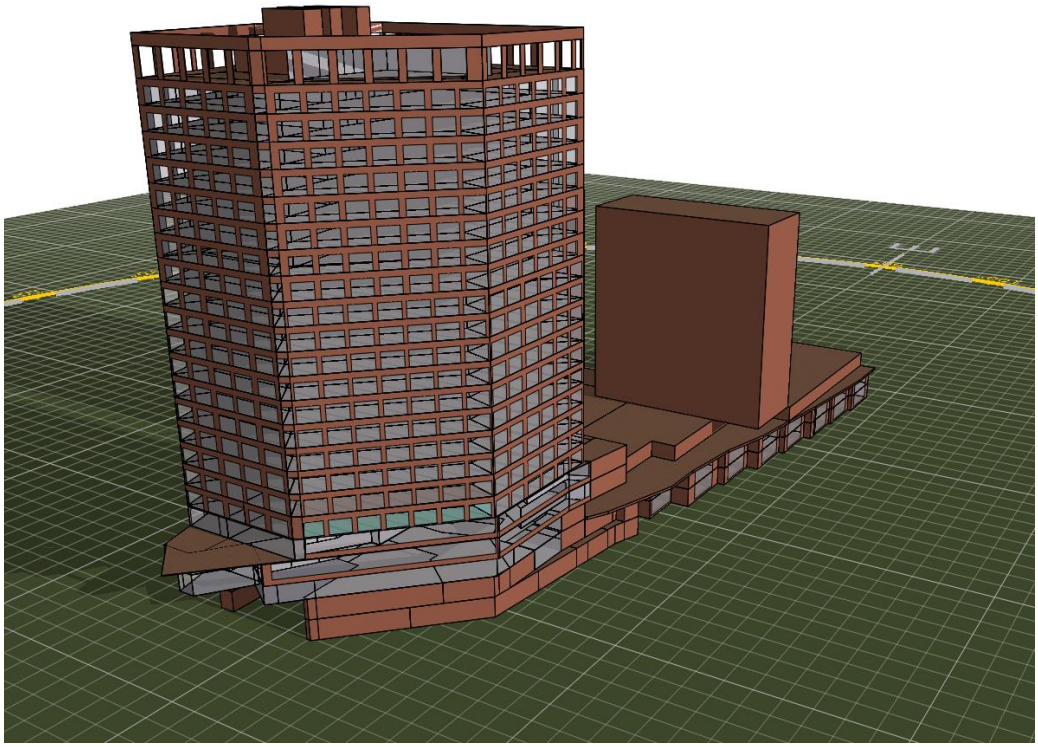


Figure 5 IES model of the 5KS development

4.2.1 Geometry

The energy model of the proposed development has been built based on the layout and fabric drawings '606_5KS_Draft Planning Issue_pdfs_200626.pdf' received from Allies+Morrison.

4.2.2 Weather

Weather data for simulation-based Part L2 assessments is provided by CIBSE. The weather file used for the Part L analysis in this study is London Typical Reference Year (TRY) 05.

4.2.3 SAP 10 Carbon emission factors implementation

As the grid electricity has significantly decarbonised since the last update of Part L in April 2014, the Government published updated carbon emission factors (SAP10) in July 2018 to demonstrate the changes. The comparison of the carbon emissions factors is shown in Table 7 below. The new emission factor has a significant impact in carbon saving performance of the on-site electricity generating technologies, such as gas-engine CHP and solar PV. Those technologies measures will achieve much less carbon savings under the SAP10 emission factors than SAP 2012 ones.

Table 7 Carbon emission factors comparison

	SAP 2012	SAP 10
Mains Gas ($kgCO_2/kWh$)	0.216	0.210
Electricity ($kgCO_2/kWh$)	0.519	0.233

The GLA has decided that from January 2019 and until central Government updates Part L with the latest carbon emission factors, planning applications are encouraged to use the SAP 10 emission factors for referable applications[3] when estimating CO_2 emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected association. Therefore, the updated SAP 10 carbon emission factors are used as the basis of this energy strategy assessment.

4.2.4 Building Fabric Properties

The building fabric properties of the development used in the model are shown in the table below:

Table 8 Building fabric properties of the proposed development

Opaque Elements	
Ground/Exposed/Basement Floor U-Value (W/m^2K)	0.2
Roof U-Value (W/m^2K)	0.18
External Wall U-Value (W/m^2K)	0.18
External Curtain Wall U-Value (W/m^2K)	1.4
Openings	
Window U-Value (W/m^2K)	1.4
Glazing g-Value	0.3
Frame factor	10%
Rooflight U-Value (W/m^2K)	1.8
Glazing g-Value	0.3
Frame factor	15%
Air Permeability	
Design Air Permeability (m^3/m^2h @ 50 Pa)	3.00

[3] The height and floorspace of the proposed development is such that it is referable to the Mayor in accordance with the provisions of the Town and Country Planning (Mayor of London) Order 2008.

5. BASELINE EMISSIONS

The baseline adopted for the purposes of this strategy is calculated by reference to compliance with Part L 2013 Criterion 1 of the Building Regulations (Part L2A), which sets out a target that defines the maximum permissible emissions (i.e. Target Emission Rate (TER)) with which a development must comply.

The 2013 Target Emissions Rate is the CO_2 emission rate from a notional building of the same size and shape as the actual building, but with specified properties as set out in the NCM Modelling guide. The baseline regulated carbon dioxide emissions for the development are **770** t CO_2/year.

The estimated emissions of the proposed development for regulated and unregulated energy uses are shown in Table 9. As required by the Building Regulations, the regulated CO_2 emissions of the proposed building will not exceed the target emissions.

Table 9 Estimated UK Building Regulations Baseline Emissions

Building Regulations Part L 2013	Non-domestic (SAP 10) [Tonnes CO2/annum]	
	Regulated	Unregulated
Baseline carbon emissions (TER)	770	627

6. BE LEAN

This section describes the energy efficiency measures that have been considered at the feasibility stage of the design in order to minimise the energy demand and achieve excellent building performance. The proposed development will feature best practice passive design and energy saving measures so that compliance with Part L of the building regulations will be achieved without reliance on the contribution of renewables and low carbon technologies.

Measures such as, high-efficiency HVAC systems (including cooling and ventilation systems), careful design of the façade and detailed analysis of the glazing ratio and performance have led to exceptional carbon reduction levels achieved at this first step of the London Plan's Energy Hierarchy. The proposed strategy has also managed to limit the cooling loads of the proposed development below the notional case.

The systems' design has also aimed to exploit the opportunity to complement the energy use profiles between the end uses by recovering waste heat from the office heat rejection circuit to meet the low-grade domestic hot water demand. The energy modelling results presented in this report demonstrate how this technology contributed toward achieving the CO_2 emissions targets.

6.1 Minimising Demand (Passive Design)

6.1.1 Envelope optimisation: solar gain

Solar gain can have a significant effect on the amount of energy required to cool the building. The design will minimise the amount of solar gain whilst maintaining high levels of usable daylight. This will be achieved through the careful design of the façade. The proposed façade incorporates a recessed glazing detail with significant shading provided by the cladding system. High-performance glazing elements with low g-values will be used for all windows, effectively reducing solar gains.

6.1.2 Envelope optimisation: thermal performance (energy efficiency)

Heat loss through the building envelope will have a significant effect on the amount of energy required to heat the building. The design will optimise the thermal performance of the envelope with respect to heat loss (annual energy consumption) and build cost. U-Values and an air permeability exceeding the current Part L 2013 Building Regulations will be applied throughout the development.

Energy modelling has shown that optimum energy performance is achieved with an average façade u-value of 1.4W/m2 K for the office building, which will be further reviewed in next design stage.

6.1.3 Envelope optimisation: balancing daylight, solar gain and heat loss

The available daylight, solar gain and envelope thermal performance are all linked. The design of the building façade and fabric has been carefully balanced to minimise solar gains on the south facing element of the scheme whilst minimising the heating load throughout the building.

It should be appreciated that for offices the façade thermal performance should be optimised for both heat losses and reduction of internal heat gains, the detailed building fabric information is shown in Table 8.

6.1.4 Part L Criterion 3

The Building is generally compliant with Part L Criterion 3 (limiting the effects of solar gains), however the high proportion of glazing to the Public Garden from levels B2 to the podium is required for adequate daylighting to promote plant growth which is an essential feature of the scheme. Analysis shows that the Public Garden area does not comply with the strict application of Criterion 3.

The environment within the Public Garden will be operated as a mixed-mode space and will only be actively cooled during extreme summer conditions. The heating and cooling systems have been modelled within the energy assessment illustrating that the design solution is sustainable and environmentally friendly.

6.2 Efficient Servicing

The proposal for 5KS is to use a hybrid energy design solution that will utilise heat pumps in combination with hybrid dry coolers. The chillers will typically be used for cooling only at times of peak demand, with heat pumps used at all other times. Heat pump efficiencies will be maximised by using heat recovery from coincident heat rejection from the cooling plant. Domestic hot water will also be generated utilising rejected heat through a combination of heat pumps and thermal storage.

The hybrid energy design solution for 5KS delivers a new approach the design of heating and cooling systems taking into account the operational performance data of the developer's existing office buildings. The design maximises operational efficiencies for part-load operation. This includes variation in operating temperatures of heating and chilled water systems to suit the demand of the building and development of variable output pumping solutions to accurately match the requirements of the system.

The hybrid energy design delivers energy efficient operation at periods of low demand including "out of hours" occupancy periods for occupiers of a single office floor plate.

The overall effect is a significant increase in plant and system efficiencies that will deliver reduced energy consumption and a reduced carbon footprint.

6.3 Fan and Pump Energy

Moving air, heat, coolth and water around a building requires work to be done. How much energy is required to do this work will depend on the design of the systems, the technology used and the controls. The design will minimise these energy uses by:

- Having all fans and pumps operating with variable speed control
- SFP shall not exceed 1.6 W/l/s for the ventilation system
- High electric power factor will be specified at least 0.95 efficiency

6.4 Chiller Performance

The technology used to generate the cooling used in the building significantly affects the amount of energy required to cool the building. The design will carefully select the most energy efficient equipment whilst balancing capital costs.

Cooling will be provided from a combination of chillers equipment consisting of:

- A small water-cooled chiller with air-cooled heat rejection for periods of low demand
- Heat pumps providing simultaneous heating and cooling
- Reversible heat pumps providing heating or cooling
- Water cooled chillers with hybrid dry coolers for periods of high demand

6.5 Heat Recovery

Ventilation systems will make use of heat recovery in order to minimise the heat lost to provide fresh air throughout the building. Heat recovery with an efficiency of 67% will be used in the office element, and 70% for all other spaces.

6.6 Lighting Technology

The lighting design and the technology employed will have a significant effect on the amount of energy needed to achieve the required light levels. The design has considered all the available technology and lighting will be selected to provide the highest level of energy efficiency whilst maintaining the operational requirements. This includes:

- LED lighting will be used in the office areas with an average efficacy of no less than 100 lm/W
- Other areas with an average efficacy of no less than 80 lm/W

6.6.1 Lighting Controls:

- Lighting will include separate metering
- Lighting will include out of range value monitoring
- Lighting will include constant illuminance control
- All perimeter zones will have proportional daylight dimming. Once the lux level of each space is achieved by natural daylight, the lighting will switch off. As the illuminance of the space reduces, the lights will proportionally increase in order to maintain the desired lux level
- The daylight sensors will be on a time switch and have a parasitic value of 0.1W/m2
- The automatic controls will be on a time switch and have a parasitic value of 0.1W/m2

6.7 Occupancy Linked Lighting Controls

Spaces frequently do not require lighting when they are unoccupied. Smart controls can be used to sense whether a space is occupied and to switch off the lighting if it is not required.

6.8 Metering

The metering strategy will be in alignment with CIBSE TM39. All meters will be provided with a pulsed output to the building energy management system (BEMS) for automated centralised monitoring of all energy and water use. The BEMS system will also ensure that heating and cooling systems are highly responsive and operate at their optimal efficiency in order to maintain internal conditions to comfort standards.

The metering strategy will also be ensure the performance of the heat pump system can be measured and reported in line with monitoring requirements set out in Section 10; Monitoring role.

6.9 System Performance Summary - Be Lean

The criteria used in the analysis for the heating, cooling, ventilation and hot water service and lighting are shown in the table below. Further design development will be required during the detailed design process.

Table 10 System performance inputs - Be Lean

Space Type	
HVAC + Ventilation System	Central gas boiler for heating; Electric water-cooled chiller for cooling; Mechanical ventilation with heat recovery (MVHR); Extract ventilation for toilet, showers and plantrooms
Heating	
Heating system type (i.e FCU, VRF…)	Fan coil units
Heat source	LTHW Boiler
Fuel	Natural gas
Seasonal Efficiency	95.7%
Cooling	
Cooling system type (i.e FCU, VRF…)	Fan coil units
Fuel Type	Electricity
Generator SEER	6.0
Ventilation	
Mechanical Supply and Extract Ventilation with Heat Recovery	MVHR for office floors with heat recovery (HR) efficiency of 67% All other areas with heat recovery efficiency of 70%
AHU + HR SFP (W/l/s)	1.6
Terminal Unit SFP (W/l/s)	0.2
Local Mechanical Extract SFP (W/l/s)	Toilet, Shower – 0.5 Plantrooms – 0.4
Domestic Hot Water	
Generator Type	Heat Recovery + Heat Pumps
DHW Delivery efficiency	90%
Storage Volume (l)	9000
Storage losses (kWh/l.day)	0.0018
Lighting	
Installed Power density	Inference method
Lamp efficacy	Office/Retail Perimeter zones - 100Lumen/W All other spaces - 80Lumen/W
Light Control	PIR (manual on-automatic off) with daylight dimming where appropriate

6.10 Be Lean Results

Through the energy saving measures outlined above, the overall development is anticipated to save **19%** on CO_2 emissions over the baseline case.

Table 11 Estimated UK Building Regulations Compliant Be Lean Emissions

Building Regulations Part L 2013	Non-domestic (SAP 10) [Tonnes CO2/annum]	
	Regulated	Unregulated
Be LEAN carbon emissions (BER)	629	627

7. COOLING AND OVERHEATING

7.1 Applying the Cooling Hierarchy

The cooling hierarchy described in the London Plan Policy 5.9 has been incorporated to the 5KS energy analysis. The measures proposed to limit the cooling demand are reported below.

7.1.1 Minimising internal heat generation through energy efficient design

The proposed design includes several active and passive measures that will minimise the internal gains:

- Optimised heat distribution through location of vertical risers to minimise the horizontal pipe length in the building;
- Low Temperature Hot Water distribution at about 45 °C instead of 60-80 °C;
- Enhanced pipe insulation to minimise heat loss;
- Use of energy efficient lighting system to minimise the internal gains:
  - LED luminaries in all areas;
  - Fully integrated and energy efficient lighting control that uses presence/absence detection, daylight dimming, maintained illuminance, time clock control and manual switching.

7.1.2 Reducing the amount of heat entering the building in summer

Passive design measures have been explored through the configuration of the building façade to optimise daylighting and reduce glare and solar gains, in particular:

- Optimisation of glazing ratio (60/40) of the office levels to maximise the building performance;
- A building fabric analysis was undertaken to determine the U and g values that optimise the energy performance. The recommended U and g values are 1.4 W/m2K and 0.3, respectively.
- Inclusion of a 325mm (variable) external projection that provides external shading.

7.1.3 Use of thermal mass and high ceilings to manage the heat within the building

The lower side of the development, the Crossrail box, and Public Garden will benefit from triple or double height spaces and large portion of the concrete structure exposed. It is expected that the configuration of these spaces will allow the exposed thermal mass to reduce the cooling peaks in summer.

Despite the limited opportunity for exposed thermal mass in the office area due to the nature and layout of the development, the servicing strategy has been devised to include the installation of exposed services and soffits.

7.1.4 Passive Ventilation

The Public Garden space at the entrance level will include operable windows for natural ventilation and free-cooling when external conditions are favourable. Moreover, openable windows will be provided for the retail area at ground floor and in the restaurants where appropriate.

Operable windows have been provided for the offices, however natural ventilation is deemed inappropriate and would prove detrimental to the building performance due to: the adjacency of the site to the Westway, an area of poor air quality, high noise, and deep floorplates.

7.1.5 Mechanical Ventilation

Due to the above-mentioned constraints, Natural Ventilation is not adequate to provide the required comfort levels all year round. A Mechanical Ventilation system provides fresh air at the rates shown in Table 12.

Table 12: Auxiliary ventilation rates.

Zone	Ventilation rate [l/(sm²)]
Entrance Gallery	2.2
Office	1.76
Auditorium	8.3
Public Garden	1.0
Crossrail Box	3.3
Restaurant	3.3

7.2 Overheating risk analysis

An analysis of the risk of overheating is required for all developments. For 5KS, Criterion 3 of the Part L2A of the building regulations is satisfied and reported in the BRUKL report submitted within Appendix 1 of this report. However, Criterion 3 only does not guarantee that the building will not overheat, hence further overheating analysis was performed, based on CIBSE Guides TM49 "Design Summer Years for London" and TM52 "The Limits of Thermal Comfort: Avoiding Overheating in European Buildings". The following areas have been selected to report the risk of overheating:

- Restaurant
- Entrance Gallery
- Office
- Auditorium
- Public Garden
- Crossrail Box

The calculations for TM52 compliance are used to assess the energy performance of the selected spaces against the following three criteria. To comply with TM52, at least two criteria shall be satisfied:

- Criterion 1 - Hours of Exceedance (He): Assessment of the occurrence of overheating. The number of hours during which the difference between the indoor operative temperature and a maximum acceptable temperature threshold is greater than or equal to 1K shall not be more than 3% of occupied hours.
- Criterion 2 – Daily Weighted Exceedance (We): Assessment of the severity of overheating. The number of hours in any day when the indoor operative temperature is higher than a maximum acceptable threshold shall be less than or equal to 6.
- Criterion 3 – Upper Limit Temperature (Tupp): Setting of an absolute maximum value of the difference between the indoor operative temperature and a maximum acceptable threshold to less than or equal to 4K.

7.2.1 Dynamic Thermal Model

The geometry of the model used for the Dynamic Analysis is consistent with the Energy Assessment. The following assumptions have been made throughout the analysis:

Dynamic overheating analysis software used: IES VE 2019.

Site orientation: Due to the nature and constraints of the site, there is limited flexibility with regards to the building orientation. Figure 6 shows the site boundary at Box level.

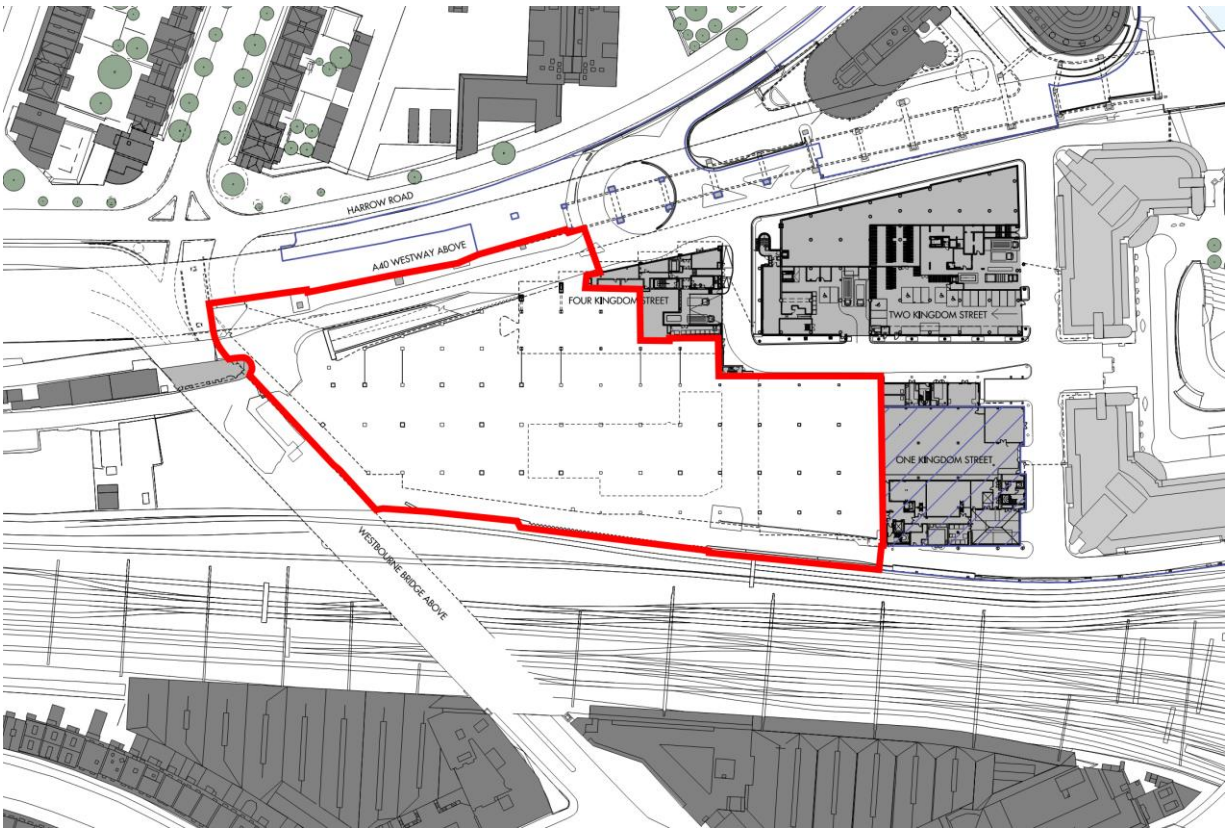


Figure 6: 5KS site.

Weather file used: 5KS is at Paddington Central, hence the weather location is selected as LWC (London Weather Centre). The Design Summer Year (DSY) files used for the dynamic simulation are:

- DSY1: 2020s, high emissions, 50% percentile scenario;
- DSY2: 2003, a year with a very intense single warm spell;
- DSY3: 1976, a year with a prolonged period of sustained warmth.

Internal gains: The internal gains assumed for the assessment are reported in Table 13.

Table 13: Internal gains.

Zone	Lighting (W/m²)	People (W/person Sensible/Latent)	Equipment (W/m²)
Entrance Gallery	12	80/60	5
Office	12	80/60	25
Auditorium	20	80/60	5
Public Garden	12	80/60	5
Crossrail Box	20	80/60	5
Restaurant	20	80/60	5

Occupancy profiles: It is assumed that the building is occupied between 7am and 8pm.

Thermal elements performance: The recommended U and g values are 1.4 W/m²K and 0.3, respectively. Air permeability is 3 m³/(hm²) at 50 Pa.

Shading features: Inclusion of a 325mm external projection to provide external shading.

Thermal mass details: The lower side of the development, the Crossrail box, and the public garden will benefit from triple or double height spaces and large portion of the concrete structure exposed. It is expected that the configuration of these spaces will allow the exposed thermal mass to reduce the cooling peaks in summer. Despite the limited opportunity for exposed thermal mass in the office area due to the nature and layout of the development, the servicing strategy has been devised to include the installation of exposed services and soffits.

Ventilation strategy: The ventilation rates are shown in Table 12.

7.2.2 Results with no Active Cooling provided

The overheating analysis was first performed in the case of no active cooling provided. Figure 7 to Figure 11 show the zone locations on the model. The results for the 2020, 2003, and 1976 weather files are shown in Table 14, Table 15 and Table 16, respectively.

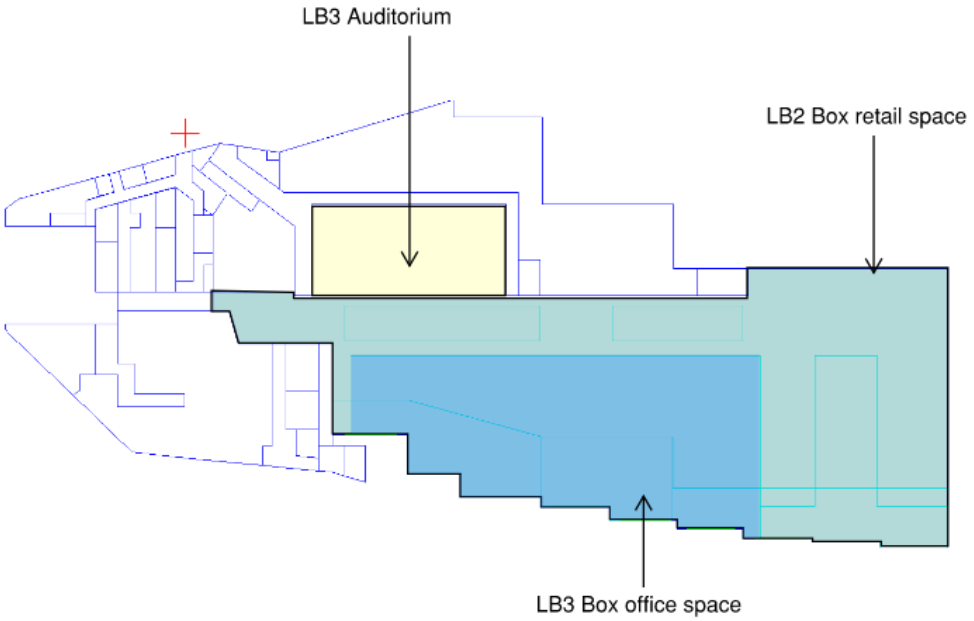


Figure 7: LB3 Area Legend.

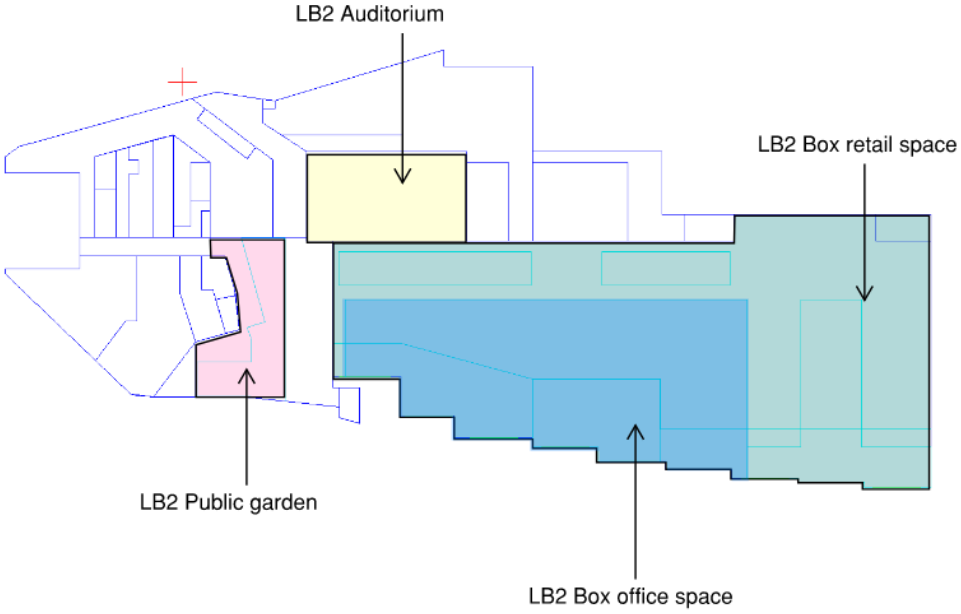


Figure 8: LB2 Area Legend.

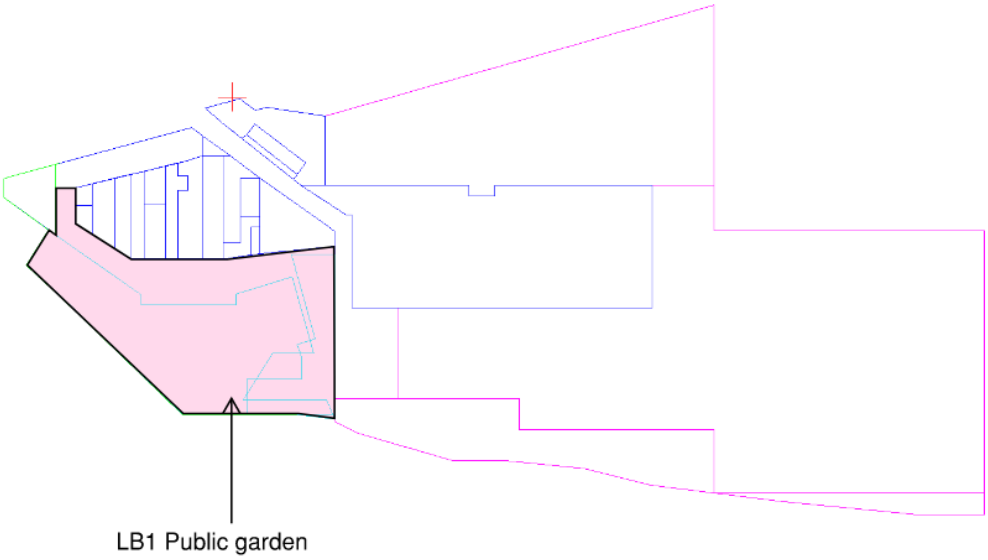


Figure 9: LB1 Area Legend.

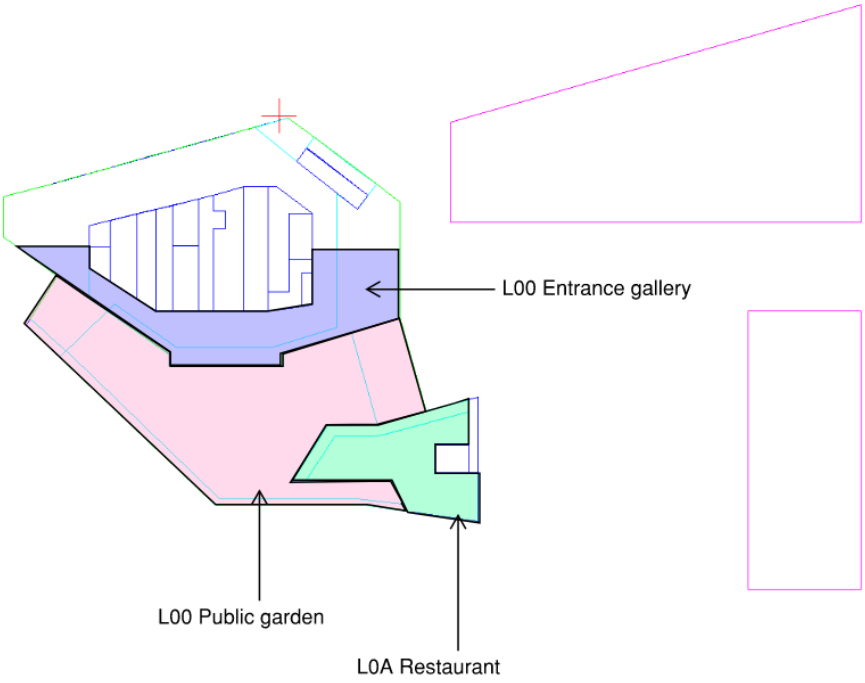


Figure 10: L00 Area Legend.

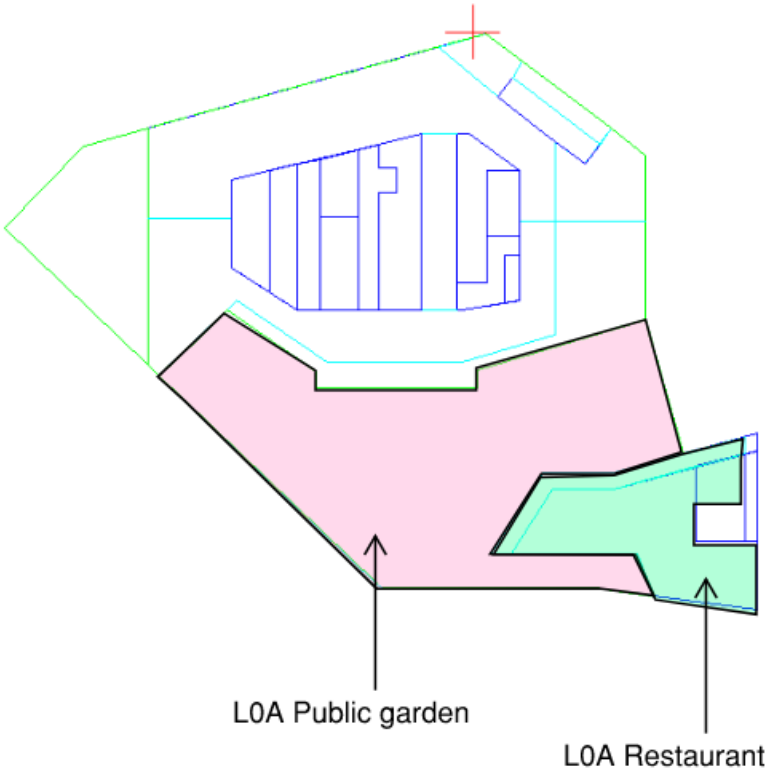


Figure 11: Mezzanine Level Area Legend.

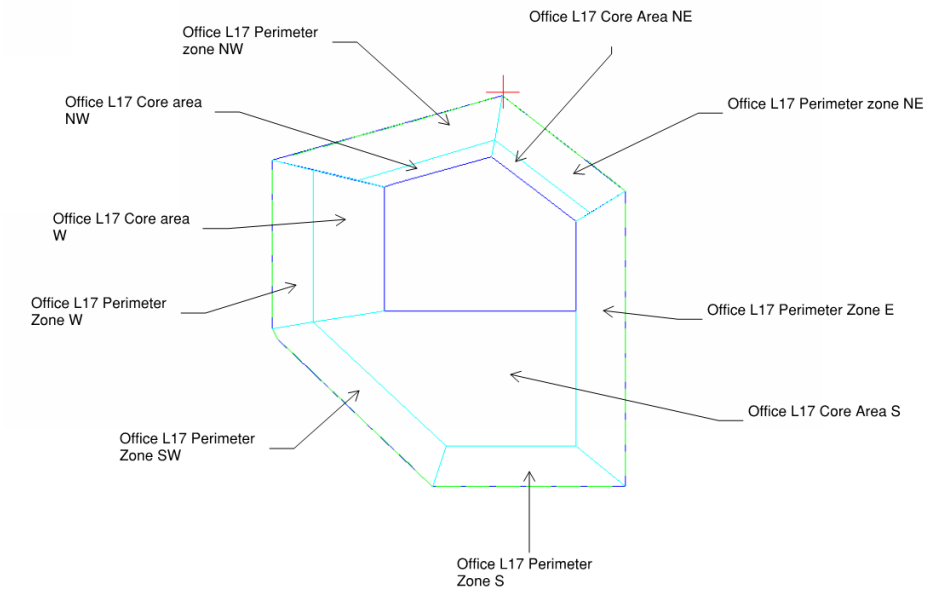


Figure 12: L17 Office Area Legend.

Table 14: TM52 compliance results for 2020 weather file

Space	Criterion 1 (% of hours)	Criterion 2 (Degree Hours)	Criterion 3 (Degree)	TM52 compliance
Office L17 Core Area NE	8.5	52	6	Failed
Office L17 Core Area NW	9.3	51	6	Failed
Office L17 Core Area S	9.8	56	6	Failed
Office L17 Core Area W	10.1	53	6	Failed
Office L17 Perimeter zone E	8.6	57	6	Failed
Office L17 Perimeter zone NE	8.7	58	6	Failed
Office L17 Perimeter zone NW	10	54	6	Failed
Office L17 Perimeter zone S	11.6	61	7	Failed
Office L17 Perimeter zone SW	13.2	64	7	Failed
Office L17 Perimeter zone W	11.9	59	7	Failed
Auditorium LB2	78.5	30	3	Failed
Auditorium LB3	71.9	25	2	Failed
LB3 Box perimeter 1	99.9	53	5	Failed
LB2 Box perimeter 1	99.9	57	5	Failed
LB3 Box office space central	100	99	8	Failed
LB3 Box office perimeter	100	113	11	Failed
LB3 Box central	100	51	4	Failed
LB3 Box perimeter 2	99.8	71	8	Failed
LB2 Box office space central	100	101	8	Failed
LB2 Box office perimeter	100	102	9	Failed
LB2 Box central	100	51	4	Failed
LB2 Box perimeter 2	98.7	60	6	Failed
L00 Entrance Gallery 1	18.9	19	2	Failed
L00 Entrance Gallery 2	34.3	23	3	Failed
LB1 Public Garden	90.6	71	9	Failed
L00 Public Garden	55.4	53	7	Failed
L00A Public Garden	25.2	29	4	Failed
LB2 Public Garden	99.5	82	8	Failed
L00A Restaurant	53.7	29	3	Failed
L00 Restaurant	70.6	35	4	Failed

Table 15: TM52 compliance results for 2003 weather file

Space	Criterion 1 (% of hours)	Criterion 2 (Degree Hours)	Criterion 3 (Degree)	TM52 compliance
Office L17 Core Area NE	10.6	66	7	Failed
Office L17 Core Area NW	10.8	63	7	Failed
Office L17 Core Area S	11.1	69	7	Failed
Office L17 Core Area W	11.3	69	8	Failed
Office L17 Perimeter zone E	12	76	8	Failed
Office L17 Perimeter zone NE	10.7	69	7	Failed
Office L17 Perimeter zone NW	11.1	68	8	Failed
Office L17 Perimeter zone S	14.1	77	8	Failed
Office L17 Perimeter zone SW	15.1	80	9	Failed
Office L17 Perimeter zone W	13.8	74	9	Failed
Auditorium LB2	90	38	3	Failed
Auditorium LB3	83.2	35	3	Failed
LB3 Box perimeter 1	100	54	5	Failed
LB2 Box perimeter 1	100	54	5	Failed
LB3 Box office space central	100	98	8	Failed
LB3 Box office perimeter	100	117	11	Failed
LB3 Box central	100	51	4	Failed
LB3 Box perimeter 2	99.9	75	8	Failed
LB2 Box office space central	100	102	9	Failed
LB2 Box office perimeter	100	104	9	Failed
LB2 Box central	100	51	4	Failed
LB2 Box perimeter 2	99.2	65	7	Failed
L00 Entrance Gallery 1	14.6	17	2	Failed
L00 Entrance Gallery 2	28.3	21	2	Failed
LB1 Public Garden	90	80	9	Failed
L00 Public Garden	52.9	60	8	Failed
L00A Public Garden	19.6	31	5	Failed
LB2 Public Garden	99.6	80	9	Failed
L00A Restaurant	55.8	29	3	Failed
L00 Restaurant	74.4	38	5	Failed

Table 16: TM52 compliance results for 1976 weather file

Space	Criterion 1 (% of hours)	Criterion 2 (Degree Hours)	Criterion 3 (Degree)	TM52 compliance
Office L17 Core Area NE	7.6	50	6	Failed
Office L17 Core Area NW	8.5	50	6	Failed
Office L17 Core Area S	9.2	55	6	Failed
Office L17 Core Area W	9.2	55	6	Failed
Office L17 Perimeter zone E	8.2	59	6	Failed
Office L17 Perimeter zone NE	8.2	53	6	Failed
Office L17 Perimeter zone NW	9.1	55	7	Failed
Office L17 Perimeter zone S	11.6	60	7	Failed
Office L17 Perimeter zone SW	15.5	64	8	Failed
Office L17 Perimeter zone W	12.3	63	8	Failed
Auditorium LB2	86.1	37	3	Failed
Auditorium LB3	80.2	27	3	Failed
LB3 Box perimeter 1	99.7	52	5	Failed
LB2 Box perimeter 1	99.7	55	5	Failed
LB3 Box office space central	100	97	8	Failed
LB3 Box office perimeter	100	108	10	Failed
LB3 Box central	99.9	51	4	Failed
LB3 Box perimeter 2	99.6	65	7	Failed
LB2 Box office space central	100	101	8	Failed
LB2 Box office perimeter	100	97	9	Failed
LB2 Box central	99.9	51	4	Failed
LB2 Box perimeter 2	97.9	56	6	Failed
L00 Entrance Gallery 1	13.8	29	3	Failed
L00 Entrance Gallery 2	31.9	29	3	Failed
LB1 Public Garden	88.5	79	9	Failed
L00 Public Garden	51.4	66	8	Failed
L00A Public Garden	21	43	5	Failed
LB2 Public Garden	99	84	8	Failed
L00A Restaurant	53.2	31	3	Failed
L00 Restaurant	69.1	40	4	Failed

7.2.3 Provision of Active Cooling

As highlighted by the overheating assessment, the use of natural/mechanical ventilation alone is not adequate to assure the occupants' comfort. Hence, active cooling is provided and the TM52 Criteria are satisfied, as shown in Table 17.

Table 17 - Compliance with TM52 when active cooling is provided

Space	Criterion 1 (% of hours)	Criterion 2 (Degree Hours)	Criterion 3 (Degree)	TM52 compliance
Office L17 Core Area NE	0	0	0	Passed
Office L17 Core Area NW	0	0	0	Passed
Office L17 Core Area S	0	0	0	Passed
Office L17 Core Area W	0	0	0	Passed
Office L17 Perimeter zone E	0	0	0	Passed
Office L17 Perimeter zone NE	0	0	0	Passed
Office L17 Perimeter zone NW	0	0	0	Passed
Office L17 Perimeter zone S	0	0	0	Passed
Office L17 Perimeter zone SW	0	0	0	Passed
Office L17 Perimeter zone W	0	0	0	Passed
Auditorium LB2	0	0	0	Passed
Auditorium LB3	0	0	0	Passed
LB3 Box perimeter 1	0	0	0	Passed
LB2 Box perimeter 1	0	0	0	Passed
LB3 Box office space central	0	0	0	Passed
LB3 Box office perimeter	0	0	0	Passed
LB3 Box central	0	0	0	Passed
LB3 Box perimeter 2	0	0	0	Passed
LB2 Box office space central	0	0	0	Passed
LB2 Box office perimeter	0	0	0	Passed
LB2 Box central	0	0	0	Passed
LB2 Box perimeter 2	0	0	0	Passed
L00 Entrance Gallery 1	0	0	0	Passed
L00 Entrance Gallery 2	0	0	0	Passed
LB1 Public Garden	0	0	0	Passed
L00 Public Garden	0	0	0	Passed
L00A Public Garden	0	0	0	Passed
LB2 Public Garden	0	0	0	Passed
L00A Restaurant	0	0	0	Passed
L00 Restaurant	0	0	0	Passed

A comparison of the cooling demand of the Actual and Notional buildings is shown in Table 18.

Table 18: Notional and 5KS Average cooling demand

	Area weighted average cooling demand (MJ/m^2)
Actual	90.9
Notional	148.8

For mechanically cooled buildings, a useful indicator of the occupants' thermal comfort is given by the Predicted Mean Vote (PMV). PMV is an index that predicts the average vote of a large group of people on a seven-point thermal comfort scale based on the heat balance of the human body, where 3

indicates "hot", -3 indicates "cold", and 0 is neutral. According to CIBSE TM52, a building is considered overheating if PMV is above 0.5. The PMV has been computed for the 5KS zones using the London DSY05 weather file. The results are shown in Figure 13 and Figure 14 for the peak day (23rd of July) and week (19th to 23rd of July), respectively.

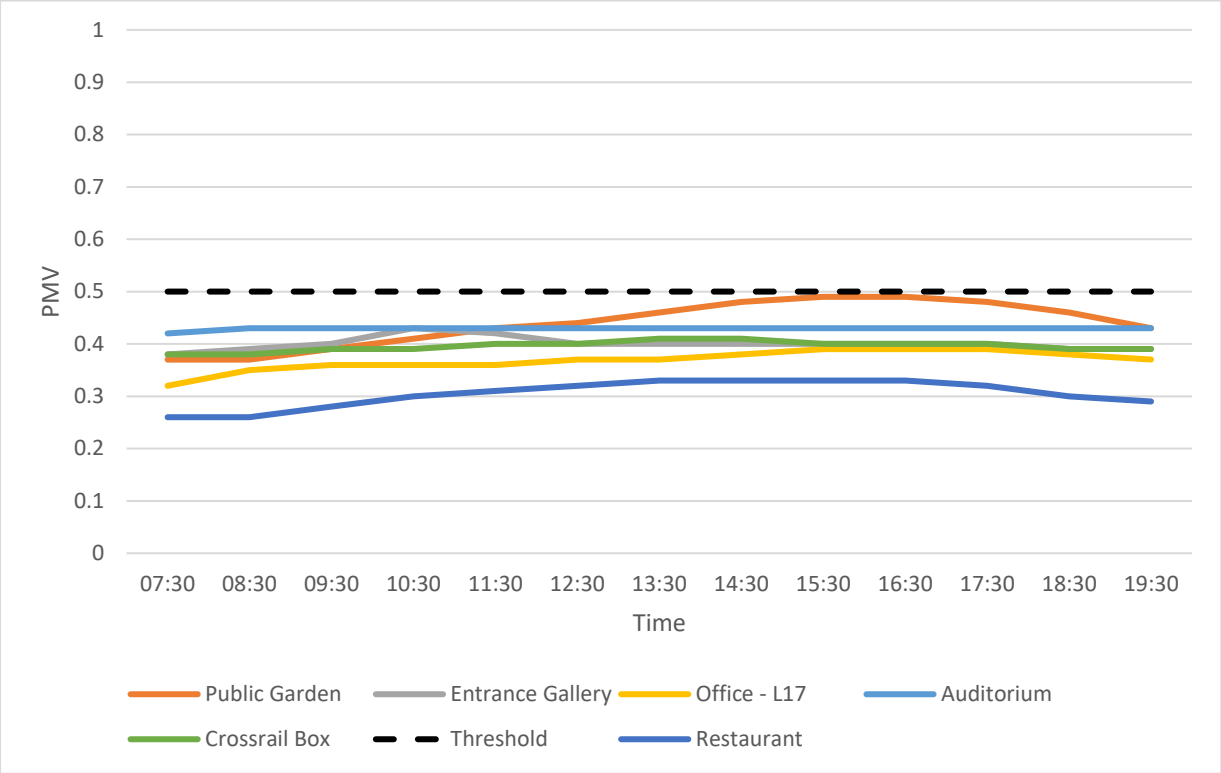


Figure 13: Predicted Mean Vote on the 23rd of July

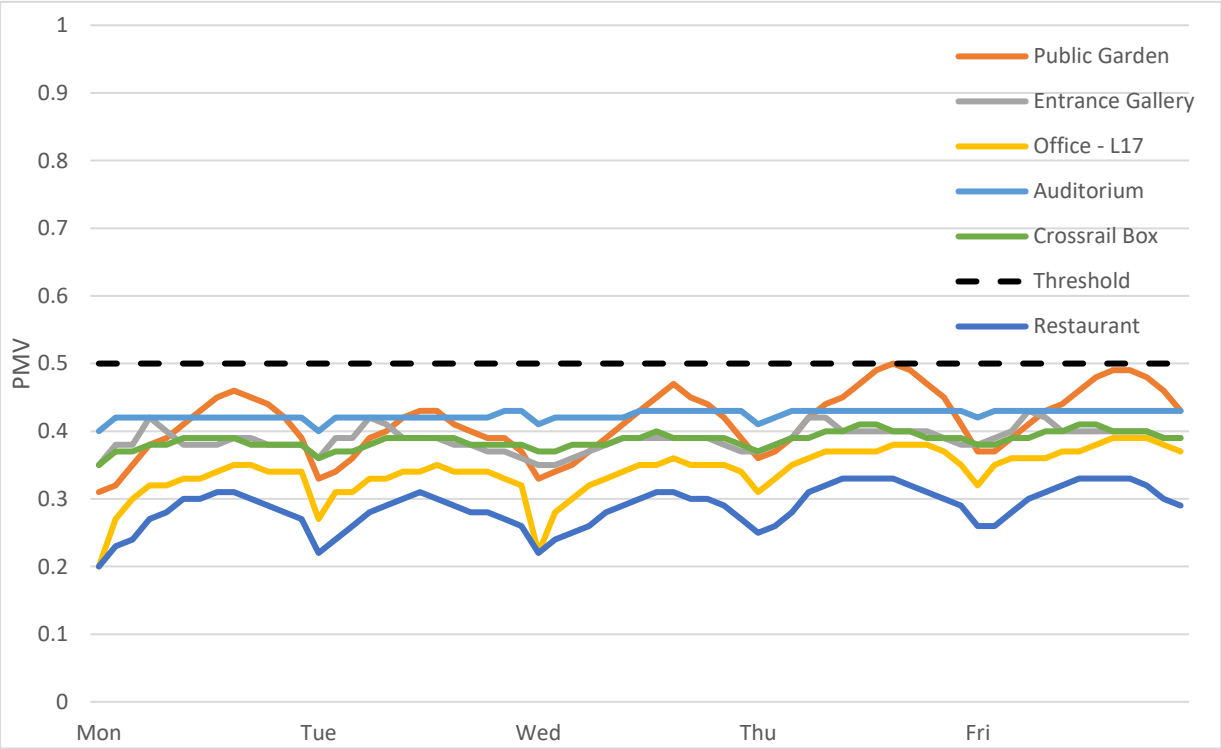


Figure 14: Predicted Mean Vote in the 19th to 23rd July week

8. BE CLEAN

As per the requirements of the London Plan, the following section investigates and identifies potential low carbon measures. The heating systems have been assessed with the following order of preference:

1. Connection to an area-wide heat network
2. Communal heating system

Section 8.1 discusses the feasibility the connection of 5KS to an existing district heating network. In Section 8.2 and Section 8.3, the carbon reduction performance of the on-site communal heating system is assessed against the Building Regulations Part L 2013 requirement.

8.1 Existing and Planned Networks

District heating (DH) is a method of delivering heat from a variation of heat producing sources to several heat customers. Heat produced from fossil fuel sources such as natural gas, oil or renewables burned directly in boilers or through combined heat and power (CHP), or a combination of both, can be delivered to residential dwellings, commercial and public offices, schools, warehouses and factories, hospitals plus industrial process heating.

Conventionally the heat demand in a DH system is met by waste heat from power stations and energy from waste plants, utilising heat which would otherwise be wasted, subsequently it comes at a very low cost. In smaller schemes, it is common to look at installing heat production facilities, which may result in additional cost to the scheme.

The advantage of district heating is its flexibility, and the ability to utilise a variety of heat sources including what is known as called low-grade heat.

Communication with Westminster City Council regarding the availability of a local connection has not been responded to (Refer to Appendix 2). The London Heat Map shows existing (red lines) and potential (orange lines) DH networks around the Westminster area. It was found from the heat map that there are no existing DH networks or any being developed in the area that the proposed development would be able to link to. Therefore, the strategy of connection to DH networks is discounted from the proposed development. The nearest existing DH network is at Church Street, as shown in

Figure 15, a considerable distance that would make a connection not feasible or economically viable.

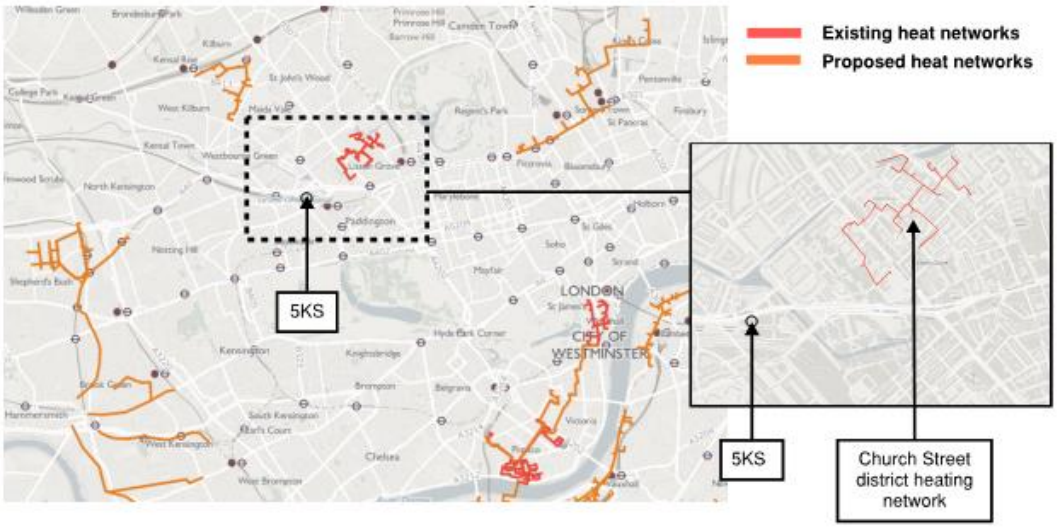


Figure 15: London Heat Map (accessed online 08/07/2020) – Potential DH Networks surrounding the 5 Kingdom Street development

It should be noted that, due to the nature of the development, the relative heating demand of the proposed development is not significant. Heating will be provided by highly efficient heat pumps that operate with low carbon emissions compared to traditional district heating networks.

In addition to this, the scheme has been designed to allow for a future district heat network connection, should a low-carbon district heat network become available in the close proximity to 5KS. This has been achieved through a capped connection to the Primary distribution at lower box level.

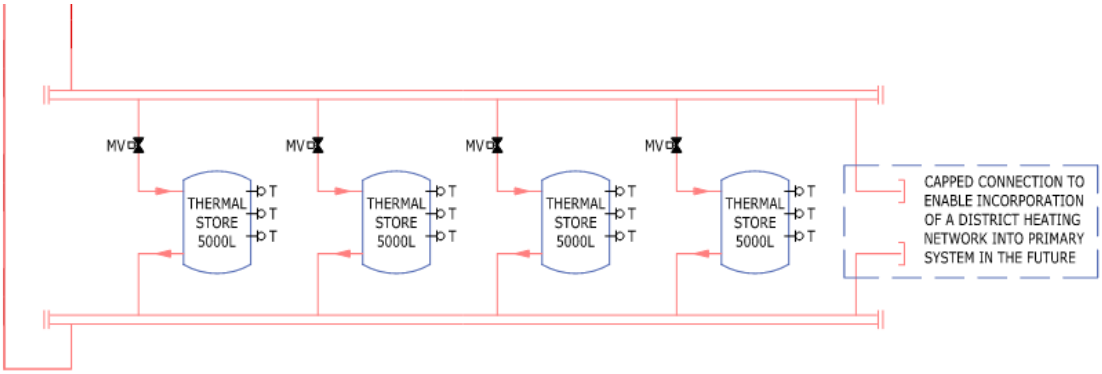


Figure 16: snapshot of stage 2 heating schematic showing capped future connection for district heating

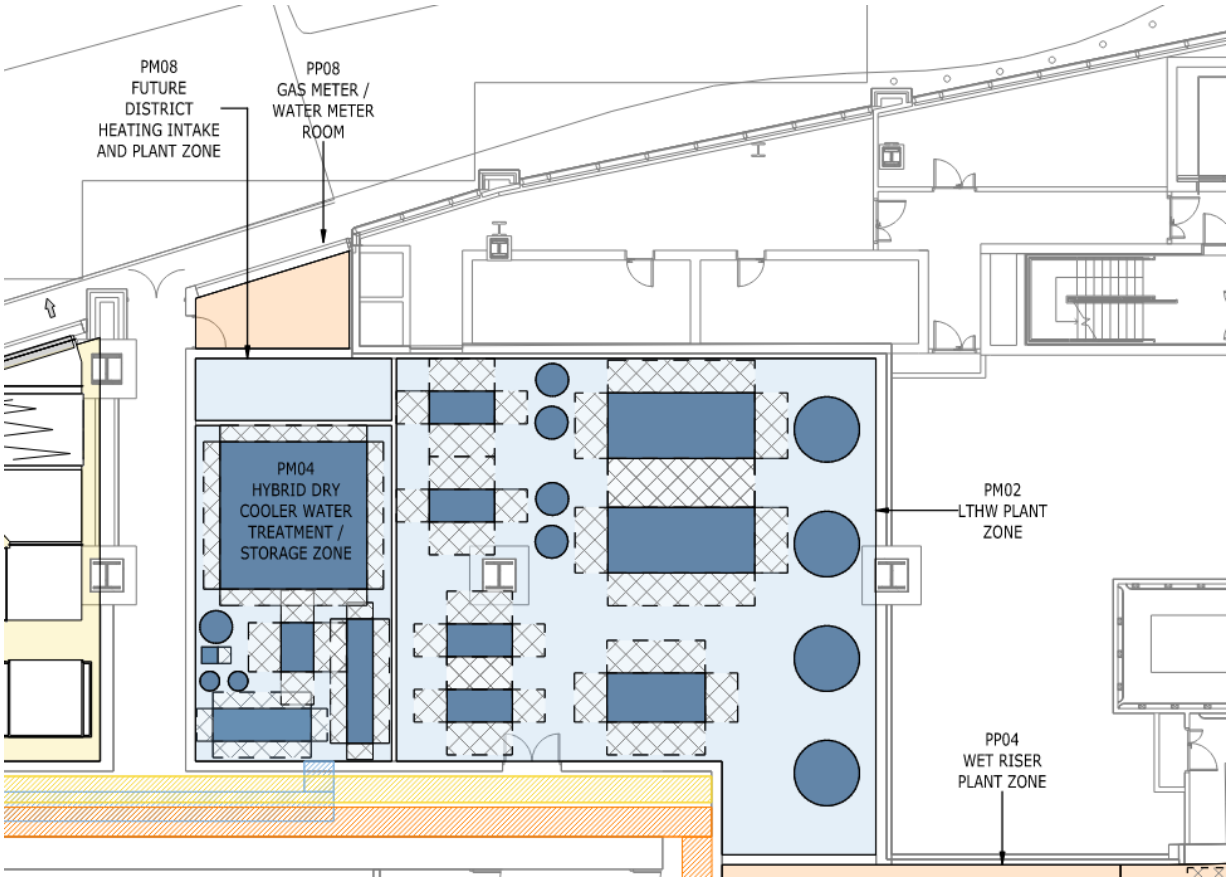


Figure 17: Snapshot of stage 2 plantroom layout showing space allowance for future district heating connection

8.2 Communal heating system

A combined heat and power (CHP) system is a potential method of providing a communal heating system. A CHP plant consists of an 'engine', which runs on fuels such as natural gas, driving an alternator to generate electricity. The heat produced by the engine and exhaust system is typically

utilised for buildings' heating systems. However, the CHP option was not proposed for the 5KS development due to the concerns relevant to this technology in combination with low heat demand for the building type. CHP systems are not appropriate for this development for the following reasons:

- They do not deliver the lowest carbon dioxide emissions, given electrical grid decarbonisation
- They have a negative impact on local air quality

8.3 Be Clean Results

After the Be Clean stage, the emission rate of the development is shown in the table below:

Table 19 Estimated UK Building Regulations Compliant Be Clean Emissions

Building Regulations Part L 2013	Non-domestic (SAP 10) [Tonnes CO2/annum]	
	Regulated	Unregulated
Be CLEAN carbon emissions (BER)	629	627

9. BE GREEN

Once all suitable energy reduction and efficiency techniques have been considered, renewable energy technologies are assessed in order to further reduce the CO_2 emissions of the development where practical. The following technologies are accepted as renewable and are to be considered in the assessment:

- Air/water source heat pumps
- Photovoltaics (PVs)
- Ground source heat pumps
- Solar thermal hot water systems
- Wind turbines
- Biomass heating (excluded due to GLA guidance on emissions and air quality)

The site's constraints limit the size and capacity of each of the technologies, and hence the potential to reduce carbon emissions on this development varies with each technology. Biomass boilers or heat pumps for heating and hot water could deliver all or most of the demand and achieve a high carbon reduction whereas solar thermal hot water, photovoltaics, wind turbines and ground source heat pumps are physically limited by the site and could not deliver equivalent reductions.

The following qualitative assessment considers each of the technologies and their suitability for the development.

9.1 Analysis of Load Patterns

9.1.1 A Typical Month

Figure 18 shows the average and maximum daily heating and cooling loads for 5KS for March (a typical temperate month) based on the diversified profiles, compared with a baseline which comprises undiversified loads that align with the British Land Office Design Brief.

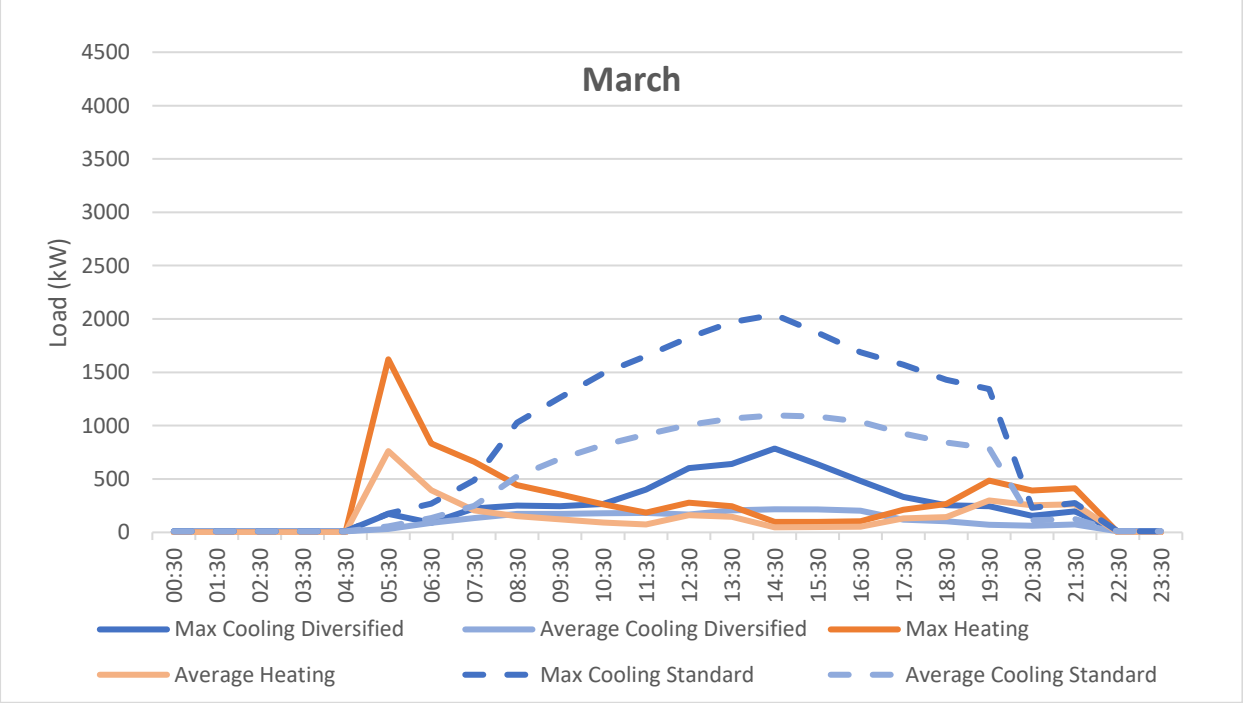


Figure 18: Heating and cooling loads – March

9.1.2 Annual Load Profiles - Cooling

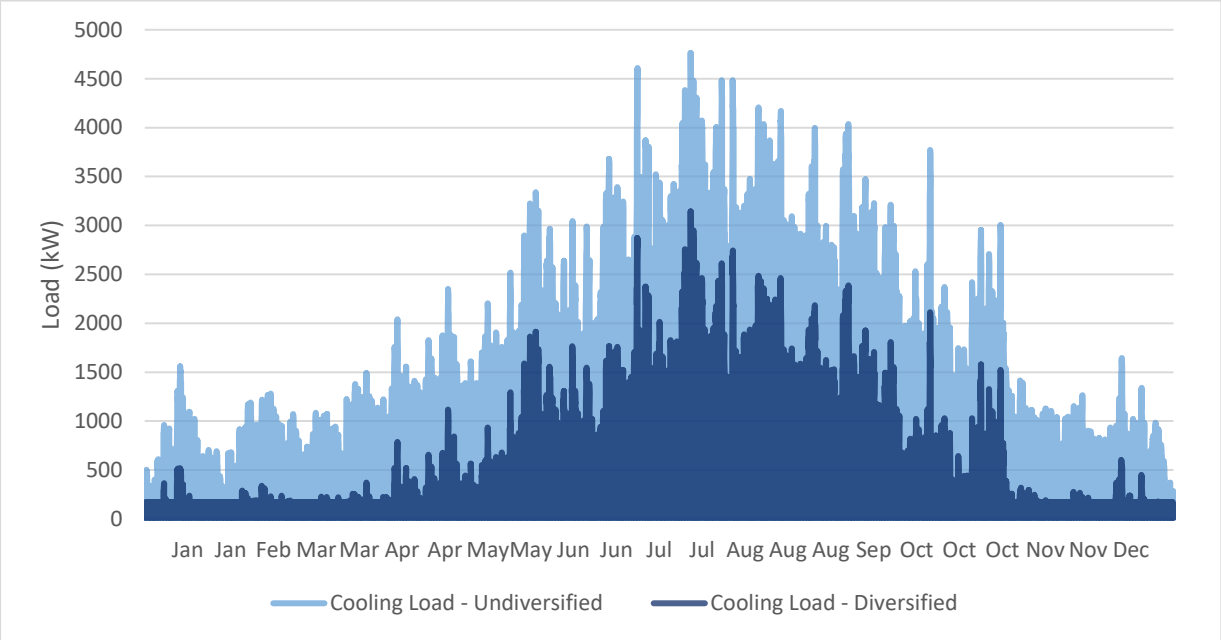


Figure 19: Annual cooling loads - comparison between diversified and baseline loads

It can be seen that there is a significant difference between the peak baseline and peak diversified cooling loads. This difference aligns with the design v actual assessment of cooling loads across six similar British Land office developments, as reported by Broadgate Estates. It can also be noted that in both the diversified and baseline cases, the average cooling load across the year is significantly lower than the annual peak.

The proposed design solution will therefore use the diversified loads to optimise plant and system selection whilst still providing overall capacity to meet the peak theoretical performance of the British Land office design criteria without diversity.

9.1.3 Annual Load Profiles – Heating

It is standard industry practice for heating loads to be calculated using a steady-state method that considers fabric, infiltration and ventilation heat losses only and does not consider internal heat gains, solar gains or thermal mass. Heating plant sized using this method will be capable of heating an unoccupied building at the briefed external design condition, which in the case of 5 Kingdom Street is -4 °C. As can be seen from the analysis of hourly outdoor temperatures, this condition rarely occurs, therefore heating plant is often under-utilised. This aligns with feedback received from Broadgate Estates.

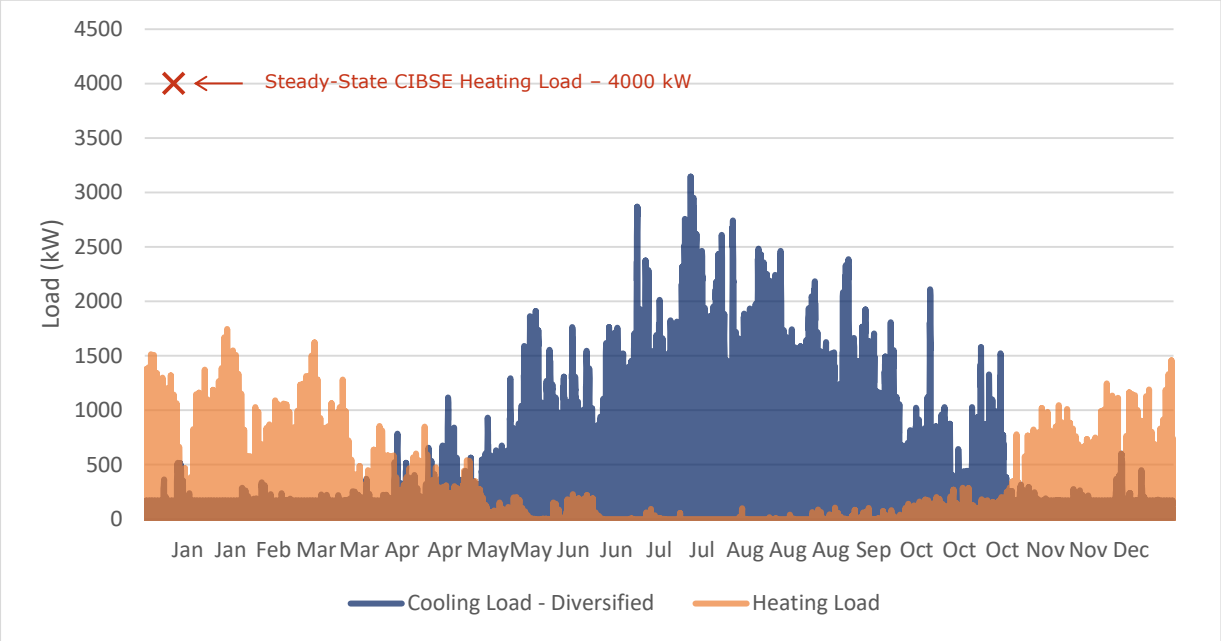


Figure 20: Annual heating loads overlaid with diversified cooling loads

Figure 20 shows that the average heating load is much lower than its steady-state equivalent, and the steady-state peak load is never reached. This is in part because of internal gains, which cannot be relied upon to meet a building's heat load, but is also strongly related to outdoor temperature, which is moderate for most of the year. Secondly, there is a significant amount of overlap between heating and cooling loads, due to a development such as 5KS being likely to have areas that will require cooling even when other areas require heating. This presents opportunities for utilisation of low-grade heat rejected from the cooling system to provide heating via heat pumps.

9.1.4 Hybrid Technologies and Performance

The following table summarises the range of available heating and cooling technologies that could be considered for application to 5KS. The Notional Part L Annual Efficiency is the figure that must be exceeded in order to see any carbon reduction benefit in a Part L Energy Assessment.

Table 20: Summary of heating and cooling technologies available for 5KS

Equipment	Notional Part L Annual Efficiency	Efficiency Typical Range	5KS Stage 2 Annual Efficiency
Gas Fired Boiler	0.96	0.92-0.97	
Electric Heating or DHW	0.96	1.0	
Air Source Heat Pump (Heating)	2.84	2.0-4.0	
Simultaneous (Heat Recovery) Air Source Heat Pump (Heating)	as above	6.0-8.0	4.23 (Weighted for whole system)
Simultaneous (Heat Recovery) Air Source Heat Pump (Cooling)	as above	6.0-8.0	7.0

Air Source Heat Pump (Cooling)	4.74	3.5-5.3	4.0-4.8
GSHP (Heating)	2.84	4.0-5.0	
GSHP (Cooling)	4.74	5.5-6.5	
Air Cooled Chiller	4.74	3.5-7.0	
Water Cooled Chiller	4.74	4.5-9.5	8.0 (Main) 5.4 (Jockey)

9.2 Air/Water Source Heat Pumps

Air/water Source Heat Pump systems use a refrigeration cycle in reverse, to extract low-grade heat from the outside air or water and transfer it into useful heat at a higher temperature, for use with space heating systems, and to generate domestic hot water.

The system is technically suited to the proposed development, for the following reasons:

- This system is practical for low temperature heating systems
- This technology is relatively robust and low maintenance
- The technology can be screened or incorporated on the roof, limiting visual impact
- As the technology is electrically driven, there is no on-site pollution impact
- Heat pump systems can also work in reverse cycle to provide cooling
- The heat pump can be arranged to provide heating and cooling to different zones simultaneously, transferring heat from cooling zones to heating zones thereby improving efficiency
- Therefore, this technology has been selected for the proposed development in combination with hybrid air cooled chillers in the communal cooling system to further reduce the carbon emission rate of the development
- In this study, it is proposed that a heat pump system shall deliver heating and DHW to the development

9.2.1 Proposed heat pump system operation

Central Heating Plant

The efficiency of an air source heat pump (ASHP) correlates to the external temperature. In heating mode, when delivering a heating water temperature of 45°C at external temperatures of -4°C to 12°C, a typical heat pump would have a COP in the range of 2.0-4.0. The Part L assessment assumes an annual seasonal performance COP of 2.84 for the notional building. This value should be exceeded through design optimisation.

The shortcoming of ASHPs is that the maximum heating demand in Winter coincides with the external conditions where the efficiency of the unit is lowest.

When there are coincident heating and cooling loads in the building, as is regularly the case for 5KS, a simultaneous heating and cooling ASHP that recovers waste heat can provide total COPs in excess of 7.0. The sizing and operation of the ASHPs therefore prioritises this mode of operation and is optimised for coincident loads.

Operation of the whole system will be optimised to satisfy the requirement for early morning heat up through controls and thermal storage, and maximise the time the system operates in simultaneous heating and cooling mode.

The seasonal heating COP of the ASHP is calculated to be 4.23 at Stage 2, however there will be scope to optimise this figure through detailed analysis at subsequent design stages.

The heat pump system will deliver 100% of the annual heating demand, and therefore must be sized to deliver the peak heating demand. The maximum heat demand required by the British Land brief is assessed as 1750 kW. The ASHP plant has a modular design that can meet this capacity. Four ASHPs are allowed for at Stage 2. This is comprised of:

- Two four-pipe (simultaneous heating & cooling) ASHPs each with a heating capacity of 400kW which provide heat recovery from heat rejected from the cooling system
- Two reversible ASHPs each with a heating capacity of 900kW

This central system will serve all non-domestic uses on the premises.

Central Cooling Plant

The chilled water system is proposed to comprise three distinct components:

1. Chilled water provided from the simultaneous ASHP operation when there are coincident heating and cooling demands in the building. Typically, this will be the operational mode from October to April
2. Water cooled chillers connected to dedicated hybrid dry cooler plant operating in the summer months (May-September) to meet high cooling loads. These will be sized to meet a diversified building load with additional capacity provided from the ASHP in cooling mode. The combined operation of the chiller plant and ASHPs will provide the full capacity of the non-diversified building design cooling demand
3. Two small jockey chillers (in an N+1 arrangement) to meet low cooling demands in winter when operation of the ASHPs gives unfavourable efficiencies, and to serve small "out of hours" cooling loads at all times of the year

This central system will serve all non-domestic uses on the premises

During all cooling modes heat recovery will be used for domestic hot water generation. The diversified peak cooling demand is assessed as 3150 kW and the undiversified peak cooling demand as 5400 kW.

- Two four-pipe (simultaneous heating & cooling) ASHPs each with a cooling capacity of 500 kW
- Two reversible ASHPs each with a cooling capacity of 1000kW
- Two hybrid dry coolers each with a capacity of 1250 kW (connected to water cooled chillers at lower box level)
- Two jockey chillers each with a cooling capacity of 200 kW

The cooling plant seasonal efficiency (PSEER) of all equipment combined is calculated as 6.0 at Stage 2. There will be scope to optimise this figure through detailed analysis at subsequent design stages.

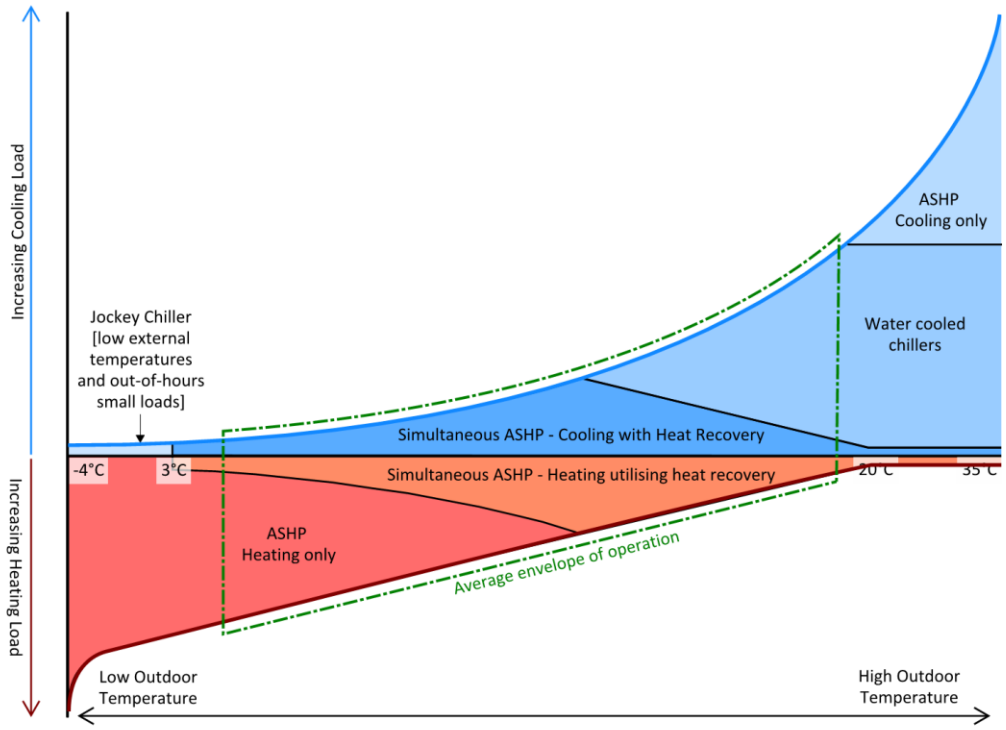


Figure 21: Heating and cooling plant operation diagram

Tenant Common Water Loops

The Crossrail Box end uses are currently unknown and therefore heating and cooling provision is made on a central plant basis only. A common water loop operating at between 20°C and 25°C will distribute around the tenanted areas, where local water source heat pumps provided by tenant fit-out works will use this loop as a source and sink of heat to provide heating and cooling to the conditioned zones. This is an efficient system in that waste heat from areas that require heating can be utilised in areas that require cooling. When there is a net heat demand the loop temperature will drop, and when there is a net cooling demand the loop temperature will rise. The loop will be maintained within its operative temperature range by connections from the main building heating and cooling systems.

A separate, smaller capacity water loop operating in a similar manner will be provided for the offices for future connection of tenant systems such as IT cooling equipment. This system will likely have a net heat rejection requirement.

Domestic Hot Water Generation

The building domestic hot water system will serve the showers and the hand basins in the office toilet areas in addition to future tenant uses in the Crossrail Box. The hot water demand is largest at the start of the day with use of the shower facilities whereas the demand for hot water usage for hand washing can be expected to be constant during the day.

The traditional approach is to provide hot water at 65°C using the main boiler plant or separate gas fired hot water heaters with capacity assessed against the peak morning use. Typically, this would be provided from 500kW of gas fired plant.

The Hybrid Energy Design utilises the building LTHW system and the inherent heat rejected from the cooling systems, and in summer the hybrid air cooler heat rejection loop, as sources of waste low-

grade heat, with heat pumps used to lift the water temperature to 65°C for domestic hot water generation and storage, with domestic hot water delivered to the building at 55°C. Thermal storage will allow a smaller capacity heat pump to operate on a continuous basis through the working day to maximise benefit from the available waste heat. The required electricity capacity of this system will be considerably lower than the required gas capacity of a traditional system.

Using dedicated heat pumps for hot water generation allows the building space heating system to be designed using low operating temperatures to optimise efficiency.

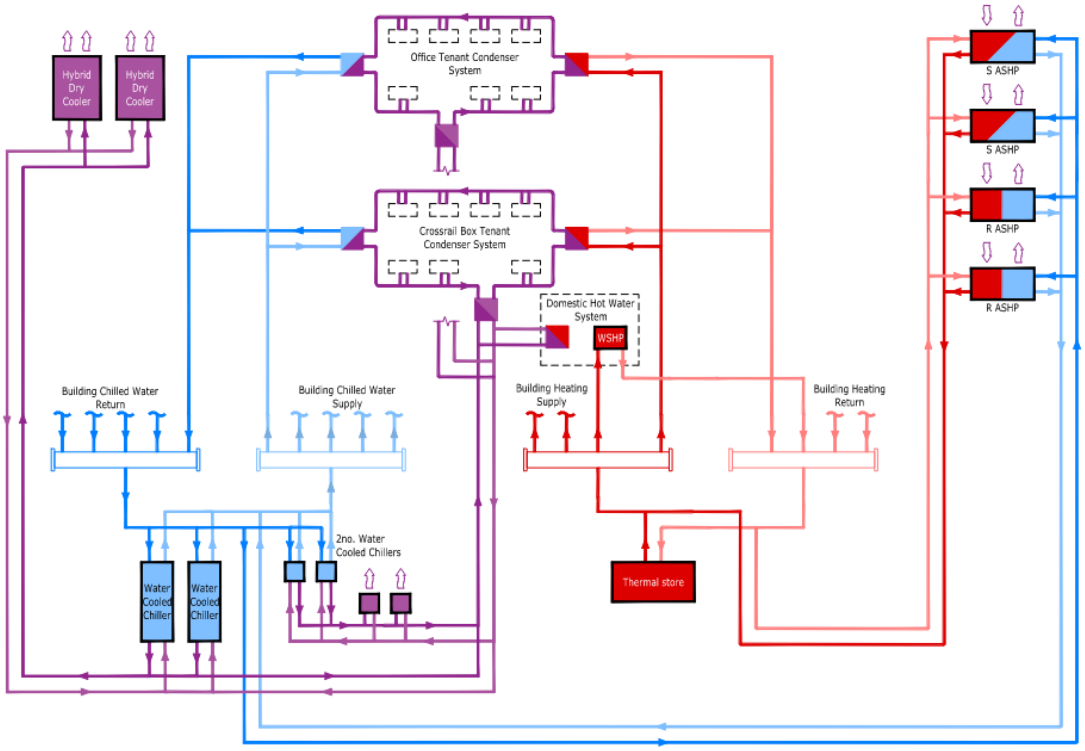


Figure 22: Hybrid energy solution concept schematic

System Water Temperatures

The operating temperatures of the heating and chilled water systems have significant effect on the efficiency of the system.

The proposed operational temperatures of the heating system are 45°C flow and 38-40°C return, optimised for maximum ASHP efficiency.

The proposed operational temperatures of the chilled water system are 7°C flow and 13°C return. In periods of reduced demand the chilled water temperatures would be elevated to 10°C flow and 16°C return to further increase system efficiencies.

Pump Energy and Periods of Low Demand

Pump energy is a significant part of a heating and cooling system, and potential energy savings can be made by optimising the design of the pumping solution to match the required heating/cooling demands as closely as possible, avoiding unnecessary high rates of water circulation.

In order to achieve this, the quantity of pump sets will be minimised and secondary pump sets will be in a modular arrangement with multiple pump sizes, to enable a combination of pumps to closely meet the system demand. Small "jockey" pumps will allow the systems to operate at very low demand to suit out of hours operation where just a single office floor may require heating or cooling at 2-3% of the system capacity.

This solution will permit an energy saving of approximately 50%; traditionally, pump sets would be selected as 100% duty/standby, or 3No pumps at 50% flow rate, with pump speed control typically providing a minimum pump operational duty of 70%, providing only coarse control and wasteful use of pumping energy.

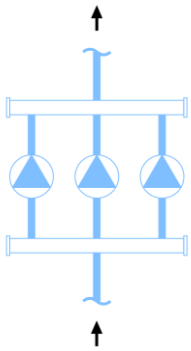


Figure 23: Traditional pumping arrangement

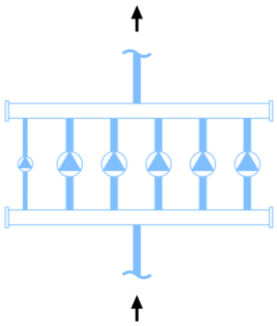


Figure 24: Improved pumping arrangement

It should be appreciated that the storage of heating/cooling within the large secondary systems is significant and residual heat/coolth in the system may be adequate to cater for the out of hours scenario without primary plant being required.

The controls system will be designed to operate the systems to achieve optimal operational efficiency, sequencing plant operation accordingly.

9.3 Ground Source Heat Pumps

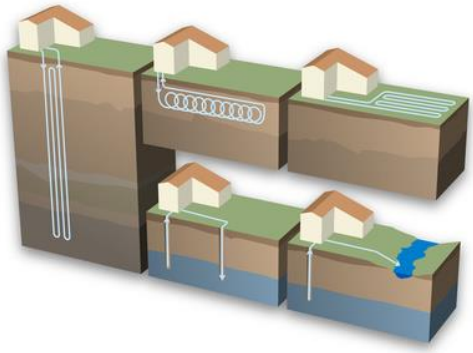


Figure 25 GSHP system

Ground Source Heat Pump (GSHP) technologies involve the use of underground water sources (aquifers) which retain a near constant temperature all year round, hence in winter the underground water is warmer than the surface air temperatures, and in summer it is cooler. This temperature difference can be used in combination with a heat pump to provide heating and cooling energy.

In order for the technology to work effectively, the ground conditions are required to provide adequate thermal transfer. The constrained plan area of the site does not allow either an open loop or horizontal mat to be used to extract and reject heat. This leaves closed loop vertical piles as the only option.

Extensive site investigations will be necessary to determine whether the local geological conditions are suitable and if there are any obstructions to the pile locations bearing in mind the piles are likely to be in the order of 100m deep.

A ground source heat pump installation would not be cost effective on this site and it would not achieve high carbon reductions when compared to other technologies such as air source heat pumps and biomass boilers. In addition, the Crossrail tunnels under the proposed development, cause further obstructions for the GSHP's installation.

Therefore, GSHP has been rejected in favour of the air source solution.

9.4 Solar Thermal Hot Water

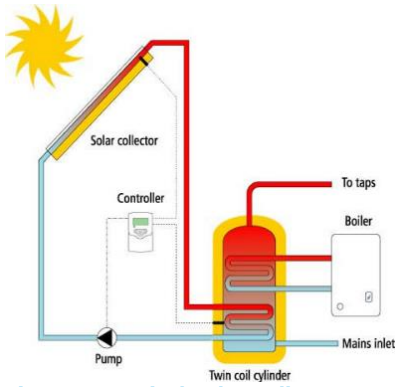


Figure 26 Typical Solar Collector System

Figure 27 Solar thermal evacuated tubes arranged as brise soleil

Solar Thermal Hot Water systems are a well-established renewable energy source to provide hot water for domestic use.

Solar thermal systems in the UK normally operate with a backup source of heat, such as gas or electricity. Due to the variable and unpredictable demand for hot water there would need to be significant thermal storage to collect heat when it is available in readiness for its use when the demand arises.

As the DHW is generated by the proposed heat pump system, this technology is not preferred for the development.

9.5 Photovoltaics

Figure 28 Typical PV roof tile array

Photovoltaic (PVs) systems convert energy from the sun into electricity through semi-conductor cells. PVs can supply electricity to the building they are installed on, or to any other load connected to the electricity grid. Energy can still be produced in overcast or cloudy conditions, so PVs can be used successfully in all parts of the UK, especially in South England.

Photovoltaic electricity generation is complementary to the heat generating solutions and does not replace or reduce the capacity of the other technologies. The only competing technology is solar thermal due to the conflict for space on the roof of the development.

The proposed energy strategy aims to maximise the benefits of the available roof space using the available area for air source heat pumps/chillers and green zones to contribute to biodiversity and mitigate the heat island effect.

If implemented, PV panels would have a very limited contribution (less than 1%) and they would either reduce the green areas or overlap with the space allocated for the energy generation system. Therefore, solar PV is not recommended for the proposed development.

9.6 Wind Turbines

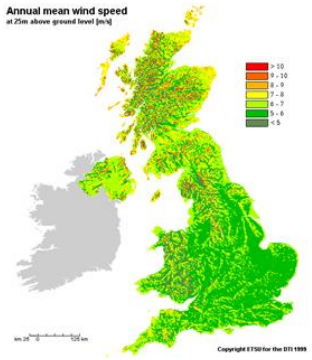


Figure 29 Wind Turbine and UK Wind Map

Wind turbines harness the power of the wind to produce electricity through circular motion. They can produce clean electricity with no associated carbon emissions, and range in outputs from watts to megawatts.

Recorded data identifies the UK as the windiest country in Europe, and as such wind power is one of the UK's most promising renewable energy technologies, and already provides electricity for nearly a quarter of million homes. Wind turbines are a technically proven technology using aerodynamic forces ('lift' and 'drag') to produce mechanical power that can then be converted to electricity.

In urban areas, the wind is characterised by increased turbulence which reduces the efficiency of wind turbines which add to these variations. Wind turbines are known to produce very low and unreliable outputs when mounted in urban environments and have been discounted from this assessment also because of spatial constraints.

9.7 Be Green Results

The incorporation of heat pump technologies, alongside the improvements made at previous stages of the Energy Hierarchy have led to the office components of the site meeting the London Plan target of 35% CO_2 reduction.

It is estimated that the incorporation of heat pumps to provide heating and DHW to the 5 kingdom Street development, the emission rate of the proposed development will reduce by **44%** compared to the Baseline Part L 2013 emission rate (based on SAP 10 emission factors).

Table 21 Estimated UK Building Regulations Compliant Be Green Emissions

Building Regulations Part L 2013	Non-domestic (SAP 10) [Tonnes CO2/annum]	
	Regulated	Unregulated
Be GREEN carbon emissions (BER)	428	627

10. MONITORING ROLE

10.1 Be Seen

In line with the 'be seen' element of the new Draft London Plan Sustainable Infrastructure (SI) policy 2, the developer makes a commitment to monitor and report on the energy performance of the development for at least five years post construction.

Figure 1: *'Be seen' process and responsibilities*

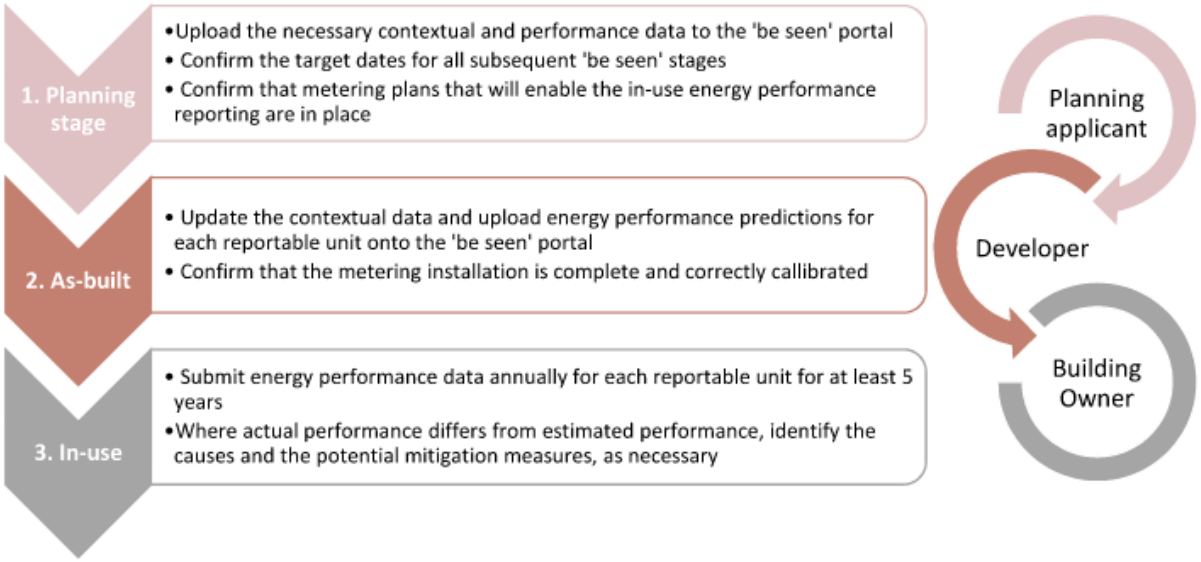


Figure 30 from GLA " Be Seen Energy Monitoring Guidance"

Planning Stage
Once planning approval has been granted, and within four weeks, the developer will provide accurate and verified estimates of each of the performance indicators relevant to the planning stage, using the "Be Seen " reporting spreadsheet.

As- Built Stage
Once the as-built design has been completed and prior to the building being handed over, the developer will provide an accurate and verified update of the estimated performance indicators submitted at planning stage

In- Use Stage

During the in-use stage, the owner will monitor and report accurate and verified annual energy performance data for the Energy Centre via the 'be seen' spreadsheet for at least five years once the defects liability period (DLP) is complete.

10.2 Heat Pump Performance

Monitoring of the heat pump system to ensure its operational performance is in line with the targets approved during planning has been established as a requirement for the proposed development by the GLA (refer to Section 3.2.3).

The heat pump system shall be monitored for three years following the completion of construction the proposed development. The metering and energy management strategy shall be developed in line with this requirement to ensure that all necessary data can be measured and reported. Correspondence detailing the scope of this monitoring role can be found in Appendix 5.

11. RESULTS AND CONCLUSION

The energy assessment presented in this report demonstrate a comprehensive approach to reducing carbon emissions associated with the proposed 5 Kingdom Street development according to the methodology and approach set out by the London Plan and the GLA Guidance on Energy Assessments (October 2018).

11.1 Energy Hierarchy Results

In this study, the future carbon emission factors (SAP10) have been used to assess the proposed development's carbon emission reduction performance. The energy hierarchy results are presented in the following tables and figures, and the conclusions are shown below:

Be Lean

Carbon savings have been achieved through careful design of the building envelope with a high thermal performance, which also reflects the architect's façade design to date. The M&E equipment has also been selected to meet high levels of efficiencies exceeding the requirements of the domestic compliance guides.

Through the energy saving measures outlined in Section 4, the overall development is anticipated to save **19%** on CO_2 emissions over the baseline case.

Be Clean

The potential connection to an existing or planned heat distribution network was investigated. There are no DH schemes in close proximity to the site. The nearest planned district heating network is at Church Street, a considerable distance that would make the solution not feasible or economically viable.

Should a low-carbon district heat network become available in the close proximity to the 5 Kingdom Street development, a space allowance has been made for a future connection.

An on-site CHP option has also been investigated but was not proposed for the 5 Kingdom Street development due to the concerns relevant to this technology in combination with low heat demand for the building type. CHP systems are not appropriate for this development for the following reasons:

- They do not deliver the lowest carbon dioxide emissions, given electrical grid decarbonisation;
- They do not help to protect local air quality.

Be Green

In the "Be Green" stage, a heat pump system has been introduced to provide heating and DHW for the proposed development. This results in a total carbon savings of **44%** for 5KS development against the Part L 2013 Target Emission Rate.

The optimum sustainable design measures for the 5 Kingdom Street development have been proposed to maximise the site-wide carbon reduction to achieve the 35% carbon savings requirement and further close to the zero-carbon target set by the planning authorities.

Results of the proposed development

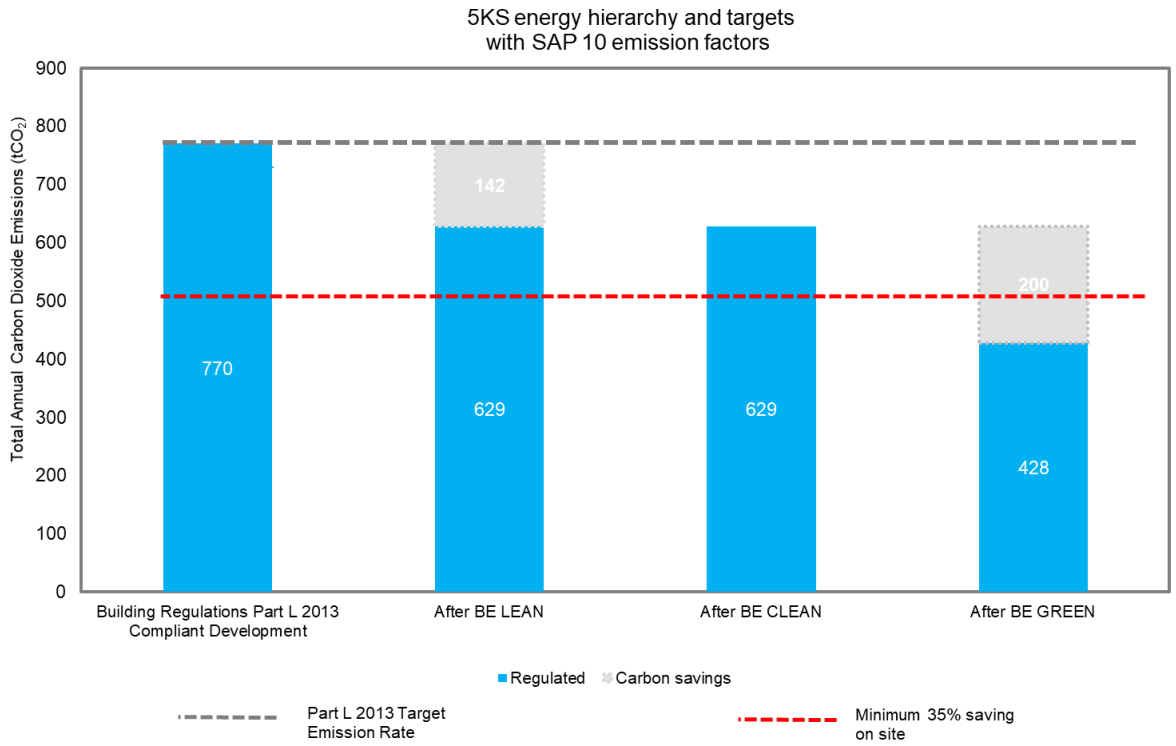


Figure 31 5KS development energy hierarchy results

Table 22 CO2 emissions after each stage of the London Plan Energy Hierarchy

CO2 emissions after each stage of the energy hierarchy [Part L 2013]		
	CO_2 Emissions [Tonnes CO_2/annum]	
	Regulated	**Unregulated**
Building Regulations Part L 2013 Compliant Development	770	627
After BE LEAN	629	627
After BE CLEAN	629	627
After BE GREEN	**428**	**627**

Table 23 Regulated carbon dioxide savings from each stage of the energy hierarchy

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	Total Regulated CO_2 Emissions Savings	
	[Tonnes CO_2/annum]	
Be lean: Savings from energy demand reduction	142	19%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	200	26%
Cumulative on-site savings	**342**	**44%**

Results of the office element

Table 24 CO2 emissions after each stage of the London Plan Energy Hierarchy (office element)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	CO_2 Emissions	
	[Tonnes CO_2/annum]	
	Regulated	Unregulated
Building Regulations Part L 2013 Compliant Development	623	548
After BE LEAN	512	548
After BE CLEAN	512	548
After BE GREEN	**339**	**548**

Table 25 Regulated carbon dioxide savings from each stage of the energy hierarchy (office element)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	Total Regulated CO_2 Emissions Savings	
	[Tonnes CO_2/annum]	
Be lean: Savings from energy demand reduction	112	18%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	172	28%
Cumulative on-site savings	**284**	**46%**

Results of the Crossrail box

Table 26 CO2 emissions after each stage of the London Plan Energy Hierarchy (Crossrail box)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	CO_2 Emissions	
	[Tonnes CO_2/annum]	
	Regulated	Unregulated
Building Regulations Part L 2013 Compliant Development	146	79
After BE LEAN	118	79
After BE CLEAN	118	79
After BE GREEN	**89**	**79**

Table 27 Regulated carbon dioxide savings from each stage of the energy hierarchy (Crossrail box)

Regulated CO2 emissions savings from each stage of the energy hierarchy [Part L 2013]		
	Total Regulated CO_2 Emissions Savings	
	[Tonnes CO_2/annum]	
Be lean: Savings from energy demand reduction	29	20%
Be clean: Savings from heat network	0	0%
Be green: Savings from renewable energy	29	19%
Cumulative on-site savings	**58**	**39%**

APPENDIX 1 – BRUKL FILES

1. **BRUKL – Whole proposed development**
2. **BRUKL – Office**
3. **BRUKL – Crossrail box**

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

5KS_Be Lean

As designed

Date: Fri Jul 24 16:51:18 2020

Administrative information

Building Details

Address: 5 Kingdom Street, London, W2 6BD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

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

Owner Details

Name: British Land

Telephone number:

Address: York House, 45 Seymour Street, London, W1H 7LX

Certifier details

Name: Jane Goodman (Contact Riccardo Zara)

Telephone number: 07977514095

Address: 240 Blackfriars Road, London, SE1 8NW

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	24.7
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.7
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.8
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	L1000106:Surf[0]
Floor	0.25	0.2	0.2	LB00003D:Surf[0]
Roof	0.25	0.18	0.18	L100011D:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.4	1.41	L0000046:Surf[8]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 5KS FCU OFFICE (HR = 0.67)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.67
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

2- 5KS RADIATORS

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- 5KS FCU WCS/SHOWERS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

4- 5KS FCU OTHER AREAS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

5- 5KS VAV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

6- 5KS PUBLIC GARDEN

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

7- 5KS KITCHEN ZONAL SUPPLY

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.1	-
Standard value	0.91*	4.7	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

8- 5KS COMMON WATER LOOP(HR = 0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.74	0	1.6	0.7
Standard value	0.91*	3.2	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L01 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L02 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L05 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L05 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L11 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L13 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L16 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L18 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 -CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L19 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - CORE WELFARE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (LOADING BAY)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (MANAGEMENT)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - MER	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - SHOWERS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - AUDITORIUM COATS/TICKETS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE LOBBY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - OFFICE ENTRANCE VOID	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE KITCHEN	-	-	-	-	-	-	-	-	1	-	N/A
L00 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - FLEXIBLE USE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - STAFF ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - AUDITORIUM FOYER	-	-	-	-	-	-	-	0.2	-	-	N/A
L19 - OFFICE AMENITY	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L00A - OFFICE (S)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A -OFFICE (N)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY SOUTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY NORTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-E	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - LOWER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - UPPER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - UPPER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - LOWER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L01 - CORE CORR 1(UNCOND)	-	80	-	129
L01 - CORE CORR 2(UNCOND)	-	80	-	71
L01 - CORE LR LIFT CORR	-	80	-	95
L01 - CORE STAIRS 1	-	80	-	63
L01 - CORE STAIRS 2	-	80	-	59
L01 - CORE WC	-	80	-	378
L01 - WC1	-	80	-	53
L02 - CORE CORR 1(UNCOND)	-	80	-	129
L02 - CORE CORR 2(UNCOND)	-	80	-	71
L02 - CORE LR LIFT CORR	-	80	-	95
L02 - CORE STAIRS 1	-	80	-	63
L02 - CORE STAIRS 2	-	80	-	59
L02 - CORE WC	-	80	-	378
L02 - OFFCE PERI NW	100	-	-	972
L02 - OFFICE CORE N	100	-	-	359
L02 - OFFICE CORE N	100	-	-	548
L02 - OFFICE CORE N	100	-	-	187
L02 - OFFICE CORE S	100	-	-	704
L02 - OFFICE CORE S	100	-	-	3819

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L02 - OFFICE PERI E	100	-	-	1427
L02 - OFFICE PERI NE	100	-	-	569
L02 - OFFICE PERI S	100	-	-	869
L02 - OFFICE PERI SW	100	-	-	1112
L02 - OFFICE PERI W	100	-	-	619
L02 - WC1	-	80	-	53
L03 - CORE CORR 1(UNCOND)	-	80	-	129
L03 - CORE CORR 3(UNCOND)	-	80	-	71
L03 - CORE LR LIFT CORR	-	80	-	95
L03 - CORE STAIRS 1	-	80	-	63
L03 - CORE STAIRS 3	-	80	-	59
L03 - CORE WC	-	80	-	378
L03 - OFFCE PERI NW	100	-	-	972
L03 - OFFICE CORE N	100	-	-	359
L03 - OFFICE CORE N	100	-	-	187
L03 - OFFICE CORE N	100	-	-	548
L03 - OFFICE CORE S	100	-	-	3819
L03 - OFFICE CORE S	100	-	-	704
L03 - OFFICE PERI E	100	-	-	1427
L03 - OFFICE PERI NE	100	-	-	569
L03 - OFFICE PERI S	100	-	-	869
L03 - OFFICE PERI SW	100	-	-	1112
L03 - OFFICE PERI W	100	-	-	619
L03 - WC1	-	80	-	53
L04 - CORE CORR 1(UNCOND)	-	80	-	129
L04 - CORE CORR 4(UNCOND)	-	80	-	71
L04 - CORE LR LIFT CORR	-	80	-	95
L04 - CORE STAIRS 1	-	80	-	63
L04 - CORE STAIRS 4	-	80	-	59
L04 - CORE WC	-	80	-	378
L04 - OFFCE PERI NW	100	-	-	972
L04 - OFFICE CORE N	100	-	-	187
L04 - OFFICE CORE N	100	-	-	548
L04 - OFFICE CORE N	100	-	-	359
L04 - OFFICE CORE S	100	-	-	704
L04 - OFFICE CORE S	100	-	-	3819
L04 - OFFICE PERI E	100	-	-	1427
L04 - OFFICE PERI NE	100	-	-	569
L04 - OFFICE PERI S	100	-	-	869
L04 - OFFICE PERI SW	100	-	-	1112
L04 - OFFICE PERI W	100	-	-	619
L04 - WC1	-	80	-	53
L05 - CORE CORR 1(UNCOND)	-	80	-	129

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L05 - CORE CORR 5(UNCOND)	-	80	-	71
L05 - CORE LR LIFT CORR	-	80	-	95
L05 - CORE STAIRS 1	-	80	-	63
L05 - CORE STAIRS 5	-	80	-	59
L05 - CORE WC	-	80	-	378
L05 - OFFCE PERI NW	100	-	-	972
L05 - OFFICE CORE N	100	-	-	548
L05 - OFFICE CORE N	100	-	-	187
L05 - OFFICE CORE N	100	-	-	359
L05 - OFFICE CORE S	100	-	-	704
L05 - OFFICE CORE S	100	-	-	3819
L05 - OFFICE PERI E	100	-	-	1427
L05 - OFFICE PERI NE	100	-	-	569
L05 - OFFICE PERI S	100	-	-	869
L05 - OFFICE PERI SW	100	-	-	1112
L05 - OFFICE PERI W	100	-	-	619
L05 - WC1	-	80	-	53
L06 - CORE CORR 1(UNCOND)	-	80	-	129
L06 - CORE CORR 6(UNCOND)	-	80	-	71
L06 - CORE LR LIFT CORR	-	80	-	95
L06 - CORE STAIRS 1	-	80	-	63
L06 - CORE STAIRS 6	-	80	-	59
L06 - CORE WC	-	80	-	378
L06 - OFFCE PERI NW	100	-	-	972
L06 - OFFICE CORE N	100	-	-	187
L06 - OFFICE CORE N	100	-	-	359
L06 - OFFICE CORE N	100	-	-	548
L06 - OFFICE CORE S	100	-	-	3819
L06 - OFFICE CORE S	100	-	-	704
L06 - OFFICE PERI E	100	-	-	1427
L06 - OFFICE PERI NE	100	-	-	569
L06 - OFFICE PERI S	100	-	-	869
L06 - OFFICE PERI SW	100	-	-	1112
L06 - OFFICE PERI W	100	-	-	619
L06 - WC1	-	80	-	53
L07 - CORE CORR 1(UNCOND)	-	80	-	129
L07 - CORE CORR 7(UNCOND)	-	80	-	71
L07 - CORE LR LIFT CORR	-	80	-	95
L07 - CORE STAIRS 1	-	80	-	63
L07 - CORE STAIRS 7	-	80	-	59
L07 - CORE WC	-	80	-	378
L07 - OFFCE PERI NW	100	-	-	972
L07 - OFFICE CORE N	100	-	-	187

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L07 - OFFICE CORE N	100	-	-	359
L07 - OFFICE CORE N	100	-	-	548
L07 - OFFICE CORE S	100	-	-	704
L07 - OFFICE CORE S	100	-	-	3819
L07 - OFFICE PERI E	100	-	-	1427
L07 - OFFICE PERI NE	100	-	-	569
L07 - OFFICE PERI S	100	-	-	869
L07 - OFFICE PERI SW	100	-	-	1112
L07 - OFFICE PERI W	100	-	-	619
L07 - WC1	-	80	-	53
L08 - CORE CORR 1(UNCOND)	-	80	-	129
L08 - CORE CORR 8(UNCOND)	-	80	-	71
L08 - CORE LR LIFT CORR	-	80	-	95
L08 - CORE STAIRS 1	-	80	-	63
L08 - CORE STAIRS 8	-	80	-	59
L08 - CORE WC	-	80	-	378
L08 - OFFCE PERI NW	100	-	-	972
L08 - OFFICE CORE N	100	-	-	359
L08 - OFFICE CORE N	100	-	-	187
L08 - OFFICE CORE N	100	-	-	548
L08 - OFFICE CORE S	100	-	-	3819
L08 - OFFICE CORE S	100	-	-	704
L08 - OFFICE PERI E	100	-	-	1427
L08 - OFFICE PERI NE	100	-	-	569
L08 - OFFICE PERI S	100	-	-	869
L08 - OFFICE PERI SW	100	-	-	1112
L08 - OFFICE PERI W	100	-	-	619
L08 - WC1	-	80	-	53
L09 - CORE CORR 1(UNCOND)	-	80	-	129
L09 - CORE CORR 9(UNCOND)	-	80	-	71
L09 - CORE LR LIFT CORR	-	80	-	95
L09 - CORE STAIRS 1	-	80	-	63
L09 - CORE STAIRS 9	-	80	-	59
L09 - CORE WC	-	80	-	378
L09 - OFFCE PERI NW	100	-	-	972
L09 - OFFICE CORE N	100	-	-	359
L09 - OFFICE CORE N	100	-	-	548
L09 - OFFICE CORE N	100	-	-	187
L09 - OFFICE CORE S	100	-	-	704
L09 - OFFICE CORE S	100	-	-	3819
L09 - OFFICE PERI E	100	-	-	1427
L09 - OFFICE PERI NE	100	-	-	569
L09 - OFFICE PERI S	100	-	-	869

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L09 - OFFICE PERI SW	100	-	-	1112
L09 - OFFICE PERI W	100	-	-	619
L09 - WC1	-	80	-	53
L10 - CORE CORR 1	-	80	-	181
L10 - CORE CORR 1(UNCOND)	-	80	-	134
L10 - CORE CORR 2	-	80	-	176
L10 - CORE LR LIFT CORR	-	80	-	95
L10 - CORE STAIRS 1	-	80	-	59
L10 - CORE STAIRS 1	-	80	-	63
L10 - CORE WC 1	-	80	-	146
L10 - CORE WC 2	-	80	-	86
L10 - CORE WC 3	-	80	-	55
L10 - CORE WC 4	-	80	-	61
L10 - CORE WC 5	-	80	-	53
L10 - OFFCE PERI NW	100	-	-	972
L10 - OFFICE CORE N	100	-	-	548
L10 - OFFICE CORE N	100	-	-	359
L10 - OFFICE CORE S	100	-	-	3510
L10 - OFFICE PERI E	100	-	-	1649
L10 - OFFICE PERI NE	100	-	-	282
L10 - OFFICE PERI NE	100	-	-	649
L10 - OFFICE PERI S	100	-	-	847
L10 - OFFICE PERI SW	100	-	-	1112
L10 - OFFICE PERI W	100	-	-	619
L11 - CORE CORR 1	-	80	-	181
L11 - CORE CORR 1(UNCOND)	-	80	-	134
L11 - CORE CORR 2	-	80	-	176
L11 - CORE LR LIFT CORR	-	80	-	87
L11 - CORE STAIRS 1	-	80	-	59
L11 - CORE STAIRS 1	-	80	-	63
L11 - CORE WC 1	-	80	-	146
L11 - CORE WC 2	-	80	-	86
L11 - CORE WC 3	-	80	-	55
L11 - CORE WC 4	-	80	-	61
L11 - CORE WC 5	-	80	-	53
L11 - OFFCE PERI NW	100	-	-	972
L11 - OFFICE CORE N	100	-	-	359
L11 - OFFICE CORE N	100	-	-	557
L11 - OFFICE CORE S	100	-	-	3531
L11 - OFFICE PERI E	100	-	-	1649
L11 - OFFICE PERI NE	100	-	-	282
L11 - OFFICE PERI NE	100	-	-	649
L11 - OFFICE PERI S	100	-	-	847

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L11 - OFFICE PERI SW	100	-	-	1112
L11 - OFFICE PERI W	100	-	-	619
L12 - CORE CORR 1	-	80	-	181
L12 - CORE CORR 1(UNCOND)	-	80	-	134
L12 - CORE CORR 2	-	80	-	176
L12 - CORE STAIRS 1	-	80	-	59
L12 - CORE STAIRS 1	-	80	-	63
L12 - CORE WC 1	-	80	-	146
L12 - CORE WC 2	-	80	-	86
L12 - CORE WC 3	-	80	-	55
L12 - CORE WC 4	-	80	-	61
L12 - CORE WC 5	-	80	-	53
L12 - OFFICE CORE NE	100	-	-	237
L12 - OFFICE CORE NW	100	-	-	248
L12 - OFFICE CORE S	100	-	-	3358
L12 - OFFICE CORE W	100	-	-	1242
L12 - OFFICE PERI E	100	-	-	1649
L12 - OFFICE PERI NE	100	-	-	698
L12 - OFFICE PERI NW	100	-	-	1017
L12 - OFFICE PERI S	100	-	-	847
L12 - OFFICE PERI SW	100	-	-	976
L12 - OFFICE PERI W	100	-	-	832
L13 - CORE CORR 1	-	80	-	181
L13 - CORE CORR 1(UNCOND)	-	80	-	134
L13 - CORE CORR 2	-	80	-	176
L13 - CORE STAIRS 1	-	80	-	59
L13 - CORE STAIRS 1	-	80	-	63
L13 - CORE WC 1	-	80	-	146
L13 - CORE WC 2	-	80	-	86
L13 - CORE WC 3	-	80	-	55
L13 - CORE WC 4	-	80	-	61
L13 - CORE WC 5	-	80	-	53
L13 - OFFICE CORE NE	100	-	-	237
L13 - OFFICE CORE NW	100	-	-	248
L13 - OFFICE CORE S	100	-	-	3358
L13 - OFFICE CORE W	100	-	-	1242
L13 - OFFICE PERI E	100	-	-	1649
L13 - OFFICE PERI NE	100	-	-	698
L13 - OFFICE PERI NW	100	-	-	1017
L13 - OFFICE PERI S	100	-	-	847
L13 - OFFICE PERI SW	100	-	-	976
L13 - OFFICE PERI W	100	-	-	832
L14 - CORE CORR 1	-	80	-	181

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L14 - CORE CORR 1(UNCOND)	-	80	-	134
L14 - CORE CORR 2	-	80	-	176
L14 - CORE STAIRS 1	-	80	-	63
L14 - CORE STAIRS 1	-	80	-	59
L14 - CORE WC 1	-	80	-	146
L14 - CORE WC 2	-	80	-	86
L14 - CORE WC 3	-	80	-	55
L14 - CORE WC 4	-	80	-	61
L14 - CORE WC 5	-	80	-	53
L14 - OFFICE CORE NE	100	-	-	237
L14 - OFFICE CORE NW	100	-	-	248
L14 - OFFICE CORE S	100	-	-	3358
L14 - OFFICE CORE W	100	-	-	1242
L14 - OFFICE PERI E	100	-	-	1649
L14 - OFFICE PERI NE	100	-	-	698
L14 - OFFICE PERI NW	100	-	-	1017
L14 - OFFICE PERI S	100	-	-	847
L14 - OFFICE PERI SW	100	-	-	976
L14 - OFFICE PERI W	100	-	-	832
L15 - CORE CORR 1	-	80	-	181
L15 - CORE CORR 1(UNCOND)	-	80	-	134
L15 - CORE CORR 2	-	80	-	176
L15 - CORE STAIRS 1	-	80	-	63
L15 - CORE STAIRS 1	-	80	-	59
L15 - CORE WC 1	-	80	-	146
L15 - CORE WC 2	-	80	-	86
L15 - CORE WC 3	-	80	-	55
L15 - CORE WC 4	-	80	-	61
L15 - CORE WC 5	-	80	-	53
L15 - OFFICE CORE NE	100	-	-	237
L15 - OFFICE CORE NW	100	-	-	248
L15 - OFFICE CORE S	100	-	-	3358
L15 - OFFICE CORE W	100	-	-	1242
L15 - OFFICE PERI E	100	-	-	1649
L15 - OFFICE PERI NE	100	-	-	698
L15 - OFFICE PERI NW	100	-	-	1017
L15 - OFFICE PERI S	100	-	-	847
L15 - OFFICE PERI SW	100	-	-	976
L15 - OFFICE PERI W	100	-	-	832
L16 - CORE CORR 1	-	80	-	181
L16 - CORE CORR 1(UNCOND)	-	80	-	134
L16 - CORE CORR 2	-	80	-	176
L16 - CORE STAIRS 1	-	80	-	59

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L16 - CORE STAIRS 1	-	80	-	63
L16 - CORE WC 1	-	80	-	146
L16 - CORE WC 2	-	80	-	86
L16 - CORE WC 3	-	80	-	55
L16 - CORE WC 4	-	80	-	61
L16 - CORE WC 5	-	80	-	53
L16 - OFFICE CORE NE	100	-	-	237
L16 - OFFICE CORE NW	100	-	-	248
L16 - OFFICE CORE S	100	-	-	3358
L16 - OFFICE CORE W	100	-	-	1242
L16 - OFFICE PERI E	100	-	-	1649
L16 - OFFICE PERI NE	100	-	-	698
L16 - OFFICE PERI NW	100	-	-	1017
L16 - OFFICE PERI S	100	-	-	847
L16 - OFFICE PERI SW	100	-	-	976
L16 - OFFICE PERI W	100	-	-	832
L17 - CORE CORR 1	-	80	-	181
L17 - CORE CORR 1(UNCOND)	-	80	-	134
L17 - CORE CORR 2	-	80	-	176
L17 - CORE STAIRS 1	-	80	-	59
L17 - CORE STAIRS 1	-	80	-	63
L17 - CORE WC 1	-	80	-	146
L17 - CORE WC 2	-	80	-	86
L17 - CORE WC 3	-	80	-	55
L17 - CORE WC 4	-	80	-	61
L17 - CORE WC 5	-	80	-	53
L17 - OFFICE CORE NE	100	-	-	237
L17 - OFFICE CORE NW	100	-	-	248
L17 - OFFICE CORE S	100	-	-	3358
L17 - OFFICE CORE W	100	-	-	1242
L17 - OFFICE PERI E	100	-	-	1649
L17 - OFFICE PERI NE	100	-	-	698
L17 - OFFICE PERI NW	100	-	-	1017
L17 - OFFICE PERI S	100	-	-	847
L17 - OFFICE PERI SW	100	-	-	976
L17 - OFFICE PERI W	100	-	-	832
L18 - CORE CORR 1	-	80	-	181
L18 - CORE CORR 1(UNCOND)	-	80	-	134
L18 - CORE CORR 2	-	80	-	176
L18 - CORE STAIRS 1	-	80	-	59
L18 - CORE STAIRS 1	-	80	-	63
L18 - CORE WC 1	-	80	-	146
L18 - CORE WC 2	-	80	-	86

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L18 - CORE WC 3	-	80	-	55
L18 - CORE WC 4	-	80	-	61
L18 - CORE WC 5	-	80	-	53
L18 - OFFICE CORE NE	100	-	-	237
L18 - OFFICE CORE NW	100	-	-	248
L18 - OFFICE CORE S	100	-	-	3358
L18 - OFFICE CORE W	100	-	-	1242
L18 - OFFICE PERI E	100	-	-	1649
L18 - OFFICE PERI NE	100	-	-	698
L18 - OFFICE PERI NW	100	-	-	1017
L18 - OFFICE PERI S	100	-	-	847
L18 - OFFICE PERI SW	100	-	-	976
L18 - OFFICE PERI W	100	-	-	832
L19 - CORE CORR 1(UNCOND)	-	80	-	153
L19 - CORE CORR 3(UNCOND)	-	80	-	94
L19 - CORE STAIRS 1	-	80	-	70
L19 - CORE STAIRS 3	-	80	-	67
LB1 - CAR PARK	-	80	-	2232
LB1 - CORE CORR	-	80	-	75
LB1 - CORE STAIRS	-	80	-	64
LB1 - CORE STAIRS	-	80	-	59
LB1 - CORE WC	-	80	-	71
LB1 - CORE WCS	-	80	-	200
LB1 - CORE WCS	-	80	-	298
LB1 - CYCLE PARK 2(UNCOND)	-	80	-	281
LB1 - LIFT VOID	-	80	-	128
LB1 - CORE CORR	-	80	-	39
LB1 - LIFT VOID	-	80	-	100
LB1 - FLEXIBLE USE	-	80	100	859
LB1 -CORE CORR	-	80	-	116
LB2 - AUDI	-	80	-	2614
LB2 - CORE CORR 1 (UNCOND)	-	80	-	111
LB2 - CORE CORR 2 (UNCOND)	-	80	-	71
LB2 - CORE STAIRS 1	-	80	-	63
LB2 - CORE STAIRS 2	-	80	-	59
LB2 - CORE WC	-	80	-	292
LB2 - STAIRS	-	80	-	96
LB2 - STAIRS	-	80	-	105
LB2 - VOID (EXT)	-	80	-	20
LB3 - AUDITORIUM	-	80	-	3101
LB3 - CORE CORR 1 (UNCOND)	-	80	-	111
LB3 - CORE CORR 2(UNCOND)	-	80	-	71
LB3 - CORE STAIRS 1	-	80	-	63

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LB3 - CORE STAIRS 2	-	80	-	59
LB3 - CORE WC	-	80	-	191
LB3 - RETAIL STAIRS	-	80	-	62
LB3 - STAIRS	-	80	-	96
LB3 - VOID (EXT)	-	80	-	20
L19 - CORE CORR 2	-	80	-	190
L20 - MACHINE ROOM	80	-	-	185
L20 - MACHINE ROOM	80	-	-	192
L20 - MACHINE ROOM	80	-	-	206
LB3 - CORE WELFARE	80	-	-	243
LB3 - OFFICE (LOADING BAY)	115	-	-	130
LB3 - PUBLIC USES REFUSE STORE	-	80	-	168
LB3 - UKPN	-	80	-	32
LB3 - OFFICE (MANAGEMENT)	115	-	-	130
LB3 - SPRINKLER AND WET RISER INLET	80	-	-	83
LB3 - SOLID VOID	-	80	-	6
LB3 - BOH CORR	-	80	-	206
LB3 - FIRE CONTROL ROOM	-	80	-	65
LB3 - RETAIL CORR(UNCOND)	-	80	-	564
LB3 - COMMS	80	-	-	301
LB3 - PLANT	80	-	-	3811
LB3 - PLANT (PH)	80	-	-	823
LB3 - EXTERNAL STAIRS	-	80	-	55
LB3 - BOH CORR	-	80	-	119
LB3 - COMMS ROOM	80	-	-	230
LB3 - REFUSE STORE	-	80	-	237
LB3 - CORR-UNCONDITIONED	-	80	-	132
LB3 - WCS	-	80	-	103
LB3 - PLANT CORR	-	80	-	188
LB3 - PLANT	80	-	-	2546
LB3 - PLANT CORR	-	80	-	195
LB3 - MER	80	-	-	338
LB3 - PLANT	80	-	-	103
LB2 - CYCLE PARK (UNCOND)	-	80	-	873
LB2 - EXTERNAL STAIRS	-	80	-	55
LB2 - SHOWERS	-	80	-	487
LB2 - CORR 1 (UNCOND)	-	80	-	179
LB2 - PLANT	80	-	-	321
LB2 - WCS	-	80	-	166
LB2 - BOH	-	80	-	53
LB2 - PLANT (GARDEN VENT)	80	-	-	989
LB2 - AUDITORIUM COATS/TICKETS	80	-	-	1492
LB2 - CORR (UNCON)	-	80	-	144

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LB2 - PLANT	80	-	-	420
LB2 - WCS	-	80	-	918
LB2 - HEATING PLANT	80	-	-	656
LB2 - COOLING PLANT	-	80	-	1302
LB1 - CYCLE PARKING SHORT STAY	-	80	-	222
LB1 - PUBLIC ROUTE/GARDEN	-	80	-	1957
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	285
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	54
L00 - OFFICE LOBBY	100	-	-	229
L00 - CAFE/RESTAURANT VOID	-	80	-	463
L00A - OFFICE ENTRANCE VOID	-	80	-	0
L00A - PUBLIC GARDEN VOID	-	80	-	14
L00A - FLEXIBLE USE	-	80	100	547
L00A - FLEXIBLE USE STAIRS	-	80	-	57
L00A - FLEXIBLE USE KITCHEN	-	80	-	471
L00 - FLEXIBLE USE STAIRS	-	80	-	66
L00 - FLEXIBLE USE	-	80	100	750
L00 - FLEXIBLE USE WCS	-	80	-	108
L00 - OFFICE ENTRANCE/GALLERY	100	-	-	250
L00 - LIFT LOBBY (OPEN)	100	-	-	320
L00 - CORE STAIRS	-	80	-	59
L00 - CORE CORR (UNCON)	-	80	-	75
L00 - LIFT LOBBY (OPEN)	100	-	-	476
L00 - CORE STAIR	-	80	-	64
L00 - CORE CORR (UNCON)	-	80	-	116
L00 - CORE WC	-	80	-	70
L00A - CORE WCS	-	80	-	200
L00A - CORE STAIRS	-	80	-	64
L00A - CORE CORR (UNCON)	-	80	-	116
L00A - CORE CORR 2	-	80	-	141
L00A - CORE STAIR	-	80	-	59
L00A - CORE CORR (UNCON)	-	80	-	75
LB3 - STAFF ROOM	80	-	-	169
LB2 - AUDITORIUM FOYER	-	80	-	496
L19 - OFFICE AMENITY	-	80	100	691
LB2 - PUBLIC GARDEN LOWER LEVEL	-	80	100	998
LB2 - VOID BELOW STAIRS	80	-	-	185
L00A - OFFICE (S)	100	-	-	1934
L00A -OFFICE (N)	100	-	-	2244
L00 - OFFICE ENTRANCE/GALLERY SOUTH	100	-	-	2356
L00 - OFFICE ENTRANCE/GALLERY NORTH	100	-	-	3126
L01 - FLEXIBLE WORKSPACE PERI NW	100	-	-	971
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	357

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	262
L01 - FLEXIBLE WORKSPACE CORE W	100	-	-	104
L01 - FLEXIBLE WORKSPACE PERI S	100	-	-	869
L01 - FLEXIBLE WORKSPACE PERI E	100	-	-	1427
L01 - FLEXIBLE WORKSPACE CORE E	100	-	-	704
L01 - FLEXIBLE WORKSPACE CORE S	100	-	-	3819
L01 - FLEXIBLE WORKSPACE PERI NE	100	-	-	569
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	187
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	773
LB3 - LOWER BOX GYM PERI	-	100	-	726
LB2 - UPPER BOX GYM PERI	-	100	-	204
L01 - FLEXIBLE WORKSPACE PERI SW	100	-	-	1112
LB3 - LOWER BOX OFFICE PERI	100	-	-	4742
LB2 - UPPER BOX OFFICE PERI	100	-	-	2906
LB2 - UPPER BOX OFFICE SPACE	100	-	-	7794
LB3 - LOWER BOX OFFICE SPACE	100	-	-	7869
LB3 - LOWER BOX GYM	-	100	-	1032
LB3 - LOWER BOX RETAIL	-	100	100	1837
LB3 - LOWER BOX CONFERENCE	-	100	100	2200
LB2 - UPPER BOX RETAIL	-	100	100	724
LB2 - UPPER BOX CONFERENCE	-	100	100	1772
LB2 - UPPER BOX GYM	-	100	-	693

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L01 - CORE LR LIFT CORR	N/A	N/A
L01 - CORE WC	N/A	N/A
L01 - WC1	N/A	N/A
L02 - CORE LR LIFT CORR	N/A	N/A
L02 - CORE WC	N/A	N/A
L02 - OFFCE PERI NW	NO (-62.6%)	NO
L02 - OFFICE CORE N	NO (-63.2%)	NO
L02 - OFFICE CORE N	NO (-64.8%)	NO
L02 - OFFICE CORE N	NO (-61.2%)	NO
L02 - OFFICE CORE S	NO (-83.3%)	NO
L02 - OFFICE CORE S	NO (-88.6%)	NO
L02 - OFFICE PERI E	NO (-55%)	NO
L02 - OFFICE PERI NE	NO (-65.9%)	NO
L02 - OFFICE PERI S	NO (-51.6%)	NO
L02 - OFFICE PERI SW	NO (-42.6%)	NO
L02 - OFFICE PERI W	NO (-53.5%)	NO
L02 - WC1	N/A	N/A
L03 - CORE LR LIFT CORR	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L03 - CORE WC	N/A	N/A
L03 - OFFCE PERI NW	NO (-60.1%)	NO
L03 - OFFICE CORE N	NO (-61.2%)	NO
L03 - OFFICE CORE N	NO (-59.4%)	NO
L03 - OFFICE CORE N	NO (-62.6%)	NO
L03 - OFFICE CORE S	NO (-87.9%)	NO
L03 - OFFICE CORE S	NO (-82.6%)	NO
L03 - OFFICE PERI E	NO (-51.6%)	NO
L03 - OFFICE PERI NE	NO (-64.4%)	NO
L03 - OFFICE PERI S	NO (-46.6%)	NO
L03 - OFFICE PERI SW	NO (-38%)	NO
L03 - OFFICE PERI W	NO (-50.1%)	NO
L03 - WC1	N/A	N/A
L04 - CORE LR LIFT CORR	N/A	N/A
L04 - CORE WC	N/A	N/A
L04 - OFFCE PERI NW	NO (-60.1%)	NO
L04 - OFFICE CORE N	NO (-59%)	NO
L04 - OFFICE CORE N	NO (-62.6%)	NO
L04 - OFFICE CORE N	NO (-61.1%)	NO
L04 - OFFICE CORE S	NO (-81.9%)	NO
L04 - OFFICE CORE S	NO (-87.6%)	NO
L04 - OFFICE PERI E	NO (-47.8%)	NO
L04 - OFFICE PERI NE	NO (-64.1%)	NO
L04 - OFFICE PERI S	NO (-46.1%)	NO
L04 - OFFICE PERI SW	NO (-37.9%)	NO
L04 - OFFICE PERI W	NO (-50.1%)	NO
L04 - WC1	N/A	N/A
L05 - CORE LR LIFT CORR	N/A	N/A
L05 - CORE WC	N/A	N/A
L05 - OFFCE PERI NW	NO (-60.1%)	NO
L05 - OFFICE CORE N	NO (-62.5%)	NO
L05 - OFFICE CORE N	NO (-58.6%)	NO
L05 - OFFICE CORE N	NO (-61.1%)	NO
L05 - OFFICE CORE S	NO (-81.2%)	NO
L05 - OFFICE CORE S	NO (-87.4%)	NO
L05 - OFFICE PERI E	NO (-45.1%)	NO
L05 - OFFICE PERI NE	NO (-63.7%)	NO
L05 - OFFICE PERI S	NO (-46%)	NO
L05 - OFFICE PERI SW	NO (-37.9%)	NO
L05 - OFFICE PERI W	NO (-50.1%)	NO
L05 - WC1	N/A	N/A
L06 - CORE LR LIFT CORR	N/A	N/A
L06 - CORE WC	N/A	N/A
L06 - OFFCE PERI NW	NO (-60%)	NO
L06 - OFFICE CORE N	NO (-58.1%)	NO
L06 - OFFICE CORE N	NO (-61%)	NO
L06 - OFFICE CORE N	NO (-62.4%)	NO
L06 - OFFICE CORE S	NO (-87%)	NO
L06 - OFFICE CORE S	NO (-80.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L06 - OFFICE PERI E	NO (-42.5%)	NO
L06 - OFFICE PERI NE	NO (-63.2%)	NO
L06 - OFFICE PERI S	NO (-45.3%)	NO
L06 - OFFICE PERI SW	NO (-37.8%)	NO
L06 - OFFICE PERI W	NO (-50.1%)	NO
L06 - WC1	N/A	N/A
L07 - CORE LR LIFT CORR	N/A	N/A
L07 - CORE WC	N/A	N/A
L07 - OFFCE PERI NW	NO (-59.8%)	NO
L07 - OFFICE CORE N	NO (-57.6%)	NO
L07 - OFFICE CORE N	NO (-61%)	NO
L07 - OFFICE CORE N	NO (-62.3%)	NO
L07 - OFFICE CORE S	NO (-79.3%)	NO
L07 - OFFICE CORE S	NO (-86.8%)	NO
L07 - OFFICE PERI E	NO (-40.6%)	NO
L07 - OFFICE PERI NE	NO (-62.5%)	NO
L07 - OFFICE PERI S	NO (-44.8%)	NO
L07 - OFFICE PERI SW	NO (-37.7%)	NO
L07 - OFFICE PERI W	NO (-50.1%)	NO
L07 - WC1	N/A	N/A
L08 - CORE LR LIFT CORR	N/A	N/A
L08 - CORE WC	N/A	N/A
L08 - OFFCE PERI NW	NO (-59.7%)	NO
L08 - OFFICE CORE N	NO (-61%)	NO
L08 - OFFICE CORE N	NO (-56.7%)	NO
L08 - OFFICE CORE N	NO (-62.2%)	NO
L08 - OFFICE CORE S	NO (-86.5%)	NO
L08 - OFFICE CORE S	NO (-78.3%)	NO
L08 - OFFICE PERI E	NO (-38.6%)	NO
L08 - OFFICE PERI NE	NO (-60.7%)	NO
L08 - OFFICE PERI S	NO (-44.4%)	NO
L08 - OFFICE PERI SW	NO (-37.6%)	NO
L08 - OFFICE PERI W	NO (-50.1%)	NO
L08 - WC1	N/A	N/A
L09 - CORE LR LIFT CORR	N/A	N/A
L09 - CORE WC	N/A	N/A
L09 - OFFCE PERI NW	NO (-59.5%)	NO
L09 - OFFICE CORE N	NO (-60.9%)	NO
L09 - OFFICE CORE N	NO (-62%)	NO
L09 - OFFICE CORE N	NO (-54%)	NO
L09 - OFFICE CORE S	NO (-77.5%)	NO
L09 - OFFICE CORE S	NO (-86.2%)	NO
L09 - OFFICE PERI E	NO (-37.3%)	NO
L09 - OFFICE PERI NE	NO (-58.1%)	NO
L09 - OFFICE PERI S	NO (-44.3%)	NO
L09 - OFFICE PERI SW	NO (-38%)	NO
L09 - OFFICE PERI W	NO (-50.1%)	NO
L09 - WC1	N/A	N/A
L10 - CORE CORR 1	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L10 - CORE CORR 2	N/A	N/A
L10 - CORE LR LIFT CORR	N/A	N/A
L10 - CORE WC 1	N/A	N/A
L10 - CORE WC 2	N/A	N/A
L10 - CORE WC 3	N/A	N/A
L10 - CORE WC 4	N/A	N/A
L10 - CORE WC 5	N/A	N/A
L10 - OFFCE PERI NW	NO (-55%)	NO
L10 - OFFICE CORE N	NO (-58.2%)	NO
L10 - OFFICE CORE N	NO (-57.2%)	NO
L10 - OFFICE CORE S	NO (-84.4%)	NO
L10 - OFFICE PERI E	NO (-21%)	NO
L10 - OFFICE PERI NE	NO (-45.1%)	NO
L10 - OFFICE PERI NE	NO (-49.3%)	NO
L10 - OFFICE PERI S	NO (-35.8%)	NO
L10 - OFFICE PERI SW	NO (-29.8%)	NO
L10 - OFFICE PERI W	NO (-44.2%)	NO
L11 - CORE CORR 1	N/A	N/A
L11 - CORE CORR 2	N/A	N/A
L11 - CORE LR LIFT CORR	NO (-91.5%)	NO
L11 - CORE WC 1	N/A	N/A
L11 - CORE WC 2	N/A	N/A
L11 - CORE WC 3	N/A	N/A
L11 - CORE WC 4	N/A	N/A
L11 - CORE WC 5	N/A	N/A
L11 - OFFCE PERI NW	NO (-62.3%)	NO
L11 - OFFICE CORE N	NO (-59.9%)	NO
L11 - OFFICE CORE N	NO (-67.2%)	NO
L11 - OFFICE CORE S	NO (-86%)	NO
L11 - OFFICE PERI E	NO (-30.6%)	NO
L11 - OFFICE PERI NE	NO (-43.9%)	NO
L11 - OFFICE PERI NE	NO (-46.6%)	NO
L11 - OFFICE PERI S	NO (-40.4%)	NO
L11 - OFFICE PERI SW	NO (-34.4%)	NO
L11 - OFFICE PERI W	NO (-47.5%)	NO
L12 - CORE CORR 1	N/A	N/A
L12 - CORE CORR 2	N/A	N/A
L12 - CORE WC 1	N/A	N/A
L12 - CORE WC 2	N/A	N/A
L12 - CORE WC 3	N/A	N/A
L12 - CORE WC 4	N/A	N/A
L12 - CORE WC 5	N/A	N/A
L12 - OFFICE CORE NE	NO (-35.9%)	NO
L12 - OFFICE CORE NW	NO (-49.7%)	NO
L12 - OFFICE CORE S	NO (-85.6%)	NO
L12 - OFFICE CORE W	NO (-82.6%)	NO
L12 - OFFICE PERI E	NO (-30.5%)	NO
L12 - OFFICE PERI NE	NO (-45.3%)	NO
L12 - OFFICE PERI NW	NO (-62.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L12 - OFFICE PERI S	NO (-40.1%)	NO
L12 - OFFICE PERI SW	NO (-36.5%)	NO
L12 - OFFICE PERI W	NO (-43.5%)	NO
L13 - CORE CORR 1	N/A	N/A
L13 - CORE CORR 2	N/A	N/A
L13 - CORE WC 1	N/A	N/A
L13 - CORE WC 2	N/A	N/A
L13 - CORE WC 3	N/A	N/A
L13 - CORE WC 4	N/A	N/A
L13 - CORE WC 5	N/A	N/A
L13 - OFFICE CORE NE	NO (-35.9%)	NO
L13 - OFFICE CORE NW	NO (-49.7%)	NO
L13 - OFFICE CORE S	NO (-85.6%)	NO
L13 - OFFICE CORE W	NO (-82.6%)	NO
L13 - OFFICE PERI E	NO (-30.5%)	NO
L13 - OFFICE PERI NE	NO (-45.3%)	NO
L13 - OFFICE PERI NW	NO (-62.1%)	NO
L13 - OFFICE PERI S	NO (-40.1%)	NO
L13 - OFFICE PERI SW	NO (-36.5%)	NO
L13 - OFFICE PERI W	NO (-43.4%)	NO
L14 - CORE CORR 1	N/A	N/A
L14 - CORE CORR 2	N/A	N/A
L14 - CORE WC 1	N/A	N/A
L14 - CORE WC 2	N/A	N/A
L14 - CORE WC 3	N/A	N/A
L14 - CORE WC 4	N/A	N/A
L14 - CORE WC 5	N/A	N/A
L14 - OFFICE CORE NE	NO (-35.9%)	NO
L14 - OFFICE CORE NW	NO (-49.7%)	NO
L14 - OFFICE CORE S	NO (-85.6%)	NO
L14 - OFFICE CORE W	NO (-82.6%)	NO
L14 - OFFICE PERI E	NO (-30.5%)	NO
L14 - OFFICE PERI NE	NO (-45.3%)	NO
L14 - OFFICE PERI NW	NO (-62.1%)	NO
L14 - OFFICE PERI S	NO (-40.1%)	NO
L14 - OFFICE PERI SW	NO (-36.5%)	NO
L14 - OFFICE PERI W	NO (-43.4%)	NO
L15 - CORE CORR 1	N/A	N/A
L15 - CORE CORR 2	N/A	N/A
L15 - CORE WC 1	N/A	N/A
L15 - CORE WC 2	N/A	N/A
L15 - CORE WC 3	N/A	N/A
L15 - CORE WC 4	N/A	N/A
L15 - CORE WC 5	N/A	N/A
L15 - OFFICE CORE NE	NO (-35.9%)	NO
L15 - OFFICE CORE NW	NO (-49.7%)	NO
L15 - OFFICE CORE S	NO (-85.6%)	NO
L15 - OFFICE CORE W	NO (-82.6%)	NO
L15 - OFFICE PERI E	NO (-30.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L15 - OFFICE PERI NE	NO (-45.3%)	NO
L15 - OFFICE PERI NW	NO (-62.1%)	NO
L15 - OFFICE PERI S	NO (-40.1%)	NO
L15 - OFFICE PERI SW	NO (-36.5%)	NO
L15 - OFFICE PERI W	NO (-43.4%)	NO
L16 - CORE CORR 1	N/A	N/A
L16 - CORE CORR 2	N/A	N/A
L16 - CORE WC 1	N/A	N/A
L16 - CORE WC 2	N/A	N/A
L16 - CORE WC 3	N/A	N/A
L16 - CORE WC 4	N/A	N/A
L16 - CORE WC 5	N/A	N/A
L16 - OFFICE CORE NE	NO (-35.9%)	NO
L16 - OFFICE CORE NW	NO (-49.7%)	NO
L16 - OFFICE CORE S	NO (-85.6%)	NO
L16 - OFFICE CORE W	NO (-82.6%)	NO
L16 - OFFICE PERI E	NO (-30.5%)	NO
L16 - OFFICE PERI NE	NO (-45.3%)	NO
L16 - OFFICE PERI NW	NO (-62.1%)	NO
L16 - OFFICE PERI S	NO (-40.1%)	NO
L16 - OFFICE PERI SW	NO (-36.5%)	NO
L16 - OFFICE PERI W	NO (-43.4%)	NO
L17 - CORE CORR 1	N/A	N/A
L17 - CORE CORR 2	N/A	N/A
L17 - CORE WC 1	N/A	N/A
L17 - CORE WC 2	N/A	N/A
L17 - CORE WC 3	N/A	N/A
L17 - CORE WC 4	N/A	N/A
L17 - CORE WC 5	N/A	N/A
L17 - OFFICE CORE NE	NO (-35.9%)	NO
L17 - OFFICE CORE NW	NO (-49.7%)	NO
L17 - OFFICE CORE S	NO (-85.6%)	NO
L17 - OFFICE CORE W	NO (-82.6%)	NO
L17 - OFFICE PERI E	NO (-30.5%)	NO
L17 - OFFICE PERI NE	NO (-45.3%)	NO
L17 - OFFICE PERI NW	NO (-62.1%)	NO
L17 - OFFICE PERI S	NO (-40.1%)	NO
L17 - OFFICE PERI SW	NO (-36.5%)	NO
L17 - OFFICE PERI W	NO (-43.4%)	NO
L18 - CORE CORR 1	N/A	N/A
L18 - CORE CORR 2	N/A	N/A
L18 - CORE WC 1	N/A	N/A
L18 - CORE WC 2	N/A	N/A
L18 - CORE WC 3	N/A	N/A
L18 - CORE WC 4	N/A	N/A
L18 - CORE WC 5	N/A	N/A
L18 - OFFICE CORE NE	NO (-35.9%)	NO
L18 - OFFICE CORE NW	NO (-49.7%)	NO
L18 - OFFICE CORE S	NO (-85.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L18 - OFFICE CORE W	NO (-82.6%)	NO
L18 - OFFICE PERI E	NO (-30.5%)	NO
L18 - OFFICE PERI NE	NO (-45.3%)	NO
L18 - OFFICE PERI NW	NO (-62.1%)	NO
L18 - OFFICE PERI S	NO (-40.1%)	NO
L18 - OFFICE PERI SW	NO (-36.5%)	NO
L18 - OFFICE PERI W	NO (-43.4%)	NO
LB1 - CORE WC	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE CORR	N/A	N/A
LB1 - FLEXIBLE USE	NO (-25.2%)	NO
LB1 -CORE CORR	N/A	N/A
LB2 - AUDI	N/A	N/A
LB2 - CORE WC	N/A	N/A
LB3 - AUDITORIUM	N/A	N/A
LB3 - CORE WC	N/A	N/A
L19 - CORE CORR 2	N/A	N/A
LB3 - CORE WELFARE	N/A	N/A
LB3 - OFFICE (LOADING BAY)	N/A	N/A
LB3 - OFFICE (MANAGEMENT)	N/A	N/A
LB3 - COMMS	N/A	N/A
LB3 - COMMS ROOM	N/A	N/A
LB3 - WCS	N/A	N/A
LB3 - MER	N/A	N/A
LB2 - SHOWERS	N/A	N/A
LB2 - WCS	N/A	N/A
LB2 - AUDITORIUM COATS/TICKETS	N/A	N/A
LB2 - WCS	N/A	N/A
LB1 - PUBLIC ROUTE/GARDEN	YES (+6.3%)	NO
L00 - OFFICE LOBBY	NO (-11.5%)	NO
L00 - CAFE/RESTAURANT VOID	NO (-49.1%)	NO
L00A - OFFICE ENTRANCE VOID	NO (-36.2%)	NO
L00A - PUBLIC GARDEN VOID	NO (-51%)	NO
L00A - FLEXIBLE USE	NO (-81.4%)	NO
L00A - FLEXIBLE USE KITCHEN	N/A	N/A
L00 - FLEXIBLE USE	NO (-60.8%)	NO
L00 - FLEXIBLE USE WCS	N/A	N/A
L00 - OFFICE ENTRANCE/GALLERY	NO (-50.1%)	NO
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - CORE WC	N/A	N/A
L00A - CORE WCS	N/A	N/A
L00A - CORE CORR 2	NO (-91.2%)	NO
LB3 - STAFF ROOM	N/A	N/A
LB2 - AUDITORIUM FOYER	NO (-62.1%)	NO
L19 - OFFICE AMENITY	NO (-16.3%)	NO
LB2 - PUBLIC GARDEN LOWER LEVEL	YES (+54.9%)	NO
L00A - OFFICE (S)	NO (-5.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00A -OFFICE (N)	NO (-44%)	NO
L00 - OFFICE ENTRANCE/GALLERY SOUTH	NO (-32.3%)	NO
L00 - OFFICE ENTRANCE/GALLERY NORTH	NO (-35.9%)	NO
L01 - FLEXIBLE WORKSPACE PERI NW	NO (-62.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-50.4%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-55.4%)	NO
L01 - FLEXIBLE WORKSPACE CORE W	NO (-52.2%)	NO
L01 - FLEXIBLE WORKSPACE PERI S	NO (-52.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI E	NO (-56.5%)	NO
L01 - FLEXIBLE WORKSPACE CORE E	NO (-83.7%)	NO
L01 - FLEXIBLE WORKSPACE CORE S	NO (-89.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI NE	NO (-66.1%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-61.6%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-66.5%)	NO
LB3 - LOWER BOX GYM PERI	NO (-33.1%)	NO
LB2 - UPPER BOX GYM PERI	NO (-73.3%)	NO
L01 - FLEXIBLE WORKSPACE PERI SW	NO (-46.8%)	NO
LB3 - LOWER BOX OFFICE PERI	NO (-48.7%)	NO
LB2 - UPPER BOX OFFICE PERI	NO (-73.8%)	NO
LB2 - UPPER BOX OFFICE SPACE	NO (-96.8%)	NO
LB3 - LOWER BOX OFFICE SPACE	NO (-94.8%)	NO
LB3 - LOWER BOX GYM	NO (-62.7%)	NO
LB3 - LOWER BOX RETAIL	N/A	N/A
LB3 - LOWER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX RETAIL	N/A	N/A
LB2 - UPPER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX GYM	NO (-73.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	60730.8	60730.8
External area [m^2]	35101.8	35101.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	26144.9	17900.1
Average U-value [W/m^2K]	0.74	0.51
Alpha value* [%]	10.15	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	8	1.93
Cooling	4.38	9.02
Auxiliary	12.74	13
Lighting	9.1	20.76
Hot water	12.99	12.2
Equipment*	43.84	43.84
TOTAL**	**47.2**	**56.91**

* 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/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	99.33	129.04
Primary energy* [kWh/m^2]	104.07	145.3
Total emissions [kg/m^2]	17.8	24.7

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	34	83.2	10.7	4.8	10.6	0.88	4.8	0.96	6
	Notional	6.7	145.6	2.2	10.7	13.6	0.86	3.79	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	11.5	95.8	3.6	5.5	10.3	0.88	4.8	0.96	6
	Notional	6.5	131.2	2.1	9.6	11.9	0.86	3.79	----	----
[ST] Water loop heat pump, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	5.1	79.3	1.4	5.8	47.5	1	3.79	0.96	4.74
	Notional	3.5	173.5	1.1	12.7	31.7	0.86	3.79	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	3.4	38.3	1.1	2.4	22.7	0.84	4.39	0.96	6
	Notional	0.8	51.4	0.2	3.8	17.6	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	26.2	0	8.1	0	1	0.9	0	0.96	0
	Notional	22.7	0	7.3	0	1	0.86	0	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	50.9	150.6	16.9	9.5	49.6	0.84	4.39	0.96	6
	Notional	6.7	170	2.1	12.5	17.7	0.86	3.79	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	3.9	194	1.2	11.2	27.1	0.88	4.8	0.96	6
	Notional	0.5	165.9	0.2	12.2	32.1	0.86	3.79	----	----
[ST] Constant volume system (fixed fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	11.1	173.1	2.9	13	157.3	1.05	3.69	0.96	6
	Notional	0	338.8	0	24.8	98.9	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	L1000106:Surf[0]
Floor	0.2	0.2	LB00003D:Surf[0]
Roof	0.15	0.18	L100011D:Surf[0]
Windows, roof windows, and rooflights	1.5	1.4	L0000046:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

5KS_Be Green

As designed

Date: Thu Jul 23 17:02:52 2020

Administrative information

Building Details

Address: 5 Kingdom Street, London, W2 6BD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

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

Owner Details

Name: British Land

Telephone number:

Address: York House, 45 Seymour Street, London, W1H 7LX

Certifier details

Name: Jane Goodman (Contact Riccardo Zara)

Telephone number: 07977514095

Address: 240 Blackfriars Road, London, SE1 8NW

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	24.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	15.7
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	L1000106:Surf[0]
Floor	0.25	0.2	0.2	LB00003D:Surf[0]
Roof	0.25	0.18	0.18	L100011D:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.4	1.41	L0000046:Surf[8]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 5KS FCU OFFICE (HR = 0.67)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.67
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

2- 5KS RADIATORS

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	-	0	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

3- 5KS FCU WCS/SHOWERS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

4- 5KS FCU OTHER AREAS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

5- 5KS VAV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

6- 5KS PUBLIC GARDEN

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

7- 5KS KITCHEN ZONAL SUPPLY

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.1	-
Standard value	2.5*	4.7	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

8- 5KS COMMON WATER LOOP(HR = 0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.84	4.74	0	1.6	0.7
Standard value	2.5*	3.2	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L01 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L02 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L05 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L05 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L11 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L13 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L16 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L18 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 -CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L19 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - CORE WELFARE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (LOADING BAY)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (MANAGEMENT)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - MER	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - SHOWERS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - AUDITORIUM COATS/TICKETS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE LOBBY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - OFFICE ENTRANCE VOID	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE KITCHEN	-	-	-	-	-	-	-	-	1	-	N/A
L00 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - FLEXIBLE USE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - STAFF ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - AUDITORIUM FOYER	-	-	-	-	-	-	-	0.2	-	-	N/A
L19 - OFFICE AMENITY	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L00A - OFFICE (S)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A -OFFICE (N)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY SOUTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY NORTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-E	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - LOWER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - UPPER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - UPPER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - LOWER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L01 - CORE CORR 1(UNCOND)	-	80	-	129
L01 - CORE CORR 2(UNCOND)	-	80	-	71
L01 - CORE LR LIFT CORR	-	80	-	95
L01 - CORE STAIRS 1	-	80	-	63
L01 - CORE STAIRS 2	-	80	-	59
L01 - CORE WC	-	80	-	378
L01 - WC1	-	80	-	53
L02 - CORE CORR 1(UNCOND)	-	80	-	129
L02 - CORE CORR 2(UNCOND)	-	80	-	71
L02 - CORE LR LIFT CORR	-	80	-	95
L02 - CORE STAIRS 1	-	80	-	63
L02 - CORE STAIRS 2	-	80	-	59
L02 - CORE WC	-	80	-	378
L02 - OFFCE PERI NW	100	-	-	972
L02 - OFFICE CORE N	100	-	-	359
L02 - OFFICE CORE N	100	-	-	548
L02 - OFFICE CORE N	100	-	-	187
L02 - OFFICE CORE S	100	-	-	704
L02 - OFFICE CORE S	100	-	-	3819

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L02 - OFFICE PERI E	100	-	-	1427
L02 - OFFICE PERI NE	100	-	-	569
L02 - OFFICE PERI S	100	-	-	869
L02 - OFFICE PERI SW	100	-	-	1112
L02 - OFFICE PERI W	100	-	-	619
L02 - WC1	-	80	-	53
L03 - CORE CORR 1(UNCOND)	-	80	-	129
L03 - CORE CORR 3(UNCOND)	-	80	-	71
L03 - CORE LR LIFT CORR	-	80	-	95
L03 - CORE STAIRS 1	-	80	-	63
L03 - CORE STAIRS 3	-	80	-	59
L03 - CORE WC	-	80	-	378
L03 - OFFCE PERI NW	100	-	-	972
L03 - OFFICE CORE N	100	-	-	359
L03 - OFFICE CORE N	100	-	-	187
L03 - OFFICE CORE N	100	-	-	548
L03 - OFFICE CORE S	100	-	-	3819
L03 - OFFICE CORE S	100	-	-	704
L03 - OFFICE PERI E	100	-	-	1427
L03 - OFFICE PERI NE	100	-	-	569
L03 - OFFICE PERI S	100	-	-	869
L03 - OFFICE PERI SW	100	-	-	1112
L03 - OFFICE PERI W	100	-	-	619
L03 - WC1	-	80	-	53
L04 - CORE CORR 1(UNCOND)	-	80	-	129
L04 - CORE CORR 4(UNCOND)	-	80	-	71
L04 - CORE LR LIFT CORR	-	80	-	95
L04 - CORE STAIRS 1	-	80	-	63
L04 - CORE STAIRS 4	-	80	-	59
L04 - CORE WC	-	80	-	378
L04 - OFFCE PERI NW	100	-	-	972
L04 - OFFICE CORE N	100	-	-	187
L04 - OFFICE CORE N	100	-	-	548
L04 - OFFICE CORE N	100	-	-	359
L04 - OFFICE CORE S	100	-	-	704
L04 - OFFICE CORE S	100	-	-	3819
L04 - OFFICE PERI E	100	-	-	1427
L04 - OFFICE PERI NE	100	-	-	569
L04 - OFFICE PERI S	100	-	-	869
L04 - OFFICE PERI SW	100	-	-	1112
L04 - OFFICE PERI W	100	-	-	619
L04 - WC1	-	80	-	53
L05 - CORE CORR 1(UNCOND)	-	80	-	129

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L05 - CORE CORR 5(UNCOND)	-	80	-	71
L05 - CORE LR LIFT CORR	-	80	-	95
L05 - CORE STAIRS 1	-	80	-	63
L05 - CORE STAIRS 5	-	80	-	59
L05 - CORE WC	-	80	-	378
L05 - OFFCE PERI NW	100	-	-	972
L05 - OFFICE CORE N	100	-	-	548
L05 - OFFICE CORE N	100	-	-	187
L05 - OFFICE CORE N	100	-	-	359
L05 - OFFICE CORE S	100	-	-	704
L05 - OFFICE CORE S	100	-	-	3819
L05 - OFFICE PERI E	100	-	-	1427
L05 - OFFICE PERI NE	100	-	-	569
L05 - OFFICE PERI S	100	-	-	869
L05 - OFFICE PERI SW	100	-	-	1112
L05 - OFFICE PERI W	100	-	-	619
L05 - WC1	-	80	-	53
L06 - CORE CORR 1(UNCOND)	-	80	-	129
L06 - CORE CORR 6(UNCOND)	-	80	-	71
L06 - CORE LR LIFT CORR	-	80	-	95
L06 - CORE STAIRS 1	-	80	-	63
L06 - CORE STAIRS 6	-	80	-	59
L06 - CORE WC	-	80	-	378
L06 - OFFCE PERI NW	100	-	-	972
L06 - OFFICE CORE N	100	-	-	187
L06 - OFFICE CORE N	100	-	-	359
L06 - OFFICE CORE N	100	-	-	548
L06 - OFFICE CORE S	100	-	-	3819
L06 - OFFICE CORE S	100	-	-	704
L06 - OFFICE PERI E	100	-	-	1427
L06 - OFFICE PERI NE	100	-	-	569
L06 - OFFICE PERI S	100	-	-	869
L06 - OFFICE PERI SW	100	-	-	1112
L06 - OFFICE PERI W	100	-	-	619
L06 - WC1	-	80	-	53
L07 - CORE CORR 1(UNCOND)	-	80	-	129
L07 - CORE CORR 7(UNCOND)	-	80	-	71
L07 - CORE LR LIFT CORR	-	80	-	95
L07 - CORE STAIRS 1	-	80	-	63
L07 - CORE STAIRS 7	-	80	-	59
L07 - CORE WC	-	80	-	378
L07 - OFFCE PERI NW	100	-	-	972
L07 - OFFICE CORE N	100	-	-	187

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L07 - OFFICE CORE N	100	-	-	359
L07 - OFFICE CORE N	100	-	-	548
L07 - OFFICE CORE S	100	-	-	704
L07 - OFFICE CORE S	100	-	-	3819
L07 - OFFICE PERI E	100	-	-	1427
L07 - OFFICE PERI NE	100	-	-	569
L07 - OFFICE PERI S	100	-	-	869
L07 - OFFICE PERI SW	100	-	-	1112
L07 - OFFICE PERI W	100	-	-	619
L07 - WC1	-	80	-	53
L08 - CORE CORR 1(UNCOND)	-	80	-	129
L08 - CORE CORR 8(UNCOND)	-	80	-	71
L08 - CORE LR LIFT CORR	-	80	-	95
L08 - CORE STAIRS 1	-	80	-	63
L08 - CORE STAIRS 8	-	80	-	59
L08 - CORE WC	-	80	-	378
L08 - OFFCE PERI NW	100	-	-	972
L08 - OFFICE CORE N	100	-	-	359
L08 - OFFICE CORE N	100	-	-	187
L08 - OFFICE CORE N	100	-	-	548
L08 - OFFICE CORE S	100	-	-	3819
L08 - OFFICE CORE S	100	-	-	704
L08 - OFFICE PERI E	100	-	-	1427
L08 - OFFICE PERI NE	100	-	-	569
L08 - OFFICE PERI S	100	-	-	869
L08 - OFFICE PERI SW	100	-	-	1112
L08 - OFFICE PERI W	100	-	-	619
L08 - WC1	-	80	-	53
L09 - CORE CORR 1(UNCOND)	-	80	-	129
L09 - CORE CORR 9(UNCOND)	-	80	-	71
L09 - CORE LR LIFT CORR	-	80	-	95
L09 - CORE STAIRS 1	-	80	-	63
L09 - CORE STAIRS 9	-	80	-	59
L09 - CORE WC	-	80	-	378
L09 - OFFCE PERI NW	100	-	-	972
L09 - OFFICE CORE N	100	-	-	359
L09 - OFFICE CORE N	100	-	-	548
L09 - OFFICE CORE N	100	-	-	187
L09 - OFFICE CORE S	100	-	-	704
L09 - OFFICE CORE S	100	-	-	3819
L09 - OFFICE PERI E	100	-	-	1427
L09 - OFFICE PERI NE	100	-	-	569
L09 - OFFICE PERI S	100	-	-	869

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L09 - OFFICE PERI SW	100	-	-	1112
L09 - OFFICE PERI W	100	-	-	619
L09 - WC1	-	80	-	53
L10 - CORE CORR 1	-	80	-	181
L10 - CORE CORR 1(UNCOND)	-	80	-	134
L10 - CORE CORR 2	-	80	-	176
L10 - CORE LR LIFT CORR	-	80	-	95
L10 - CORE STAIRS 1	-	80	-	59
L10 - CORE STAIRS 1	-	80	-	63
L10 - CORE WC 1	-	80	-	146
L10 - CORE WC 2	-	80	-	86
L10 - CORE WC 3	-	80	-	55
L10 - CORE WC 4	-	80	-	61
L10 - CORE WC 5	-	80	-	53
L10 - OFFCE PERI NW	100	-	-	972
L10 - OFFICE CORE N	100	-	-	548
L10 - OFFICE CORE N	100	-	-	359
L10 - OFFICE CORE S	100	-	-	3510
L10 - OFFICE PERI E	100	-	-	1649
L10 - OFFICE PERI NE	100	-	-	282
L10 - OFFICE PERI NE	100	-	-	649
L10 - OFFICE PERI S	100	-	-	847
L10 - OFFICE PERI SW	100	-	-	1112
L10 - OFFICE PERI W	100	-	-	619
L11 - CORE CORR 1	-	80	-	181
L11 - CORE CORR 1(UNCOND)	-	80	-	134
L11 - CORE CORR 2	-	80	-	176
L11 - CORE LR LIFT CORR	-	80	-	87
L11 - CORE STAIRS 1	-	80	-	59
L11 - CORE STAIRS 1	-	80	-	63
L11 - CORE WC 1	-	80	-	146
L11 - CORE WC 2	-	80	-	86
L11 - CORE WC 3	-	80	-	55
L11 - CORE WC 4	-	80	-	61
L11 - CORE WC 5	-	80	-	53
L11 - OFFCE PERI NW	100	-	-	972
L11 - OFFICE CORE N	100	-	-	359
L11 - OFFICE CORE N	100	-	-	557
L11 - OFFICE CORE S	100	-	-	3531
L11 - OFFICE PERI E	100	-	-	1649
L11 - OFFICE PERI NE	100	-	-	282
L11 - OFFICE PERI NE	100	-	-	649
L11 - OFFICE PERI S	100	-	-	847

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L11 - OFFICE PERI SW	100	-	-	1112
L11 - OFFICE PERI W	100	-	-	619
L12 - CORE CORR 1	-	80	-	181
L12 - CORE CORR 1(UNCOND)	-	80	-	134
L12 - CORE CORR 2	-	80	-	176
L12 - CORE STAIRS 1	-	80	-	59
L12 - CORE STAIRS 1	-	80	-	63
L12 - CORE WC 1	-	80	-	146
L12 - CORE WC 2	-	80	-	86
L12 - CORE WC 3	-	80	-	55
L12 - CORE WC 4	-	80	-	61
L12 - CORE WC 5	-	80	-	53
L12 - OFFICE CORE NE	100	-	-	237
L12 - OFFICE CORE NW	100	-	-	248
L12 - OFFICE CORE S	100	-	-	3358
L12 - OFFICE CORE W	100	-	-	1242
L12 - OFFICE PERI E	100	-	-	1649
L12 - OFFICE PERI NE	100	-	-	698
L12 - OFFICE PERI NW	100	-	-	1017
L12 - OFFICE PERI S	100	-	-	847
L12 - OFFICE PERI SW	100	-	-	976
L12 - OFFICE PERI W	100	-	-	832
L13 - CORE CORR 1	-	80	-	181
L13 - CORE CORR 1(UNCOND)	-	80	-	134
L13 - CORE CORR 2	-	80	-	176
L13 - CORE STAIRS 1	-	80	-	59
L13 - CORE STAIRS 1	-	80	-	63
L13 - CORE WC 1	-	80	-	146
L13 - CORE WC 2	-	80	-	86
L13 - CORE WC 3	-	80	-	55
L13 - CORE WC 4	-	80	-	61
L13 - CORE WC 5	-	80	-	53
L13 - OFFICE CORE NE	100	-	-	237
L13 - OFFICE CORE NW	100	-	-	248
L13 - OFFICE CORE S	100	-	-	3358
L13 - OFFICE CORE W	100	-	-	1242
L13 - OFFICE PERI E	100	-	-	1649
L13 - OFFICE PERI NE	100	-	-	698
L13 - OFFICE PERI NW	100	-	-	1017
L13 - OFFICE PERI S	100	-	-	847
L13 - OFFICE PERI SW	100	-	-	976
L13 - OFFICE PERI W	100	-	-	832
L14 - CORE CORR 1	-	80	-	181

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L14 - CORE CORR 1(UNCOND)	-	80	-	134
L14 - CORE CORR 2	-	80	-	176
L14 - CORE STAIRS 1	-	80	-	63
L14 - CORE STAIRS 1	-	80	-	59
L14 - CORE WC 1	-	80	-	146
L14 - CORE WC 2	-	80	-	86
L14 - CORE WC 3	-	80	-	55
L14 - CORE WC 4	-	80	-	61
L14 - CORE WC 5	-	80	-	53
L14 - OFFICE CORE NE	100	-	-	237
L14 - OFFICE CORE NW	100	-	-	248
L14 - OFFICE CORE S	100	-	-	3358
L14 - OFFICE CORE W	100	-	-	1242
L14 - OFFICE PERI E	100	-	-	1649
L14 - OFFICE PERI NE	100	-	-	698
L14 - OFFICE PERI NW	100	-	-	1017
L14 - OFFICE PERI S	100	-	-	847
L14 - OFFICE PERI SW	100	-	-	976
L14 - OFFICE PERI W	100	-	-	832
L15 - CORE CORR 1	-	80	-	181
L15 - CORE CORR 1(UNCOND)	-	80	-	134
L15 - CORE CORR 2	-	80	-	176
L15 - CORE STAIRS 1	-	80	-	63
L15 - CORE STAIRS 1	-	80	-	59
L15 - CORE WC 1	-	80	-	146
L15 - CORE WC 2	-	80	-	86
L15 - CORE WC 3	-	80	-	55
L15 - CORE WC 4	-	80	-	61
L15 - CORE WC 5	-	80	-	53
L15 - OFFICE CORE NE	100	-	-	237
L15 - OFFICE CORE NW	100	-	-	248
L15 - OFFICE CORE S	100	-	-	3358
L15 - OFFICE CORE W	100	-	-	1242
L15 - OFFICE PERI E	100	-	-	1649
L15 - OFFICE PERI NE	100	-	-	698
L15 - OFFICE PERI NW	100	-	-	1017
L15 - OFFICE PERI S	100	-	-	847
L15 - OFFICE PERI SW	100	-	-	976
L15 - OFFICE PERI W	100	-	-	832
L16 - CORE CORR 1	-	80	-	181
L16 - CORE CORR 1(UNCOND)	-	80	-	134
L16 - CORE CORR 2	-	80	-	176
L16 - CORE STAIRS 1	-	80	-	59

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L16 - CORE STAIRS 1	-	80	-	63
L16 - CORE WC 1	-	80	-	146
L16 - CORE WC 2	-	80	-	86
L16 - CORE WC 3	-	80	-	55
L16 - CORE WC 4	-	80	-	61
L16 - CORE WC 5	-	80	-	53
L16 - OFFICE CORE NE	100	-	-	237
L16 - OFFICE CORE NW	100	-	-	248
L16 - OFFICE CORE S	100	-	-	3358
L16 - OFFICE CORE W	100	-	-	1242
L16 - OFFICE PERI E	100	-	-	1649
L16 - OFFICE PERI NE	100	-	-	698
L16 - OFFICE PERI NW	100	-	-	1017
L16 - OFFICE PERI S	100	-	-	847
L16 - OFFICE PERI SW	100	-	-	976
L16 - OFFICE PERI W	100	-	-	832
L17 - CORE CORR 1	-	80	-	181
L17 - CORE CORR 1(UNCOND)	-	80	-	134
L17 - CORE CORR 2	-	80	-	176
L17 - CORE STAIRS 1	-	80	-	59
L17 - CORE STAIRS 1	-	80	-	63
L17 - CORE WC 1	-	80	-	146
L17 - CORE WC 2	-	80	-	86
L17 - CORE WC 3	-	80	-	55
L17 - CORE WC 4	-	80	-	61
L17 - CORE WC 5	-	80	-	53
L17 - OFFICE CORE NE	100	-	-	237
L17 - OFFICE CORE NW	100	-	-	248
L17 - OFFICE CORE S	100	-	-	3358
L17 - OFFICE CORE W	100	-	-	1242
L17 - OFFICE PERI E	100	-	-	1649
L17 - OFFICE PERI NE	100	-	-	698
L17 - OFFICE PERI NW	100	-	-	1017
L17 - OFFICE PERI S	100	-	-	847
L17 - OFFICE PERI SW	100	-	-	976
L17 - OFFICE PERI W	100	-	-	832
L18 - CORE CORR 1	-	80	-	181
L18 - CORE CORR 1(UNCOND)	-	80	-	134
L18 - CORE CORR 2	-	80	-	176
L18 - CORE STAIRS 1	-	80	-	59
L18 - CORE STAIRS 1	-	80	-	63
L18 - CORE WC 1	-	80	-	146
L18 - CORE WC 2	-	80	-	86

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L18 - CORE WC 3	-	80	-	55
L18 - CORE WC 4	-	80	-	61
L18 - CORE WC 5	-	80	-	53
L18 - OFFICE CORE NE	100	-	-	237
L18 - OFFICE CORE NW	100	-	-	248
L18 - OFFICE CORE S	100	-	-	3358
L18 - OFFICE CORE W	100	-	-	1242
L18 - OFFICE PERI E	100	-	-	1649
L18 - OFFICE PERI NE	100	-	-	698
L18 - OFFICE PERI NW	100	-	-	1017
L18 - OFFICE PERI S	100	-	-	847
L18 - OFFICE PERI SW	100	-	-	976
L18 - OFFICE PERI W	100	-	-	832
L19 - CORE CORR 1(UNCOND)	-	80	-	153
L19 - CORE CORR 3(UNCOND)	-	80	-	94
L19 - CORE STAIRS 1	-	80	-	70
L19 - CORE STAIRS 3	-	80	-	67
LB1 - CAR PARK	-	80	-	2232
LB1 - CORE CORR	-	80	-	75
LB1 - CORE STAIRS	-	80	-	64
LB1 - CORE STAIRS	-	80	-	59
LB1 - CORE WC	-	80	-	71
LB1 - CORE WCS	-	80	-	200
LB1 - CORE WCS	-	80	-	298
LB1 - CYCLE PARK 2(UNCOND)	-	80	-	281
LB1 - LIFT VOID	-	80	-	128
LB1 - CORE CORR	-	80	-	39
LB1 - LIFT VOID	-	80	-	100
LB1 - FLEXIBLE USE	-	80	100	859
LB1 -CORE CORR	-	80	-	116
LB2 - AUDI	-	80	-	2614
LB2 - CORE CORR 1 (UNCOND)	-	80	-	111
LB2 - CORE CORR 2 (UNCOND)	-	80	-	71
LB2 - CORE STAIRS 1	-	80	-	63
LB2 - CORE STAIRS 2	-	80	-	59
LB2 - CORE WC	-	80	-	292
LB2 - STAIRS	-	80	-	96
LB2 - STAIRS	-	80	-	105
LB2 - VOID (EXT)	-	80	-	20
LB3 - AUDITORIUM	-	80	-	3101
LB3 - CORE CORR 1 (UNCOND)	-	80	-	111
LB3 - CORE CORR 2(UNCOND)	-	80	-	71
LB3 - CORE STAIRS 1	-	80	-	63

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LB3 - CORE STAIRS 2	-	80	-	59
LB3 - CORE WC	-	80	-	191
LB3 - RETAIL STAIRS	-	80	-	62
LB3 - STAIRS	-	80	-	96
LB3 - VOID (EXT)	-	80	-	20
L19 - CORE CORR 2	-	80	-	190
L20 - MACHINE ROOM	80	-	-	185
L20 - MACHINE ROOM	80	-	-	192
L20 - MACHINE ROOM	80	-	-	206
LB3 - CORE WELFARE	80	-	-	243
LB3 - OFFICE (LOADING BAY)	115	-	-	130
LB3 - PUBLIC USES REFUSE STORE	-	80	-	168
LB3 - UKPN	-	80	-	32
LB3 - OFFICE (MANAGEMENT)	115	-	-	130
LB3 - SPRINKLER AND WET RISER INLET	80	-	-	83
LB3 - SOLID VOID	-	80	-	6
LB3 - BOH CORR	-	80	-	206
LB3 - FIRE CONTROL ROOM	-	80	-	65
LB3 - RETAIL CORR(UNCOND)	-	80	-	564
LB3 - COMMS	80	-	-	301
LB3 - PLANT	80	-	-	3811
LB3 - PLANT (PH)	80	-	-	823
LB3 - EXTERNAL STAIRS	-	80	-	55
LB3 - BOH CORR	-	80	-	119
LB3 - COMMS ROOM	80	-	-	230
LB3 - REFUSE STORE	-	80	-	237
LB3 - CORR-UNCONDITIONED	-	80	-	132
LB3 - WCS	-	80	-	103
LB3 - PLANT CORR	-	80	-	188
LB3 - PLANT	80	-	-	2546
LB3 - PLANT CORR	-	80	-	195
LB3 - MER	80	-	-	338
LB3 - PLANT	80	-	-	103
LB2 - CYCLE PARK (UNCOND)	-	80	-	873
LB2 - EXTERNAL STAIRS	-	80	-	55
LB2 - SHOWERS	-	80	-	487
LB2 - CORR 1 (UNCOND)	-	80	-	179
LB2 - PLANT	80	-	-	321
LB2 - WCS	-	80	-	166
LB2 - BOH	-	80	-	53
LB2 - PLANT (GARDEN VENT)	80	-	-	989
LB2 - AUDITORIUM COATS/TICKETS	80	-	-	1492
LB2 - CORR (UNCON)	-	80	-	144

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LB2 - PLANT	80	-	-	420
LB2 - WCS	-	80	-	918
LB2 - HEATING PLANT	80	-	-	656
LB2 - COOLING PLANT	-	80	-	1302
LB1 - CYCLE PARKING SHORT STAY	-	80	-	222
LB1 - PUBLIC ROUTE/GARDEN	-	80	-	1957
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	285
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	54
L00 - OFFICE LOBBY	100	-	-	229
L00 - CAFE/RESTAURANT VOID	-	80	-	463
L00A - OFFICE ENTRANCE VOID	-	80	-	0
L00A - PUBLIC GARDEN VOID	-	80	-	14
L00A - FLEXIBLE USE	-	80	100	547
L00A - FLEXIBLE USE STAIRS	-	80	-	57
L00A - FLEXIBLE USE KITCHEN	-	80	-	471
L00 - FLEXIBLE USE STAIRS	-	80	-	66
L00 - FLEXIBLE USE	-	80	100	750
L00 - FLEXIBLE USE WCS	-	80	-	108
L00 - OFFICE ENTRANCE/GALLERY	100	-	-	250
L00 - LIFT LOBBY (OPEN)	100	-	-	320
L00 - CORE STAIRS	-	80	-	59
L00 - CORE CORR (UNCON)	-	80	-	75
L00 - LIFT LOBBY (OPEN)	100	-	-	476
L00 - CORE STAIR	-	80	-	64
L00 - CORE CORR (UNCON)	-	80	-	116
L00 - CORE WC	-	80	-	70
L00A - CORE WCS	-	80	-	200
L00A - CORE STAIRS	-	80	-	64
L00A - CORE CORR (UNCON)	-	80	-	116
L00A - CORE CORR 2	-	80	-	141
L00A - CORE STAIR	-	80	-	59
L00A - CORE CORR (UNCON)	-	80	-	75
LB3 - STAFF ROOM	80	-	-	169
LB2 - AUDITORIUM FOYER	-	80	-	496
L19 - OFFICE AMENITY	-	80	100	691
LB2 - PUBLIC GARDEN LOWER LEVEL	-	80	100	998
LB2 - VOID BELOW STAIRS	80	-	-	185
L00A - OFFICE (S)	100	-	-	1934
L00A -OFFICE (N)	100	-	-	2244
L00 - OFFICE ENTRANCE/GALLERY SOUTH	100	-	-	2356
L00 - OFFICE ENTRANCE/GALLERY NORTH	100	-	-	3126
L01 - FLEXIBLE WORKSPACE PERI NW	100	-	-	971
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	357

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	262
L01 - FLEXIBLE WORKSPACE CORE W	100	-	-	104
L01 - FLEXIBLE WORKSPACE PERI S	100	-	-	869
L01 - FLEXIBLE WORKSPACE PERI E	100	-	-	1427
L01 - FLEXIBLE WORKSPACE CORE E	100	-	-	704
L01 - FLEXIBLE WORKSPACE CORE S	100	-	-	3819
L01 - FLEXIBLE WORKSPACE PERI NE	100	-	-	569
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	187
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	773
LB3 - LOWER BOX GYM PERI	-	100	-	726
LB2 - UPPER BOX GYM PERI	-	100	-	204
L01 - FLEXIBLE WORKSPACE PERI SW	100	-	-	1112
LB3 - LOWER BOX OFFICE PERI	100	-	-	4742
LB2 - UPPER BOX OFFICE PERI	100	-	-	2906
LB2 - UPPER BOX OFFICE SPACE	100	-	-	7794
LB3 - LOWER BOX OFFICE SPACE	100	-	-	7869
LB3 - LOWER BOX GYM	-	100	-	1032
LB3 - LOWER BOX RETAIL	-	100	100	1837
LB3 - LOWER BOX CONFERENCE	-	100	100	2200
LB2 - UPPER BOX RETAIL	-	100	100	724
LB2 - UPPER BOX CONFERENCE	-	100	100	1772
LB2 - UPPER BOX GYM	-	100	-	693

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L01 - CORE LR LIFT CORR	N/A	N/A
L01 - CORE WC	N/A	N/A
L01 - WC1	N/A	N/A
L02 - CORE LR LIFT CORR	N/A	N/A
L02 - CORE WC	N/A	N/A
L02 - OFFCE PERI NW	NO (-62.6%)	NO
L02 - OFFICE CORE N	NO (-63.2%)	NO
L02 - OFFICE CORE N	NO (-64.8%)	NO
L02 - OFFICE CORE N	NO (-61.2%)	NO
L02 - OFFICE CORE S	NO (-83.3%)	NO
L02 - OFFICE CORE S	NO (-88.6%)	NO
L02 - OFFICE PERI E	NO (-55%)	NO
L02 - OFFICE PERI NE	NO (-65.9%)	NO
L02 - OFFICE PERI S	NO (-51.6%)	NO
L02 - OFFICE PERI SW	NO (-42.6%)	NO
L02 - OFFICE PERI W	NO (-53.5%)	NO
L02 - WC1	N/A	N/A
L03 - CORE LR LIFT CORR	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L03 - CORE WC	N/A	N/A
L03 - OFFCE PERI NW	NO (-60.1%)	NO
L03 - OFFICE CORE N	NO (-61.2%)	NO
L03 - OFFICE CORE N	NO (-59.4%)	NO
L03 - OFFICE CORE N	NO (-62.6%)	NO
L03 - OFFICE CORE S	NO (-87.9%)	NO
L03 - OFFICE CORE S	NO (-82.6%)	NO
L03 - OFFICE PERI E	NO (-51.6%)	NO
L03 - OFFICE PERI NE	NO (-64.4%)	NO
L03 - OFFICE PERI S	NO (-46.6%)	NO
L03 - OFFICE PERI SW	NO (-38%)	NO
L03 - OFFICE PERI W	NO (-50.1%)	NO
L03 - WC1	N/A	N/A
L04 - CORE LR LIFT CORR	N/A	N/A
L04 - CORE WC	N/A	N/A
L04 - OFFCE PERI NW	NO (-60.1%)	NO
L04 - OFFICE CORE N	NO (-59%)	NO
L04 - OFFICE CORE N	NO (-62.6%)	NO
L04 - OFFICE CORE N	NO (-61.1%)	NO
L04 - OFFICE CORE S	NO (-81.9%)	NO
L04 - OFFICE CORE S	NO (-87.6%)	NO
L04 - OFFICE PERI E	NO (-47.8%)	NO
L04 - OFFICE PERI NE	NO (-64.1%)	NO
L04 - OFFICE PERI S	NO (-46.1%)	NO
L04 - OFFICE PERI SW	NO (-37.9%)	NO
L04 - OFFICE PERI W	NO (-50.1%)	NO
L04 - WC1	N/A	N/A
L05 - CORE LR LIFT CORR	N/A	N/A
L05 - CORE WC	N/A	N/A
L05 - OFFCE PERI NW	NO (-60.1%)	NO
L05 - OFFICE CORE N	NO (-62.5%)	NO
L05 - OFFICE CORE N	NO (-58.6%)	NO
L05 - OFFICE CORE N	NO (-61.1%)	NO
L05 - OFFICE CORE S	NO (-81.2%)	NO
L05 - OFFICE CORE S	NO (-87.4%)	NO
L05 - OFFICE PERI E	NO (-45.1%)	NO
L05 - OFFICE PERI NE	NO (-63.7%)	NO
L05 - OFFICE PERI S	NO (-46%)	NO
L05 - OFFICE PERI SW	NO (-37.9%)	NO
L05 - OFFICE PERI W	NO (-50.1%)	NO
L05 - WC1	N/A	N/A
L06 - CORE LR LIFT CORR	N/A	N/A
L06 - CORE WC	N/A	N/A
L06 - OFFCE PERI NW	NO (-60%)	NO
L06 - OFFICE CORE N	NO (-58.1%)	NO
L06 - OFFICE CORE N	NO (-61%)	NO
L06 - OFFICE CORE N	NO (-62.4%)	NO
L06 - OFFICE CORE S	NO (-87%)	NO
L06 - OFFICE CORE S	NO (-80.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L06 - OFFICE PERI E	NO (-42.5%)	NO
L06 - OFFICE PERI NE	NO (-63.2%)	NO
L06 - OFFICE PERI S	NO (-45.3%)	NO
L06 - OFFICE PERI SW	NO (-37.8%)	NO
L06 - OFFICE PERI W	NO (-50.1%)	NO
L06 - WC1	N/A	N/A
L07 - CORE LR LIFT CORR	N/A	N/A
L07 - CORE WC	N/A	N/A
L07 - OFFCE PERI NW	NO (-59.8%)	NO
L07 - OFFICE CORE N	NO (-57.6%)	NO
L07 - OFFICE CORE N	NO (-61%)	NO
L07 - OFFICE CORE N	NO (-62.3%)	NO
L07 - OFFICE CORE S	NO (-79.3%)	NO
L07 - OFFICE CORE S	NO (-86.8%)	NO
L07 - OFFICE PERI E	NO (-40.6%)	NO
L07 - OFFICE PERI NE	NO (-62.5%)	NO
L07 - OFFICE PERI S	NO (-44.8%)	NO
L07 - OFFICE PERI SW	NO (-37.7%)	NO
L07 - OFFICE PERI W	NO (-50.1%)	NO
L07 - WC1	N/A	N/A
L08 - CORE LR LIFT CORR	N/A	N/A
L08 - CORE WC	N/A	N/A
L08 - OFFCE PERI NW	NO (-59.7%)	NO
L08 - OFFICE CORE N	NO (-61%)	NO
L08 - OFFICE CORE N	NO (-56.7%)	NO
L08 - OFFICE CORE N	NO (-62.2%)	NO
L08 - OFFICE CORE S	NO (-86.5%)	NO
L08 - OFFICE CORE S	NO (-78.3%)	NO
L08 - OFFICE PERI E	NO (-38.6%)	NO
L08 - OFFICE PERI NE	NO (-60.7%)	NO
L08 - OFFICE PERI S	NO (-44.4%)	NO
L08 - OFFICE PERI SW	NO (-37.6%)	NO
L08 - OFFICE PERI W	NO (-50.1%)	NO
L08 - WC1	N/A	N/A
L09 - CORE LR LIFT CORR	N/A	N/A
L09 - CORE WC	N/A	N/A
L09 - OFFCE PERI NW	NO (-59.5%)	NO
L09 - OFFICE CORE N	NO (-60.9%)	NO
L09 - OFFICE CORE N	NO (-62%)	NO
L09 - OFFICE CORE N	NO (-54%)	NO
L09 - OFFICE CORE S	NO (-77.5%)	NO
L09 - OFFICE CORE S	NO (-86.2%)	NO
L09 - OFFICE PERI E	NO (-37.3%)	NO
L09 - OFFICE PERI NE	NO (-58.1%)	NO
L09 - OFFICE PERI S	NO (-44.3%)	NO
L09 - OFFICE PERI SW	NO (-38%)	NO
L09 - OFFICE PERI W	NO (-50.1%)	NO
L09 - WC1	N/A	N/A
L10 - CORE CORR 1	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L10 - CORE CORR 2	N/A	N/A
L10 - CORE LR LIFT CORR	N/A	N/A
L10 - CORE WC 1	N/A	N/A
L10 - CORE WC 2	N/A	N/A
L10 - CORE WC 3	N/A	N/A
L10 - CORE WC 4	N/A	N/A
L10 - CORE WC 5	N/A	N/A
L10 - OFFCE PERI NW	NO (-55%)	NO
L10 - OFFICE CORE N	NO (-58.2%)	NO
L10 - OFFICE CORE N	NO (-57.2%)	NO
L10 - OFFICE CORE S	NO (-84.4%)	NO
L10 - OFFICE PERI E	NO (-21%)	NO
L10 - OFFICE PERI NE	NO (-45.1%)	NO
L10 - OFFICE PERI NE	NO (-49.3%)	NO
L10 - OFFICE PERI S	NO (-35.8%)	NO
L10 - OFFICE PERI SW	NO (-29.8%)	NO
L10 - OFFICE PERI W	NO (-44.2%)	NO
L11 - CORE CORR 1	N/A	N/A
L11 - CORE CORR 2	N/A	N/A
L11 - CORE LR LIFT CORR	NO (-91.5%)	NO
L11 - CORE WC 1	N/A	N/A
L11 - CORE WC 2	N/A	N/A
L11 - CORE WC 3	N/A	N/A
L11 - CORE WC 4	N/A	N/A
L11 - CORE WC 5	N/A	N/A
L11 - OFFCE PERI NW	NO (-62.3%)	NO
L11 - OFFICE CORE N	NO (-59.9%)	NO
L11 - OFFICE CORE N	NO (-67.2%)	NO
L11 - OFFICE CORE S	NO (-86%)	NO
L11 - OFFICE PERI E	NO (-30.6%)	NO
L11 - OFFICE PERI NE	NO (-43.9%)	NO
L11 - OFFICE PERI NE	NO (-46.6%)	NO
L11 - OFFICE PERI S	NO (-40.4%)	NO
L11 - OFFICE PERI SW	NO (-34.4%)	NO
L11 - OFFICE PERI W	NO (-47.5%)	NO
L12 - CORE CORR 1	N/A	N/A
L12 - CORE CORR 2	N/A	N/A
L12 - CORE WC 1	N/A	N/A
L12 - CORE WC 2	N/A	N/A
L12 - CORE WC 3	N/A	N/A
L12 - CORE WC 4	N/A	N/A
L12 - CORE WC 5	N/A	N/A
L12 - OFFICE CORE NE	NO (-35.9%)	NO
L12 - OFFICE CORE NW	NO (-49.7%)	NO
L12 - OFFICE CORE S	NO (-85.6%)	NO
L12 - OFFICE CORE W	NO (-82.6%)	NO
L12 - OFFICE PERI E	NO (-30.5%)	NO
L12 - OFFICE PERI NE	NO (-45.3%)	NO
L12 - OFFICE PERI NW	NO (-62.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L12 - OFFICE PERI S	NO (-40.1%)	NO
L12 - OFFICE PERI SW	NO (-36.5%)	NO
L12 - OFFICE PERI W	NO (-43.5%)	NO
L13 - CORE CORR 1	N/A	N/A
L13 - CORE CORR 2	N/A	N/A
L13 - CORE WC 1	N/A	N/A
L13 - CORE WC 2	N/A	N/A
L13 - CORE WC 3	N/A	N/A
L13 - CORE WC 4	N/A	N/A
L13 - CORE WC 5	N/A	N/A
L13 - OFFICE CORE NE	NO (-35.9%)	NO
L13 - OFFICE CORE NW	NO (-49.7%)	NO
L13 - OFFICE CORE S	NO (-85.6%)	NO
L13 - OFFICE CORE W	NO (-82.6%)	NO
L13 - OFFICE PERI E	NO (-30.5%)	NO
L13 - OFFICE PERI NE	NO (-45.3%)	NO
L13 - OFFICE PERI NW	NO (-62.1%)	NO
L13 - OFFICE PERI S	NO (-40.1%)	NO
L13 - OFFICE PERI SW	NO (-36.5%)	NO
L13 - OFFICE PERI W	NO (-43.4%)	NO
L14 - CORE CORR 1	N/A	N/A
L14 - CORE CORR 2	N/A	N/A
L14 - CORE WC 1	N/A	N/A
L14 - CORE WC 2	N/A	N/A
L14 - CORE WC 3	N/A	N/A
L14 - CORE WC 4	N/A	N/A
L14 - CORE WC 5	N/A	N/A
L14 - OFFICE CORE NE	NO (-35.9%)	NO
L14 - OFFICE CORE NW	NO (-49.7%)	NO
L14 - OFFICE CORE S	NO (-85.6%)	NO
L14 - OFFICE CORE W	NO (-82.6%)	NO
L14 - OFFICE PERI E	NO (-30.5%)	NO
L14 - OFFICE PERI NE	NO (-45.3%)	NO
L14 - OFFICE PERI NW	NO (-62.1%)	NO
L14 - OFFICE PERI S	NO (-40.1%)	NO
L14 - OFFICE PERI SW	NO (-36.5%)	NO
L14 - OFFICE PERI W	NO (-43.4%)	NO
L15 - CORE CORR 1	N/A	N/A
L15 - CORE CORR 2	N/A	N/A
L15 - CORE WC 1	N/A	N/A
L15 - CORE WC 2	N/A	N/A
L15 - CORE WC 3	N/A	N/A
L15 - CORE WC 4	N/A	N/A
L15 - CORE WC 5	N/A	N/A
L15 - OFFICE CORE NE	NO (-35.9%)	NO
L15 - OFFICE CORE NW	NO (-49.7%)	NO
L15 - OFFICE CORE S	NO (-85.6%)	NO
L15 - OFFICE CORE W	NO (-82.6%)	NO
L15 - OFFICE PERI E	NO (-30.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L15 - OFFICE PERI NE	NO (-45.3%)	NO
L15 - OFFICE PERI NW	NO (-62.1%)	NO
L15 - OFFICE PERI S	NO (-40.1%)	NO
L15 - OFFICE PERI SW	NO (-36.5%)	NO
L15 - OFFICE PERI W	NO (-43.4%)	NO
L16 - CORE CORR 1	N/A	N/A
L16 - CORE CORR 2	N/A	N/A
L16 - CORE WC 1	N/A	N/A
L16 - CORE WC 2	N/A	N/A
L16 - CORE WC 3	N/A	N/A
L16 - CORE WC 4	N/A	N/A
L16 - CORE WC 5	N/A	N/A
L16 - OFFICE CORE NE	NO (-35.9%)	NO
L16 - OFFICE CORE NW	NO (-49.7%)	NO
L16 - OFFICE CORE S	NO (-85.6%)	NO
L16 - OFFICE CORE W	NO (-82.6%)	NO
L16 - OFFICE PERI E	NO (-30.5%)	NO
L16 - OFFICE PERI NE	NO (-45.3%)	NO
L16 - OFFICE PERI NW	NO (-62.1%)	NO
L16 - OFFICE PERI S	NO (-40.1%)	NO
L16 - OFFICE PERI SW	NO (-36.5%)	NO
L16 - OFFICE PERI W	NO (-43.4%)	NO
L17 - CORE CORR 1	N/A	N/A
L17 - CORE CORR 2	N/A	N/A
L17 - CORE WC 1	N/A	N/A
L17 - CORE WC 2	N/A	N/A
L17 - CORE WC 3	N/A	N/A
L17 - CORE WC 4	N/A	N/A
L17 - CORE WC 5	N/A	N/A
L17 - OFFICE CORE NE	NO (-35.9%)	NO
L17 - OFFICE CORE NW	NO (-49.7%)	NO
L17 - OFFICE CORE S	NO (-85.6%)	NO
L17 - OFFICE CORE W	NO (-82.6%)	NO
L17 - OFFICE PERI E	NO (-30.5%)	NO
L17 - OFFICE PERI NE	NO (-45.3%)	NO
L17 - OFFICE PERI NW	NO (-62.1%)	NO
L17 - OFFICE PERI S	NO (-40.1%)	NO
L17 - OFFICE PERI SW	NO (-36.5%)	NO
L17 - OFFICE PERI W	NO (-43.4%)	NO
L18 - CORE CORR 1	N/A	N/A
L18 - CORE CORR 2	N/A	N/A
L18 - CORE WC 1	N/A	N/A
L18 - CORE WC 2	N/A	N/A
L18 - CORE WC 3	N/A	N/A
L18 - CORE WC 4	N/A	N/A
L18 - CORE WC 5	N/A	N/A
L18 - OFFICE CORE NE	NO (-35.9%)	NO
L18 - OFFICE CORE NW	NO (-49.7%)	NO
L18 - OFFICE CORE S	NO (-85.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L18 - OFFICE CORE W	NO (-82.6%)	NO
L18 - OFFICE PERI E	NO (-30.5%)	NO
L18 - OFFICE PERI NE	NO (-45.3%)	NO
L18 - OFFICE PERI NW	NO (-62.1%)	NO
L18 - OFFICE PERI S	NO (-40.1%)	NO
L18 - OFFICE PERI SW	NO (-36.5%)	NO
L18 - OFFICE PERI W	NO (-43.4%)	NO
LB1 - CORE WC	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE CORR	N/A	N/A
LB1 - FLEXIBLE USE	NO (-25.2%)	NO
LB1 -CORE CORR	N/A	N/A
LB2 - AUDI	N/A	N/A
LB2 - CORE WC	N/A	N/A
LB3 - AUDITORIUM	N/A	N/A
LB3 - CORE WC	N/A	N/A
L19 - CORE CORR 2	N/A	N/A
LB3 - CORE WELFARE	N/A	N/A
LB3 - OFFICE (LOADING BAY)	N/A	N/A
LB3 - OFFICE (MANAGEMENT)	N/A	N/A
LB3 - COMMS	N/A	N/A
LB3 - COMMS ROOM	N/A	N/A
LB3 - WCS	N/A	N/A
LB3 - MER	N/A	N/A
LB2 - SHOWERS	N/A	N/A
LB2 - WCS	N/A	N/A
LB2 - AUDITORIUM COATS/TICKETS	N/A	N/A
LB2 - WCS	N/A	N/A
LB1 - PUBLIC ROUTE/GARDEN	YES (+6.3%)	NO
L00 - OFFICE LOBBY	NO (-11.5%)	NO
L00 - CAFE/RESTAURANT VOID	NO (-49.1%)	NO
L00A - OFFICE ENTRANCE VOID	NO (-36.2%)	NO
L00A - PUBLIC GARDEN VOID	NO (-51%)	NO
L00A - FLEXIBLE USE	NO (-81.4%)	NO
L00A - FLEXIBLE USE KITCHEN	N/A	N/A
L00 - FLEXIBLE USE	NO (-60.8%)	NO
L00 - FLEXIBLE USE WCS	N/A	N/A
L00 - OFFICE ENTRANCE/GALLERY	NO (-50.1%)	NO
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - CORE WC	N/A	N/A
L00A - CORE WCS	N/A	N/A
L00A - CORE CORR 2	NO (-91.2%)	NO
LB3 - STAFF ROOM	N/A	N/A
LB2 - AUDITORIUM FOYER	NO (-62.1%)	NO
L19 - OFFICE AMENITY	NO (-16.3%)	NO
LB2 - PUBLIC GARDEN LOWER LEVEL	YES (+54.9%)	NO
L00A - OFFICE (S)	NO (-5.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00A -OFFICE (N)	NO (-44%)	NO
L00 - OFFICE ENTRANCE/GALLERY SOUTH	NO (-32.3%)	NO
L00 - OFFICE ENTRANCE/GALLERY NORTH	NO (-35.9%)	NO
L01 - FLEXIBLE WORKSPACE PERI NW	NO (-62.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-50.4%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-55.4%)	NO
L01 - FLEXIBLE WORKSPACE CORE W	NO (-52.2%)	NO
L01 - FLEXIBLE WORKSPACE PERI S	NO (-52.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI E	NO (-56.5%)	NO
L01 - FLEXIBLE WORKSPACE CORE E	NO (-83.7%)	NO
L01 - FLEXIBLE WORKSPACE CORE S	NO (-89.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI NE	NO (-66.1%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-61.6%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-66.5%)	NO
LB3 - LOWER BOX GYM PERI	NO (-33.1%)	NO
LB2 - UPPER BOX GYM PERI	NO (-73.3%)	NO
L01 - FLEXIBLE WORKSPACE PERI SW	NO (-46.8%)	NO
LB3 - LOWER BOX OFFICE PERI	NO (-48.7%)	NO
LB2 - UPPER BOX OFFICE PERI	NO (-73.8%)	NO
LB2 - UPPER BOX OFFICE SPACE	NO (-96.8%)	NO
LB3 - LOWER BOX OFFICE SPACE	NO (-94.8%)	NO
LB3 - LOWER BOX GYM	NO (-62.7%)	NO
LB3 - LOWER BOX RETAIL	N/A	N/A
LB3 - LOWER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX RETAIL	N/A	N/A
LB2 - UPPER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX GYM	NO (-73.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	60730.8	60730.8
External area [m^2]	35101.8	35101.8
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	26144.9	17900.1
Average U-value [W/m^2K]	0.74	0.51
Alpha value* [%]	10.15	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.84	0.65
Cooling	4.42	9.02
Auxiliary	12.74	13
Lighting	9.1	20.76
Hot water	2.94	4.11
Equipment*	43.84	43.84
TOTAL**	**31.04**	**47.54**

* 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/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	99.33	129.04
Primary energy* [kWh/m^2]	107.22	156.57
Total emissions [kg/m^2]	15.7	24.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	34	83.2	2.4	4.8	10.6	3.9	4.8	4.23	6
	Notional	6.7	145.6	0.7	10.7	13.6	2.56	3.79	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	11.5	95.8	0.8	5.5	10.3	3.9	4.8	4.23	6
	Notional	6.5	131.2	0.7	9.6	11.9	2.56	3.79	----	----
[ST] Water loop heat pump, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	5.1	79.3	0.6	5.8	47.5	2.56	3.79	2.84	4.74
	Notional	3.5	173.5	0.4	12.7	31.7	2.56	3.79	----	----
[ST] Single-duct VAV, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	3.4	38.3	0.3	2.4	22.7	3.71	4.39	4.23	6
	Notional	0.8	51.4	0.1	3.8	17.6	2.56	3.79	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	26.2	0	1.8	0	1	3.97	0	4.23	0
	Notional	22.7	0	2.5	0	1	2.56	0	----	----
[ST] Single-duct VAV, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	50.9	150.6	4.6	11	49.6	3.06	3.81	4.23	6
	Notional	6.7	170	0.7	12.5	17.7	2.56	3.79	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	3.9	194	0.3	11.2	27.1	3.9	4.8	4.23	6
	Notional	0.5	165.9	0.1	12.2	32.1	2.56	3.79	----	----
[ST] Constant volume system (fixed fresh air rate), [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	11.1	173.1	0.7	13	157.3	4.66	3.69	4.23	6
	Notional	0	338.8	0	24.8	98.9	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	L1000106:Surf[0]
Floor	0.2	0.2	LB00003D:Surf[0]
Roof	0.15	0.18	L100011D:Surf[0]
Windows, roof windows, and rooflights	1.5	1.4	L0000046:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

5KS_Be Lean_Office

As designed

Date: Thu Jul 23 18:03:38 2020

Administrative information

Building Details

Address: 5 Kingdom Street, London, W2 6BD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

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

Owner Details

Name: British Land

Telephone number:

Address: York House, 45 Seymour Street, London, W1H 7LX

Certifier details

Name: Jane Goodman (Contact Riccardo Zara)

Telephone number: 07977514095

Address: 240 Blackfriars Road, London, SE1 8NW

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	22.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	22.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	16.3
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	L1000106:Surf[0]
Floor	0.25	0.2	0.2	LB00003D:Surf[0]
Roof	0.25	0.18	0.18	L100011D:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.4	1.41	L0000046:Surf[8]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 5KS FCU OFFICE (HR = 0.67)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.67
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

2- 5KS RADIATORS

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

3- 5KS FCU WCS/SHOWERS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

4- 5KS FCU OTHER AREAS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

5- 5KS VAV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

6- 5KS PUBLIC GARDEN

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

7- 5KS KITCHEN ZONAL SUPPLY

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.1	-
Standard value	0.91*	4.7	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L01 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L02 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L05 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L05 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L05 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L08 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L14 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L16 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 -CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L19 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - CORE WELFARE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (LOADING BAY)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (MANAGEMENT)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - MER	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - SHOWERS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - AUDITORIUM COATS/TICKETS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE LOBBY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - OFFICE ENTRANCE VOID	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE KITCHEN	-	-	-	-	-	-	-	-	1	-	N/A
L00 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - FLEXIBLE USE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - STAFF ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - AUDITORIUM FOYER	-	-	-	-	-	-	-	0.2	-	-	N/A
L19 - OFFICE AMENITY	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - OFFICE (S)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A -OFFICE (N)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY SOUTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY NORTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01 - FLEXIBLE WORKSPACE PERI E	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-E	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-S	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE PERI NE	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE PERI SW	-	-	-	-	-	-	0.2	-	-	N/A	

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L01 - CORE CORR 1(UNCOND)	-	80	-	129
L01 - CORE CORR 2(UNCOND)	-	80	-	71
L01 - CORE LR LIFT CORR	-	80	-	95
L01 - CORE STAIRS 1	-	80	-	63
L01 - CORE STAIRS 2	-	80	-	59
L01 - CORE WC	-	80	-	378
L01 - WC1	-	80	-	53
L02 - CORE CORR 1(UNCOND)	-	80	-	129
L02 - CORE CORR 2(UNCOND)	-	80	-	71
L02 - CORE LR LIFT CORR	-	80	-	95
L02 - CORE STAIRS 1	-	80	-	63
L02 - CORE STAIRS 2	-	80	-	59
L02 - CORE WC	-	80	-	378
L02 - OFFCE PERI NW	100	-	-	972
L02 - OFFICE CORE N	100	-	-	359
L02 - OFFICE CORE N	100	-	-	548
L02 - OFFICE CORE N	100	-	-	187
L02 - OFFICE CORE S	100	-	-	704
L02 - OFFICE CORE S	100	-	-	3819
L02 - OFFICE PERI E	100	-	-	1427
L02 - OFFICE PERI NE	100	-	-	569
L02 - OFFICE PERI S	100	-	-	869
L02 - OFFICE PERI SW	100	-	-	1112
L02 - OFFICE PERI W	100	-	-	619
L02 - WC1	-	80	-	53
L03 - CORE CORR 1(UNCOND)	-	80	-	129
L03 - CORE CORR 3(UNCOND)	-	80	-	71
L03 - CORE LR LIFT CORR	-	80	-	95
L03 - CORE STAIRS 1	-	80	-	63
L03 - CORE STAIRS 3	-	80	-	59
L03 - CORE WC	-	80	-	378
L03 - OFFCE PERI NW	100	-	-	972

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L03 - OFFICE CORE N	100	-	-	359
L03 - OFFICE CORE N	100	-	-	187
L03 - OFFICE CORE N	100	-	-	548
L03 - OFFICE CORE S	100	-	-	3819
L03 - OFFICE CORE S	100	-	-	704
L03 - OFFICE PERI E	100	-	-	1427
L03 - OFFICE PERI NE	100	-	-	569
L03 - OFFICE PERI S	100	-	-	869
L03 - OFFICE PERI SW	100	-	-	1112
L03 - OFFICE PERI W	100	-	-	619
L03 - WC1	-	80	-	53
L04 - CORE CORR 1(UNCOND)	-	80	-	129
L04 - CORE CORR 4(UNCOND)	-	80	-	71
L04 - CORE LR LIFT CORR	-	80	-	95
L04 - CORE STAIRS 1	-	80	-	63
L04 - CORE STAIRS 4	-	80	-	59
L04 - CORE WC	-	80	-	378
L04 - OFFCE PERI NW	100	-	-	972
L04 - OFFICE CORE N	100	-	-	187
L04 - OFFICE CORE N	100	-	-	548
L04 - OFFICE CORE N	100	-	-	359
L04 - OFFICE CORE S	100	-	-	704
L04 - OFFICE CORE S	100	-	-	3819
L04 - OFFICE PERI E	100	-	-	1427
L04 - OFFICE PERI NE	100	-	-	569
L04 - OFFICE PERI S	100	-	-	869
L04 - OFFICE PERI SW	100	-	-	1112
L04 - OFFICE PERI W	100	-	-	619
L04 - WC1	-	80	-	53
L05 - CORE CORR 1(UNCOND)	-	80	-	129
L05 - CORE CORR 5(UNCOND)	-	80	-	71
L05 - CORE LR LIFT CORR	-	80	-	95
L05 - CORE STAIRS 1	-	80	-	63
L05 - CORE STAIRS 5	-	80	-	59
L05 - CORE WC	-	80	-	378
L05 - OFFCE PERI NW	100	-	-	972
L05 - OFFICE CORE N	100	-	-	548
L05 - OFFICE CORE N	100	-	-	187
L05 - OFFICE CORE N	100	-	-	359
L05 - OFFICE CORE S	100	-	-	704
L05 - OFFICE CORE S	100	-	-	3819
L05 - OFFICE PERI E	100	-	-	1427
L05 - OFFICE PERI NE	100	-	-	569

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L05 - OFFICE PERI S	100	-	-	869
L05 - OFFICE PERI SW	100	-	-	1112
L05 - OFFICE PERI W	100	-	-	619
L05 - WC1	-	80	-	53
L06 - CORE CORR 1(UNCOND)	-	80	-	129
L06 - CORE CORR 6(UNCOND)	-	80	-	71
L06 - CORE LR LIFT CORR	-	80	-	95
L06 - CORE STAIRS 1	-	80	-	63
L06 - CORE STAIRS 6	-	80	-	59
L06 - CORE WC	-	80	-	378
L06 - OFFCE PERI NW	100	-	-	972
L06 - OFFICE CORE N	100	-	-	187
L06 - OFFICE CORE N	100	-	-	359
L06 - OFFICE CORE N	100	-	-	548
L06 - OFFICE CORE S	100	-	-	3819
L06 - OFFICE CORE S	100	-	-	704
L06 - OFFICE PERI E	100	-	-	1427
L06 - OFFICE PERI NE	100	-	-	569
L06 - OFFICE PERI S	100	-	-	869
L06 - OFFICE PERI SW	100	-	-	1112
L06 - OFFICE PERI W	100	-	-	619
L06 - WC1	-	80	-	53
L07 - CORE CORR 1(UNCOND)	-	80	-	129
L07 - CORE CORR 7(UNCOND)	-	80	-	71
L07 - CORE LR LIFT CORR	-	80	-	95
L07 - CORE STAIRS 1	-	80	-	63
L07 - CORE STAIRS 7	-	80	-	59
L07 - CORE WC	-	80	-	378
L07 - OFFCE PERI NW	100	-	-	972
L07 - OFFICE CORE N	100	-	-	187
L07 - OFFICE CORE N	100	-	-	359
L07 - OFFICE CORE N	100	-	-	548
L07 - OFFICE CORE S	100	-	-	704
L07 - OFFICE CORE S	100	-	-	3819
L07 - OFFICE PERI E	100	-	-	1427
L07 - OFFICE PERI NE	100	-	-	569
L07 - OFFICE PERI S	100	-	-	869
L07 - OFFICE PERI SW	100	-	-	1112
L07 - OFFICE PERI W	100	-	-	619
L07 - WC1	-	80	-	53
L08 - CORE CORR 1(UNCOND)	-	80	-	129
L08 - CORE CORR 8(UNCOND)	-	80	-	71
L08 - CORE LR LIFT CORR	-	80	-	95

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L08 - CORE STAIRS 1	-	80	-	63
L08 - CORE STAIRS 8	-	80	-	59
L08 - CORE WC	-	80	-	378
L08 - OFFCE PERI NW	100	-	-	972
L08 - OFFICE CORE N	100	-	-	359
L08 - OFFICE CORE N	100	-	-	187
L08 - OFFICE CORE N	100	-	-	548
L08 - OFFICE CORE S	100	-	-	3819
L08 - OFFICE CORE S	100	-	-	704
L08 - OFFICE PERI E	100	-	-	1427
L08 - OFFICE PERI NE	100	-	-	569
L08 - OFFICE PERI S	100	-	-	869
L08 - OFFICE PERI SW	100	-	-	1112
L08 - OFFICE PERI W	100	-	-	619
L08 - WC1	-	80	-	53
L09 - CORE CORR 1(UNCOND)	-	80	-	129
L09 - CORE CORR 9(UNCOND)	-	80	-	71
L09 - CORE LR LIFT CORR	-	80	-	95
L09 - CORE STAIRS 1	-	80	-	63
L09 - CORE STAIRS 9	-	80	-	59
L09 - CORE WC	-	80	-	378
L09 - OFFCE PERI NW	100	-	-	972
L09 - OFFICE CORE N	100	-	-	359
L09 - OFFICE CORE N	100	-	-	548
L09 - OFFICE CORE N	100	-	-	187
L09 - OFFICE CORE S	100	-	-	704
L09 - OFFICE CORE S	100	-	-	3819
L09 - OFFICE PERI E	100	-	-	1427
L09 - OFFICE PERI NE	100	-	-	569
L09 - OFFICE PERI S	100	-	-	869
L09 - OFFICE PERI SW	100	-	-	1112
L09 - OFFICE PERI W	100	-	-	619
L09 - WC1	-	80	-	53
L10 - CORE CORR 1	-	80	-	181
L10 - CORE CORR 1(UNCOND)	-	80	-	134
L10 - CORE CORR 2	-	80	-	176
L10 - CORE LR LIFT CORR	-	80	-	95
L10 - CORE STAIRS 1	-	80	-	59
L10 - CORE STAIRS 1	-	80	-	63
L10 - CORE WC 1	-	80	-	146
L10 - CORE WC 2	-	80	-	86
L10 - CORE WC 3	-	80	-	55
L10 - CORE WC 4	-	80	-	61

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L10 - CORE WC 5	-	80	-	53
L10 - OFFCE PERI NW	100	-	-	972
L10 - OFFICE CORE N	100	-	-	548
L10 - OFFICE CORE N	100	-	-	359
L10 - OFFICE CORE S	100	-	-	3510
L10 - OFFICE PERI E	100	-	-	1649
L10 - OFFICE PERI NE	100	-	-	282
L10 - OFFICE PERI NE	100	-	-	649
L10 - OFFICE PERI S	100	-	-	847
L10 - OFFICE PERI SW	100	-	-	1112
L10 - OFFICE PERI W	100	-	-	619
L11 - CORE CORR 1	-	80	-	181
L11 - CORE CORR 1(UNCOND)	-	80	-	134
L11 - CORE CORR 2	-	80	-	176
L11 - CORE LR LIFT CORR	-	80	-	87
L11 - CORE STAIRS 1	-	80	-	59
L11 - CORE STAIRS 1	-	80	-	63
L11 - CORE WC 1	-	80	-	146
L11 - CORE WC 2	-	80	-	86
L11 - CORE WC 3	-	80	-	55
L11 - CORE WC 4	-	80	-	61
L11 - CORE WC 5	-	80	-	53
L11 - OFFCE PERI NW	100	-	-	972
L11 - OFFICE CORE N	100	-	-	359
L11 - OFFICE CORE N	100	-	-	557
L11 - OFFICE CORE S	100	-	-	3531
L11 - OFFICE PERI E	100	-	-	1649
L11 - OFFICE PERI NE	100	-	-	282
L11 - OFFICE PERI NE	100	-	-	649
L11 - OFFICE PERI S	100	-	-	847
L11 - OFFICE PERI SW	100	-	-	1112
L11 - OFFICE PERI W	100	-	-	619
L12 - CORE CORR 1	-	80	-	181
L12 - CORE CORR 1(UNCOND)	-	80	-	134
L12 - CORE CORR 2	-	80	-	176
L12 - CORE STAIRS 1	-	80	-	59
L12 - CORE STAIRS 1	-	80	-	63
L12 - CORE WC 1	-	80	-	146
L12 - CORE WC 2	-	80	-	86
L12 - CORE WC 3	-	80	-	55
L12 - CORE WC 4	-	80	-	61
L12 - CORE WC 5	-	80	-	53
L12 - OFFICE CORE NE	100	-	-	237

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L12 - OFFICE CORE NW	100	-	-	248
L12 - OFFICE CORE S	100	-	-	3358
L12 - OFFICE CORE W	100	-	-	1242
L12 - OFFICE PERI E	100	-	-	1649
L12 - OFFICE PERI NE	100	-	-	698
L12 - OFFICE PERI NW	100	-	-	1017
L12 - OFFICE PERI S	100	-	-	847
L12 - OFFICE PERI SW	100	-	-	976
L12 - OFFICE PERI W	100	-	-	832
L13 - CORE CORR 1	-	80	-	181
L13 - CORE CORR 1(UNCOND)	-	80	-	134
L13 - CORE CORR 2	-	80	-	176
L13 - CORE STAIRS 1	-	80	-	59
L13 - CORE STAIRS 1	-	80	-	63
L13 - CORE WC 1	-	80	-	146
L13 - CORE WC 2	-	80	-	86
L13 - CORE WC 3	-	80	-	55
L13 - CORE WC 4	-	80	-	61
L13 - CORE WC 5	-	80	-	53
L13 - OFFICE CORE NE	100	-	-	237
L13 - OFFICE CORE NW	100	-	-	248
L13 - OFFICE CORE S	100	-	-	3358
L13 - OFFICE CORE W	100	-	-	1242
L13 - OFFICE PERI E	100	-	-	1649
L13 - OFFICE PERI NE	100	-	-	698
L13 - OFFICE PERI NW	100	-	-	1017
L13 - OFFICE PERI S	100	-	-	847
L13 - OFFICE PERI SW	100	-	-	976
L13 - OFFICE PERI W	100	-	-	832
L14 - CORE CORR 1	-	80	-	181
L14 - CORE CORR 1(UNCOND)	-	80	-	134
L14 - CORE CORR 2	-	80	-	176
L14 - CORE STAIRS 1	-	80	-	63
L14 - CORE STAIRS 1	-	80	-	59
L14 - CORE WC 1	-	80	-	146
L14 - CORE WC 2	-	80	-	86
L14 - CORE WC 3	-	80	-	55
L14 - CORE WC 4	-	80	-	61
L14 - CORE WC 5	-	80	-	53
L14 - OFFICE CORE NE	100	-	-	237
L14 - OFFICE CORE NW	100	-	-	248
L14 - OFFICE CORE S	100	-	-	3358
L14 - OFFICE CORE W	100	-	-	1242

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L14 - OFFICE PERI E	100	-	-	1649
L14 - OFFICE PERI NE	100	-	-	698
L14 - OFFICE PERI NW	100	-	-	1017
L14 - OFFICE PERI S	100	-	-	847
L14 - OFFICE PERI SW	100	-	-	976
L14 - OFFICE PERI W	100	-	-	832
L15 - CORE CORR 1	-	80	-	181
L15 - CORE CORR 1(UNCOND)	-	80	-	134
L15 - CORE CORR 2	-	80	-	176
L15 - CORE STAIRS 1	-	80	-	63
L15 - CORE STAIRS 1	-	80	-	59
L15 - CORE WC 1	-	80	-	146
L15 - CORE WC 2	-	80	-	86
L15 - CORE WC 3	-	80	-	55
L15 - CORE WC 4	-	80	-	61
L15 - CORE WC 5	-	80	-	53
L15 - OFFICE CORE NE	100	-	-	237
L15 - OFFICE CORE NW	100	-	-	248
L15 - OFFICE CORE S	100	-	-	3358
L15 - OFFICE CORE W	100	-	-	1242
L15 - OFFICE PERI E	100	-	-	1649
L15 - OFFICE PERI NE	100	-	-	698
L15 - OFFICE PERI NW	100	-	-	1017
L15 - OFFICE PERI S	100	-	-	847
L15 - OFFICE PERI SW	100	-	-	976
L15 - OFFICE PERI W	100	-	-	832
L16 - CORE CORR 1	-	80	-	181
L16 - CORE CORR 1(UNCOND)	-	80	-	134
L16 - CORE CORR 2	-	80	-	176
L16 - CORE STAIRS 1	-	80	-	59
L16 - CORE STAIRS 1	-	80	-	63
L16 - CORE WC 1	-	80	-	146
L16 - CORE WC 2	-	80	-	86
L16 - CORE WC 3	-	80	-	55
L16 - CORE WC 4	-	80	-	61
L16 - CORE WC 5	-	80	-	53
L16 - OFFICE CORE NE	100	-	-	237
L16 - OFFICE CORE NW	100	-	-	248
L16 - OFFICE CORE S	100	-	-	3358
L16 - OFFICE CORE W	100	-	-	1242
L16 - OFFICE PERI E	100	-	-	1649
L16 - OFFICE PERI NE	100	-	-	698
L16 - OFFICE PERI NW	100	-	-	1017

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L16 - OFFICE PERI S	100	-	-	847
L16 - OFFICE PERI SW	100	-	-	976
L16 - OFFICE PERI W	100	-	-	832
L17 - CORE CORR 1	-	80	-	181
L17 - CORE CORR 1(UNCOND)	-	80	-	134
L17 - CORE CORR 2	-	80	-	176
L17 - CORE STAIRS 1	-	80	-	59
L17 - CORE STAIRS 1	-	80	-	63
L17 - CORE WC 1	-	80	-	146
L17 - CORE WC 2	-	80	-	86
L17 - CORE WC 3	-	80	-	55
L17 - CORE WC 4	-	80	-	61
L17 - CORE WC 5	-	80	-	53
L17 - OFFICE CORE NE	100	-	-	237
L17 - OFFICE CORE NW	100	-	-	248
L17 - OFFICE CORE S	100	-	-	3358
L17 - OFFICE CORE W	100	-	-	1242
L17 - OFFICE PERI E	100	-	-	1649
L17 - OFFICE PERI NE	100	-	-	698
L17 - OFFICE PERI NW	100	-	-	1017
L17 - OFFICE PERI S	100	-	-	847
L17 - OFFICE PERI SW	100	-	-	976
L17 - OFFICE PERI W	100	-	-	832
L18 - CORE CORR 1	-	80	-	181
L18 - CORE CORR 1(UNCOND)	-	80	-	134
L18 - CORE CORR 2	-	80	-	176
L18 - CORE STAIRS 1	-	80	-	59
L18 - CORE STAIRS 1	-	80	-	63
L18 - CORE WC 1	-	80	-	146
L18 - CORE WC 2	-	80	-	86
L18 - CORE WC 3	-	80	-	55
L18 - CORE WC 4	-	80	-	61
L18 - CORE WC 5	-	80	-	53
L18 - OFFICE CORE NE	100	-	-	237
L18 - OFFICE CORE NW	100	-	-	248
L18 - OFFICE CORE S	100	-	-	3358
L18 - OFFICE CORE W	100	-	-	1242
L18 - OFFICE PERI E	100	-	-	1649
L18 - OFFICE PERI NE	100	-	-	698
L18 - OFFICE PERI NW	100	-	-	1017
L18 - OFFICE PERI S	100	-	-	847
L18 - OFFICE PERI SW	100	-	-	976
L18 - OFFICE PERI W	100	-	-	832

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L19 - CORE CORR 1(UNCOND)	-	80	-	153
L19 - CORE CORR 3(UNCOND)	-	80	-	94
L19 - CORE STAIRS 1	-	80	-	70
L19 - CORE STAIRS 3	-	80	-	67
LB1 - CAR PARK	-	80	-	2232
LB1 - CORE CORR	-	80	-	75
LB1 - CORE STAIRS	-	80	-	64
LB1 - CORE STAIRS	-	80	-	59
LB1 - CORE WC	-	80	-	71
LB1 - CORE WCS	-	80	-	200
LB1 - CORE WCS	-	80	-	298
LB1 - CYCLE PARK 2(UNCOND)	-	80	-	281
LB1 - LIFT VOID	-	80	-	128
LB1 - CORE CORR	-	80	-	39
LB1 - LIFT VOID	-	80	-	100
LB1 - FLEXIBLE USE	-	80	100	859
LB1 -CORE CORR	-	80	-	116
LB2 - AUDI	-	80	-	2614
LB2 - CORE CORR 1 (UNCOND)	-	80	-	111
LB2 - CORE CORR 2 (UNCOND)	-	80	-	71
LB2 - CORE STAIRS 1	-	80	-	63
LB2 - CORE STAIRS 2	-	80	-	59
LB2 - CORE WC	-	80	-	292
LB2 - STAIRS	-	80	-	96
LB2 - VOID (EXT)	-	80	-	20
LB3 - AUDITORIUM	-	80	-	3101
LB3 - CORE CORR 1 (UNCOND)	-	80	-	111
LB3 - CORE CORR 2(UNCOND)	-	80	-	71
LB3 - CORE STAIRS 1	-	80	-	63
LB3 - CORE STAIRS 2	-	80	-	59
LB3 - CORE WC	-	80	-	191
LB3 - RETAIL STAIRS	-	80	-	62
LB3 - STAIRS	-	80	-	96
LB3 - VOID (EXT)	-	80	-	20
L19 - CORE CORR 2	-	80	-	190
L20 - MACHINE ROOM	80	-	-	185
L20 - MACHINE ROOM	80	-	-	192
L20 - MACHINE ROOM	80	-	-	206
LB3 - CORE WELFARE	80	-	-	243
LB3 - OFFICE (LOADING BAY)	115	-	-	130
LB3 - PUBLIC USES REFUSE STORE	-	80	-	168
LB3 - UKPN	-	80	-	32
LB3 - OFFICE (MANAGEMENT)	115	-	-	130

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LB3 - SPRINKLER AND WET RISER INLET	80	-	-	83
LB3 - SOLID VOID	-	80	-	6
LB3 - BOH CORR	-	80	-	206
LB3 - FIRE CONTROL ROOM	-	80	-	65
LB3 - RETAIL CORR(UNCOND)	-	80	-	564
LB3 - COMMS	80	-	-	301
LB3 - PLANT	80	-	-	3811
LB3 - PLANT (PH)	80	-	-	823
LB3 - EXTERNAL STAIRS	-	80	-	55
LB3 - BOH CORR	-	80	-	119
LB3 - COMMS ROOM	80	-	-	230
LB3 - REFUSE STORE	-	80	-	237
LB3 - CORR-UNCONDITIONED	-	80	-	132
LB3 - WCS	-	80	-	103
LB3 - PLANT CORR	-	80	-	188
LB3 - PLANT	80	-	-	2546
LB3 - PLANT CORR	-	80	-	195
LB3 - MER	80	-	-	338
LB3 - PLANT	80	-	-	103
LB2 - CYCLE PARK (UNCOND)	-	80	-	873
LB2 - EXTERNAL STAIRS	-	80	-	55
LB2 - SHOWERS	-	80	-	487
LB2 - CORR 1 (UNCOND)	-	80	-	179
LB2 - PLANT	80	-	-	321
LB2 - WCS	-	80	-	166
LB2 - BOH	-	80	-	53
LB2 - PLANT (GARDEN VENT)	80	-	-	989
LB2 - AUDITORIUM COATS/TICKETS	80	-	-	1492
LB2 - CORR (UNCON)	-	80	-	144
LB2 - PLANT	80	-	-	420
LB2 - WCS	-	80	-	918
LB2 - HEATING PLANT	80	-	-	656
LB2 - COOLING PLANT	-	80	-	1302
LB1 - CYCLE PARKING SHORT STAY	-	80	-	222
LB1 - PUBLIC ROUTE/GARDEN	-	80	-	1957
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	285
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	54
L00 - OFFICE LOBBY	100	-	-	229
L00 - CAFE/RESTAURANT VOID	-	80	-	463
L00A - OFFICE ENTRANCE VOID	-	80	-	0
L00A - PUBLIC GARDEN VOID	-	80	-	14
L00A - FLEXIBLE USE	-	80	100	547
L00A - FLEXIBLE USE STAIRS	-	80	-	57

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00A - FLEXIBLE USE KITCHEN	-	80	-	471
L00 - FLEXIBLE USE STAIRS	-	80	-	66
L00 - FLEXIBLE USE	-	80	100	750
L00 - FLEXIBLE USE WCS	-	80	-	108
L00 - OFFICE ENTRANCE/GALLERY	100	-	-	250
L00 - LIFT LOBBY (OPEN)	100	-	-	320
L00 - CORE STAIRS	-	80	-	59
L00 - CORE CORR (UNCON)	-	80	-	75
L00 - LIFT LOBBY (OPEN)	100	-	-	476
L00 - CORE STAIR	-	80	-	64
L00 - CORE CORR (UNCON)	-	80	-	116
L00 - CORE WC	-	80	-	70
L00A - CORE WCS	-	80	-	200
L00A - CORE STAIRS	-	80	-	64
L00A - CORE CORR (UNCON)	-	80	-	116
L00A - CORE CORR 2	-	80	-	141
L00A - CORE STAIR	-	80	-	59
L00A - CORE CORR (UNCON)	-	80	-	75
LB3 - STAFF ROOM	80	-	-	169
LB2 - AUDITORIUM FOYER	-	80	-	496
L19 - OFFICE AMENITY	-	80	100	691
LB2 - PUBLIC GARDEN LOWER LEVEL	-	80	100	998
LB2 - VOID BELOW STAIRS	80	-	-	185
L00A - OFFICE (S)	100	-	-	1934
L00A -OFFICE (N)	100	-	-	2244
L00 - OFFICE ENTRANCE/GALLERY SOUTH	100	-	-	2356
L00 - OFFICE ENTRANCE/GALLERY NORTH	100	-	-	3126
L01 - FLEXIBLE WORKSPACE PERI NW	100	-	-	971
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	357
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	262
L01 - FLEXIBLE WORKSPACE CORE W	100	-	-	104
L01 - FLEXIBLE WORKSPACE PERI S	100	-	-	869
L01 - FLEXIBLE WORKSPACE PERI E	100	-	-	1427
L01 - FLEXIBLE WORKSPACE CORE E	100	-	-	704
L01 - FLEXIBLE WORKSPACE CORE S	100	-	-	3819
L01 - FLEXIBLE WORKSPACE PERI NE	100	-	-	569
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	187
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	773
L01 - FLEXIBLE WORKSPACE PERI SW	100	-	-	1112

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L01 - CORE LR LIFT CORR	N/A	N/A
L01 - CORE WC	N/A	N/A
L01 - WC1	N/A	N/A
L02 - CORE LR LIFT CORR	N/A	N/A
L02 - CORE WC	N/A	N/A
L02 - OFFCE PERI NW	NO (-62.6%)	NO
L02 - OFFICE CORE N	NO (-63.2%)	NO
L02 - OFFICE CORE N	NO (-64.8%)	NO
L02 - OFFICE CORE N	NO (-61.2%)	NO
L02 - OFFICE CORE S	NO (-83.3%)	NO
L02 - OFFICE CORE S	NO (-88.6%)	NO
L02 - OFFICE PERI E	NO (-55%)	NO
L02 - OFFICE PERI NE	NO (-65.9%)	NO
L02 - OFFICE PERI S	NO (-51.6%)	NO
L02 - OFFICE PERI SW	NO (-42.6%)	NO
L02 - OFFICE PERI W	NO (-53.5%)	NO
L02 - WC1	N/A	N/A
L03 - CORE LR LIFT CORR	N/A	N/A
L03 - CORE WC	N/A	N/A
L03 - OFFCE PERI NW	NO (-60.1%)	NO
L03 - OFFICE CORE N	NO (-61.2%)	NO
L03 - OFFICE CORE N	NO (-59.4%)	NO
L03 - OFFICE CORE N	NO (-62.6%)	NO
L03 - OFFICE CORE S	NO (-87.9%)	NO
L03 - OFFICE CORE S	NO (-82.6%)	NO
L03 - OFFICE PERI E	NO (-51.6%)	NO
L03 - OFFICE PERI NE	NO (-64.4%)	NO
L03 - OFFICE PERI S	NO (-46.6%)	NO
L03 - OFFICE PERI SW	NO (-38%)	NO
L03 - OFFICE PERI W	NO (-50.1%)	NO
L03 - WC1	N/A	N/A
L04 - CORE LR LIFT CORR	N/A	N/A
L04 - CORE WC	N/A	N/A
L04 - OFFCE PERI NW	NO (-60.1%)	NO
L04 - OFFICE CORE N	NO (-59%)	NO
L04 - OFFICE CORE N	NO (-62.6%)	NO
L04 - OFFICE CORE N	NO (-61.1%)	NO
L04 - OFFICE CORE S	NO (-81.9%)	NO
L04 - OFFICE CORE S	NO (-87.6%)	NO
L04 - OFFICE PERI E	NO (-47.8%)	NO
L04 - OFFICE PERI NE	NO (-64.1%)	NO
L04 - OFFICE PERI S	NO (-46.1%)	NO
L04 - OFFICE PERI SW	NO (-37.9%)	NO
L04 - OFFICE PERI W	NO (-50.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04 - WC1	N/A	N/A
L05 - CORE LR LIFT CORR	N/A	N/A
L05 - CORE WC	N/A	N/A
L05 - OFFCE PERI NW	NO (-60.1%)	NO
L05 - OFFICE CORE N	NO (-62.5%)	NO
L05 - OFFICE CORE N	NO (-58.6%)	NO
L05 - OFFICE CORE N	NO (-61.1%)	NO
L05 - OFFICE CORE S	NO (-81.2%)	NO
L05 - OFFICE CORE S	NO (-87.4%)	NO
L05 - OFFICE PERI E	NO (-45.1%)	NO
L05 - OFFICE PERI NE	NO (-63.7%)	NO
L05 - OFFICE PERI S	NO (-46%)	NO
L05 - OFFICE PERI SW	NO (-37.9%)	NO
L05 - OFFICE PERI W	NO (-50.1%)	NO
L05 - WC1	N/A	N/A
L06 - CORE LR LIFT CORR	N/A	N/A
L06 - CORE WC	N/A	N/A
L06 - OFFCE PERI NW	NO (-60%)	NO
L06 - OFFICE CORE N	NO (-58.1%)	NO
L06 - OFFICE CORE N	NO (-61%)	NO
L06 - OFFICE CORE N	NO (-62.4%)	NO
L06 - OFFICE CORE S	NO (-87%)	NO
L06 - OFFICE CORE S	NO (-80.2%)	NO
L06 - OFFICE PERI E	NO (-42.5%)	NO
L06 - OFFICE PERI NE	NO (-63.2%)	NO
L06 - OFFICE PERI S	NO (-45.3%)	NO
L06 - OFFICE PERI SW	NO (-37.8%)	NO
L06 - OFFICE PERI W	NO (-50.1%)	NO
L06 - WC1	N/A	N/A
L07 - CORE LR LIFT CORR	N/A	N/A
L07 - CORE WC	N/A	N/A
L07 - OFFCE PERI NW	NO (-59.8%)	NO
L07 - OFFICE CORE N	NO (-57.6%)	NO
L07 - OFFICE CORE N	NO (-61%)	NO
L07 - OFFICE CORE N	NO (-62.3%)	NO
L07 - OFFICE CORE S	NO (-79.3%)	NO
L07 - OFFICE CORE S	NO (-86.8%)	NO
L07 - OFFICE PERI E	NO (-40.6%)	NO
L07 - OFFICE PERI NE	NO (-62.5%)	NO
L07 - OFFICE PERI S	NO (-44.8%)	NO
L07 - OFFICE PERI SW	NO (-37.7%)	NO
L07 - OFFICE PERI W	NO (-50.1%)	NO
L07 - WC1	N/A	N/A
L08 - CORE LR LIFT CORR	N/A	N/A
L08 - CORE WC	N/A	N/A
L08 - OFFCE PERI NW	NO (-59.7%)	NO
L08 - OFFICE CORE N	NO (-61%)	NO
L08 - OFFICE CORE N	NO (-56.7%)	NO
L08 - OFFICE CORE N	NO (-62.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L08 - OFFICE CORE S	NO (-86.5%)	NO
L08 - OFFICE CORE S	NO (-78.3%)	NO
L08 - OFFICE PERI E	NO (-38.6%)	NO
L08 - OFFICE PERI NE	NO (-60.7%)	NO
L08 - OFFICE PERI S	NO (-44.4%)	NO
L08 - OFFICE PERI SW	NO (-37.6%)	NO
L08 - OFFICE PERI W	NO (-50.1%)	NO
L08 - WC1	N/A	N/A
L09 - CORE LR LIFT CORR	N/A	N/A
L09 - CORE WC	N/A	N/A
L09 - OFFCE PERI NW	NO (-59.5%)	NO
L09 - OFFICE CORE N	NO (-60.9%)	NO
L09 - OFFICE CORE N	NO (-62%)	NO
L09 - OFFICE CORE N	NO (-54%)	NO
L09 - OFFICE CORE S	NO (-77.5%)	NO
L09 - OFFICE CORE S	NO (-86.2%)	NO
L09 - OFFICE PERI E	NO (-37.3%)	NO
L09 - OFFICE PERI NE	NO (-58.1%)	NO
L09 - OFFICE PERI S	NO (-44.3%)	NO
L09 - OFFICE PERI SW	NO (-38%)	NO
L09 - OFFICE PERI W	NO (-50.1%)	NO
L09 - WC1	N/A	N/A
L10 - CORE CORR 1	N/A	N/A
L10 - CORE CORR 2	N/A	N/A
L10 - CORE LR LIFT CORR	N/A	N/A
L10 - CORE WC 1	N/A	N/A
L10 - CORE WC 2	N/A	N/A
L10 - CORE WC 3	N/A	N/A
L10 - CORE WC 4	N/A	N/A
L10 - CORE WC 5	N/A	N/A
L10 - OFFCE PERI NW	NO (-55%)	NO
L10 - OFFICE CORE N	NO (-58.2%)	NO
L10 - OFFICE CORE N	NO (-57.2%)	NO
L10 - OFFICE CORE S	NO (-84.4%)	NO
L10 - OFFICE PERI E	NO (-21%)	NO
L10 - OFFICE PERI NE	NO (-45.1%)	NO
L10 - OFFICE PERI NE	NO (-49.3%)	NO
L10 - OFFICE PERI S	NO (-35.8%)	NO
L10 - OFFICE PERI SW	NO (-29.8%)	NO
L10 - OFFICE PERI W	NO (-44.2%)	NO
L11 - CORE CORR 1	N/A	N/A
L11 - CORE CORR 2	N/A	N/A
L11 - CORE LR LIFT CORR	NO (-91.5%)	NO
L11 - CORE WC 1	N/A	N/A
L11 - CORE WC 2	N/A	N/A
L11 - CORE WC 3	N/A	N/A
L11 - CORE WC 4	N/A	N/A
L11 - CORE WC 5	N/A	N/A
L11 - OFFCE PERI NW	NO (-62.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L11 - OFFICE CORE N	NO (-59.9%)	NO
L11 - OFFICE CORE N	NO (-67.2%)	NO
L11 - OFFICE CORE S	NO (-86%)	NO
L11 - OFFICE PERI E	NO (-30.6%)	NO
L11 - OFFICE PERI NE	NO (-43.9%)	NO
L11 - OFFICE PERI NE	NO (-46.6%)	NO
L11 - OFFICE PERI S	NO (-40.4%)	NO
L11 - OFFICE PERI SW	NO (-34.4%)	NO
L11 - OFFICE PERI W	NO (-47.5%)	NO
L12 - CORE CORR 1	N/A	N/A
L12 - CORE CORR 2	N/A	N/A
L12 - CORE WC 1	N/A	N/A
L12 - CORE WC 2	N/A	N/A
L12 - CORE WC 3	N/A	N/A
L12 - CORE WC 4	N/A	N/A
L12 - CORE WC 5	N/A	N/A
L12 - OFFICE CORE NE	NO (-35.9%)	NO
L12 - OFFICE CORE NW	NO (-49.7%)	NO
L12 - OFFICE CORE S	NO (-85.6%)	NO
L12 - OFFICE CORE W	NO (-82.6%)	NO
L12 - OFFICE PERI E	NO (-30.5%)	NO
L12 - OFFICE PERI NE	NO (-45.3%)	NO
L12 - OFFICE PERI NW	NO (-62.1%)	NO
L12 - OFFICE PERI S	NO (-40.1%)	NO
L12 - OFFICE PERI SW	NO (-36.5%)	NO
L12 - OFFICE PERI W	NO (-43.5%)	NO
L13 - CORE CORR 1	N/A	N/A
L13 - CORE CORR 2	N/A	N/A
L13 - CORE WC 1	N/A	N/A
L13 - CORE WC 2	N/A	N/A
L13 - CORE WC 3	N/A	N/A
L13 - CORE WC 4	N/A	N/A
L13 - CORE WC 5	N/A	N/A
L13 - OFFICE CORE NE	NO (-35.9%)	NO
L13 - OFFICE CORE NW	NO (-49.7%)	NO
L13 - OFFICE CORE S	NO (-85.6%)	NO
L13 - OFFICE CORE W	NO (-82.6%)	NO
L13 - OFFICE PERI E	NO (-30.5%)	NO
L13 - OFFICE PERI NE	NO (-45.3%)	NO
L13 - OFFICE PERI NW	NO (-62.1%)	NO
L13 - OFFICE PERI S	NO (-40.1%)	NO
L13 - OFFICE PERI SW	NO (-36.5%)	NO
L13 - OFFICE PERI W	NO (-43.4%)	NO
L14 - CORE CORR 1	N/A	N/A
L14 - CORE CORR 2	N/A	N/A
L14 - CORE WC 1	N/A	N/A
L14 - CORE WC 2	N/A	N/A
L14 - CORE WC 3	N/A	N/A
L14 - CORE WC 4	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L14 - CORE WC 5	N/A	N/A
L14 - OFFICE CORE NE	NO (-35.9%)	NO
L14 - OFFICE CORE NW	NO (-49.7%)	NO
L14 - OFFICE CORE S	NO (-85.6%)	NO
L14 - OFFICE CORE W	NO (-82.6%)	NO
L14 - OFFICE PERI E	NO (-30.5%)	NO
L14 - OFFICE PERI NE	NO (-45.3%)	NO
L14 - OFFICE PERI NW	NO (-62.1%)	NO
L14 - OFFICE PERI S	NO (-40.1%)	NO
L14 - OFFICE PERI SW	NO (-36.5%)	NO
L14 - OFFICE PERI W	NO (-43.4%)	NO
L15 - CORE CORR 1	N/A	N/A
L15 - CORE CORR 2	N/A	N/A
L15 - CORE WC 1	N/A	N/A
L15 - CORE WC 2	N/A	N/A
L15 - CORE WC 3	N/A	N/A
L15 - CORE WC 4	N/A	N/A
L15 - CORE WC 5	N/A	N/A
L15 - OFFICE CORE NE	NO (-35.9%)	NO
L15 - OFFICE CORE NW	NO (-49.7%)	NO
L15 - OFFICE CORE S	NO (-85.6%)	NO
L15 - OFFICE CORE W	NO (-82.6%)	NO
L15 - OFFICE PERI E	NO (-30.5%)	NO
L15 - OFFICE PERI NE	NO (-45.3%)	NO
L15 - OFFICE PERI NW	NO (-62.1%)	NO
L15 - OFFICE PERI S	NO (-40.1%)	NO
L15 - OFFICE PERI SW	NO (-36.5%)	NO
L15 - OFFICE PERI W	NO (-43.4%)	NO
L16 - CORE CORR 1	N/A	N/A
L16 - CORE CORR 2	N/A	N/A
L16 - CORE WC 1	N/A	N/A
L16 - CORE WC 2	N/A	N/A
L16 - CORE WC 3	N/A	N/A
L16 - CORE WC 4	N/A	N/A
L16 - CORE WC 5	N/A	N/A
L16 - OFFICE CORE NE	NO (-35.9%)	NO
L16 - OFFICE CORE NW	NO (-49.7%)	NO
L16 - OFFICE CORE S	NO (-85.6%)	NO
L16 - OFFICE CORE W	NO (-82.6%)	NO
L16 - OFFICE PERI E	NO (-30.5%)	NO
L16 - OFFICE PERI NE	NO (-45.3%)	NO
L16 - OFFICE PERI NW	NO (-62.1%)	NO
L16 - OFFICE PERI S	NO (-40.1%)	NO
L16 - OFFICE PERI SW	NO (-36.5%)	NO
L16 - OFFICE PERI W	NO (-43.4%)	NO
L17 - CORE CORR 1	N/A	N/A
L17 - CORE CORR 2	N/A	N/A
L17 - CORE WC 1	N/A	N/A
L17 - CORE WC 2	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L17 - CORE WC 3	N/A	N/A
L17 - CORE WC 4	N/A	N/A
L17 - CORE WC 5	N/A	N/A
L17 - OFFICE CORE NE	NO (-35.9%)	NO
L17 - OFFICE CORE NW	NO (-49.7%)	NO
L17 - OFFICE CORE S	NO (-85.6%)	NO
L17 - OFFICE CORE W	NO (-82.6%)	NO
L17 - OFFICE PERI E	NO (-30.5%)	NO
L17 - OFFICE PERI NE	NO (-45.3%)	NO
L17 - OFFICE PERI NW	NO (-62.1%)	NO
L17 - OFFICE PERI S	NO (-40.1%)	NO
L17 - OFFICE PERI SW	NO (-36.5%)	NO
L17 - OFFICE PERI W	NO (-43.4%)	NO
L18 - CORE CORR 1	N/A	N/A
L18 - CORE CORR 2	N/A	N/A
L18 - CORE WC 1	N/A	N/A
L18 - CORE WC 2	N/A	N/A
L18 - CORE WC 3	N/A	N/A
L18 - CORE WC 4	N/A	N/A
L18 - CORE WC 5	N/A	N/A
L18 - OFFICE CORE NE	NO (-35.9%)	NO
L18 - OFFICE CORE NW	NO (-49.7%)	NO
L18 - OFFICE CORE S	NO (-85.6%)	NO
L18 - OFFICE CORE W	NO (-82.6%)	NO
L18 - OFFICE PERI E	NO (-30.5%)	NO
L18 - OFFICE PERI NE	NO (-45.3%)	NO
L18 - OFFICE PERI NW	NO (-62.1%)	NO
L18 - OFFICE PERI S	NO (-40.1%)	NO
L18 - OFFICE PERI SW	NO (-36.5%)	NO
L18 - OFFICE PERI W	NO (-43.4%)	NO
LB1 - CORE WC	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE CORR	N/A	N/A
LB1 - FLEXIBLE USE	NO (-25.2%)	NO
LB1 -CORE CORR	N/A	N/A
LB2 - AUDI	N/A	N/A
LB2 - CORE WC	N/A	N/A
LB3 - AUDITORIUM	N/A	N/A
LB3 - CORE WC	N/A	N/A
L19 - CORE CORR 2	N/A	N/A
LB3 - CORE WELFARE	N/A	N/A
LB3 - OFFICE (LOADING BAY)	N/A	N/A
LB3 - OFFICE (MANAGEMENT)	N/A	N/A
LB3 - COMMS	N/A	N/A
LB3 - COMMS ROOM	N/A	N/A
LB3 - WCS	N/A	N/A
LB3 - MER	N/A	N/A
LB2 - SHOWERS	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
LB2 - WCS	N/A	N/A
LB2 - AUDITORIUM COATS/TICKETS	N/A	N/A
LB2 - WCS	N/A	N/A
LB1 - PUBLIC ROUTE/GARDEN	YES (+6.4%)	NO
L00 - OFFICE LOBBY	NO (-11.5%)	NO
L00 - CAFE/RESTAURANT VOID	NO (-49.1%)	NO
L00A - OFFICE ENTRANCE VOID	NO (-36.2%)	NO
L00A - PUBLIC GARDEN VOID	NO (-51%)	NO
L00A - FLEXIBLE USE	NO (-81.4%)	NO
L00A - FLEXIBLE USE KITCHEN	N/A	N/A
L00 - FLEXIBLE USE	NO (-60.8%)	NO
L00 - FLEXIBLE USE WCS	N/A	N/A
L00 - OFFICE ENTRANCE/GALLERY	NO (-50.1%)	NO
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - CORE WC	N/A	N/A
L00A - CORE WCS	N/A	N/A
L00A - CORE CORR 2	NO (-91.2%)	NO
LB3 - STAFF ROOM	N/A	N/A
LB2 - AUDITORIUM FOYER	NO (-62.1%)	NO
L19 - OFFICE AMENITY	NO (-16.3%)	NO
LB2 - PUBLIC GARDEN LOWER LEVEL	YES (+55%)	NO
L00A - OFFICE (S)	NO (-5.6%)	NO
L00A -OFFICE (N)	NO (-44%)	NO
L00 - OFFICE ENTRANCE/GALLERY SOUTH	NO (-32.3%)	NO
L00 - OFFICE ENTRANCE/GALLERY NORTH	NO (-35.9%)	NO
L01 - FLEXIBLE WORKSPACE PERI NW	NO (-62.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-50.4%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-55.4%)	NO
L01 - FLEXIBLE WORKSPACE CORE W	NO (-52.2%)	NO
L01 - FLEXIBLE WORKSPACE PERI S	NO (-52.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI E	NO (-56.5%)	NO
L01 - FLEXIBLE WORKSPACE CORE E	NO (-83.7%)	NO
L01 - FLEXIBLE WORKSPACE CORE S	NO (-89.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI NE	NO (-66.1%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-61.6%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-66.5%)	NO
L01 - FLEXIBLE WORKSPACE PERI SW	NO (-46.8%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	53090.2	53090.2
External area [m^2]	28847.5	28847.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	24310.9	15595.5
Average U-value [W/m^2K]	0.84	0.54
Alpha value* [%]	10.19	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	8.91	2.02
Cooling	4.29	8.78
Auxiliary	10.64	11.85
Lighting	8.44	19.02
Hot water	11.75	11.01
Equipment*	42.42	42.42
TOTAL**	**44.03**	**52.68**

* 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/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	101.8	126
Primary energy* [kWh/m^2]	95.16	134.59
Total emissions [kg/m^2]	16.3	22.9

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	34.1	83.1	10.7	4.8	10.6	0.88	4.8	0.96	6
	Notional	6.7	145.7	2.2	10.7	13.6	0.86	3.79	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	30	110.4	9.4	6.4	12.9	0.88	4.8	0.96	6
	Notional	13.2	121.6	4.2	8.9	13	0.86	3.79	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	2.9	51.7	1	3.3	22.7	0.84	4.39	0.96	6
	Notional	2.2	59.8	0.7	4.4	17.6	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	24.8	0	7.7	0	1	0.9	0	0.96	0
	Notional	22.1	0	7.1	0	1	0.86	0	----	----
[ST] Single-duct VAV, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	49.6	157.2	16.4	9.9	49.6	0.84	4.39	0.96	6
	Notional	6.6	175.2	2.1	12.8	17.7	0.86	3.79	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	3.7	244.2	1.1	14.1	27.2	0.88	4.8	0.96	6
	Notional	0.5	195.6	0.2	14.3	32.3	0.86	3.79	----	----
[ST] Constant volume system (fixed fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	11.1	173.5	2.9	13.1	157.3	1.05	3.69	0.96	6
	Notional	0	339.4	0	24.9	98.9	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	L1000106:Surf[0]
Floor	0.2	0.2	LB00003D:Surf[0]
Roof	0.15	0.18	L100011D:Surf[0]
Windows, roof windows, and rooflights	1.5	1.4	L0000046:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

5KS_Be Green_Office

As designed

Date: Thu Jul 23 18:33:36 2020

Administrative information

Building Details

Address: 5 Kingdom Street, London, W2 6BD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

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

Owner Details

Name: British Land

Telephone number:

Address: York House, 45 Seymour Street, London, W1H 7LX

Certifier details

Name: Jane Goodman (Contact Riccardo Zara)

Telephone number: 07977514095

Address: 240 Blackfriars Road, London, SE1 8NW

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	22.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	22.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	14.2
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	L1000106:Surf[0]
Floor	0.25	0.2	0.2	LB00003D:Surf[0]
Roof	0.25	0.18	0.18	L100011D:Surf[0]
Windows***, roof windows, and rooflights	2.2	1.4	1.41	L0000046:Surf[8]
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 5KS FCU OFFICE (HR = 0.67)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.67
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

2- 5KS RADIATORS

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	-	0	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

3- 5KS FCU WCS/SHOWERS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

4- 5KS FCU OTHER AREAS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

5- 5KS VAV

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

6- 5KS PUBLIC GARDEN

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

7- 5KS KITCHEN ZONAL SUPPLY

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.1	-
Standard value	2.5*	4.7	N/A	1.1^	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L01 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L02 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L02 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L03 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L04 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L05 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L05 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L05 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L06 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L06 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L07 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L08 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L08 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L09 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09 - WC1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L10 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE LR LIFT CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L11 - OFFCE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L12 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L13 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L14 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L14 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L15 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L16 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L16 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L17 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 1	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - CORE WC 1	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 2	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 3	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 4	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - CORE WC 5	-	-	-	-	-	-	-	0.5	-	-	N/A
L18 - OFFICE CORE NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE CORE W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L18 - OFFICE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB1 - CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB1 -CORE CORR	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L19 - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - CORE WELFARE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (LOADING BAY)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - OFFICE (MANAGEMENT)	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - COMMS ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB3 - MER	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - SHOWERS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
LB2 - AUDITORIUM COATS/TICKETS	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE LOBBY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - OFFICE ENTRANCE VOID	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A - FLEXIBLE USE KITCHEN	-	-	-	-	-	-	-	-	1	-	N/A
L00 - FLEXIBLE USE	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - FLEXIBLE USE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - LIFT LOBBY (OPEN)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - CORE WC	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE WCS	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - CORE CORR 2	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - STAFF ROOM	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - AUDITORIUM FOYER	-	-	-	-	-	-	-	0.2	-	-	N/A
L19 - OFFICE AMENITY	-	-	-	-	-	-	-	0.5	-	-	N/A
L00A - OFFICE (S)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00A -OFFICE (N)	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY SOUTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L00 - OFFICE ENTRANCE/GALLERY NORTH	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE CORE-W	-	-	-	-	-	-	-	0.2	-	-	N/A
L01 - FLEXIBLE WORKSPACE PERI S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01 - FLEXIBLE WORKSPACE PERI E	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-E	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-S	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE PERI NE	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE CORE-N	-	-	-	-	-	-	0.2	-	-	N/A	
L01 - FLEXIBLE WORKSPACE PERI SW	-	-	-	-	-	-	0.2	-	-	N/A	

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
L01 - CORE CORR 1(UNCOND)	-	80	-	129
L01 - CORE CORR 2(UNCOND)	-	80	-	71
L01 - CORE LR LIFT CORR	-	80	-	95
L01 - CORE STAIRS 1	-	80	-	63
L01 - CORE STAIRS 2	-	80	-	59
L01 - CORE WC	-	80	-	378
L01 - WC1	-	80	-	53
L02 - CORE CORR 1(UNCOND)	-	80	-	129
L02 - CORE CORR 2(UNCOND)	-	80	-	71
L02 - CORE LR LIFT CORR	-	80	-	95
L02 - CORE STAIRS 1	-	80	-	63
L02 - CORE STAIRS 2	-	80	-	59
L02 - CORE WC	-	80	-	378
L02 - OFFCE PERI NW	100	-	-	972
L02 - OFFICE CORE N	100	-	-	359
L02 - OFFICE CORE N	100	-	-	548
L02 - OFFICE CORE N	100	-	-	187
L02 - OFFICE CORE S	100	-	-	704
L02 - OFFICE CORE S	100	-	-	3819
L02 - OFFICE PERI E	100	-	-	1427
L02 - OFFICE PERI NE	100	-	-	569
L02 - OFFICE PERI S	100	-	-	869
L02 - OFFICE PERI SW	100	-	-	1112
L02 - OFFICE PERI W	100	-	-	619
L02 - WC1	-	80	-	53
L03 - CORE CORR 1(UNCOND)	-	80	-	129
L03 - CORE CORR 3(UNCOND)	-	80	-	71
L03 - CORE LR LIFT CORR	-	80	-	95
L03 - CORE STAIRS 1	-	80	-	63
L03 - CORE STAIRS 3	-	80	-	59
L03 - CORE WC	-	80	-	378
L03 - OFFCE PERI NW	100	-	-	972

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L03 - OFFICE CORE N	100	-	-	359
L03 - OFFICE CORE N	100	-	-	187
L03 - OFFICE CORE N	100	-	-	548
L03 - OFFICE CORE S	100	-	-	3819
L03 - OFFICE CORE S	100	-	-	704
L03 - OFFICE PERI E	100	-	-	1427
L03 - OFFICE PERI NE	100	-	-	569
L03 - OFFICE PERI S	100	-	-	869
L03 - OFFICE PERI SW	100	-	-	1112
L03 - OFFICE PERI W	100	-	-	619
L03 - WC1	-	80	-	53
L04 - CORE CORR 1(UNCOND)	-	80	-	129
L04 - CORE CORR 4(UNCOND)	-	80	-	71
L04 - CORE LR LIFT CORR	-	80	-	95
L04 - CORE STAIRS 1	-	80	-	63
L04 - CORE STAIRS 4	-	80	-	59
L04 - CORE WC	-	80	-	378
L04 - OFFCE PERI NW	100	-	-	972
L04 - OFFICE CORE N	100	-	-	187
L04 - OFFICE CORE N	100	-	-	548
L04 - OFFICE CORE N	100	-	-	359
L04 - OFFICE CORE S	100	-	-	704
L04 - OFFICE CORE S	100	-	-	3819
L04 - OFFICE PERI E	100	-	-	1427
L04 - OFFICE PERI NE	100	-	-	569
L04 - OFFICE PERI S	100	-	-	869
L04 - OFFICE PERI SW	100	-	-	1112
L04 - OFFICE PERI W	100	-	-	619
L04 - WC1	-	80	-	53
L05 - CORE CORR 1(UNCOND)	-	80	-	129
L05 - CORE CORR 5(UNCOND)	-	80	-	71
L05 - CORE LR LIFT CORR	-	80	-	95
L05 - CORE STAIRS 1	-	80	-	63
L05 - CORE STAIRS 5	-	80	-	59
L05 - CORE WC	-	80	-	378
L05 - OFFCE PERI NW	100	-	-	972
L05 - OFFICE CORE N	100	-	-	548
L05 - OFFICE CORE N	100	-	-	187
L05 - OFFICE CORE N	100	-	-	359
L05 - OFFICE CORE S	100	-	-	704
L05 - OFFICE CORE S	100	-	-	3819
L05 - OFFICE PERI E	100	-	-	1427
L05 - OFFICE PERI NE	100	-	-	569

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L05 - OFFICE PERI S	100	-	-	869
L05 - OFFICE PERI SW	100	-	-	1112
L05 - OFFICE PERI W	100	-	-	619
L05 - WC1	-	80	-	53
L06 - CORE CORR 1(UNCOND)	-	80	-	129
L06 - CORE CORR 6(UNCOND)	-	80	-	71
L06 - CORE LR LIFT CORR	-	80	-	95
L06 - CORE STAIRS 1	-	80	-	63
L06 - CORE STAIRS 6	-	80	-	59
L06 - CORE WC	-	80	-	378
L06 - OFFCE PERI NW	100	-	-	972
L06 - OFFICE CORE N	100	-	-	187
L06 - OFFICE CORE N	100	-	-	359
L06 - OFFICE CORE N	100	-	-	548
L06 - OFFICE CORE S	100	-	-	3819
L06 - OFFICE CORE S	100	-	-	704
L06 - OFFICE PERI E	100	-	-	1427
L06 - OFFICE PERI NE	100	-	-	569
L06 - OFFICE PERI S	100	-	-	869
L06 - OFFICE PERI SW	100	-	-	1112
L06 - OFFICE PERI W	100	-	-	619
L06 - WC1	-	80	-	53
L07 - CORE CORR 1(UNCOND)	-	80	-	129
L07 - CORE CORR 7(UNCOND)	-	80	-	71
L07 - CORE LR LIFT CORR	-	80	-	95
L07 - CORE STAIRS 1	-	80	-	63
L07 - CORE STAIRS 7	-	80	-	59
L07 - CORE WC	-	80	-	378
L07 - OFFCE PERI NW	100	-	-	972
L07 - OFFICE CORE N	100	-	-	187
L07 - OFFICE CORE N	100	-	-	359
L07 - OFFICE CORE N	100	-	-	548
L07 - OFFICE CORE S	100	-	-	704
L07 - OFFICE CORE S	100	-	-	3819
L07 - OFFICE PERI E	100	-	-	1427
L07 - OFFICE PERI NE	100	-	-	569
L07 - OFFICE PERI S	100	-	-	869
L07 - OFFICE PERI SW	100	-	-	1112
L07 - OFFICE PERI W	100	-	-	619
L07 - WC1	-	80	-	53
L08 - CORE CORR 1(UNCOND)	-	80	-	129
L08 - CORE CORR 8(UNCOND)	-	80	-	71
L08 - CORE LR LIFT CORR	-	80	-	95

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L08 - CORE STAIRS 1	-	80	-	63
L08 - CORE STAIRS 8	-	80	-	59
L08 - CORE WC	-	80	-	378
L08 - OFFCE PERI NW	100	-	-	972
L08 - OFFICE CORE N	100	-	-	359
L08 - OFFICE CORE N	100	-	-	187
L08 - OFFICE CORE N	100	-	-	548
L08 - OFFICE CORE S	100	-	-	3819
L08 - OFFICE CORE S	100	-	-	704
L08 - OFFICE PERI E	100	-	-	1427
L08 - OFFICE PERI NE	100	-	-	569
L08 - OFFICE PERI S	100	-	-	869
L08 - OFFICE PERI SW	100	-	-	1112
L08 - OFFICE PERI W	100	-	-	619
L08 - WC1	-	80	-	53
L09 - CORE CORR 1(UNCOND)	-	80	-	129
L09 - CORE CORR 9(UNCOND)	-	80	-	71
L09 - CORE LR LIFT CORR	-	80	-	95
L09 - CORE STAIRS 1	-	80	-	63
L09 - CORE STAIRS 9	-	80	-	59
L09 - CORE WC	-	80	-	378
L09 - OFFCE PERI NW	100	-	-	972
L09 - OFFICE CORE N	100	-	-	359
L09 - OFFICE CORE N	100	-	-	548
L09 - OFFICE CORE N	100	-	-	187
L09 - OFFICE CORE S	100	-	-	704
L09 - OFFICE CORE S	100	-	-	3819
L09 - OFFICE PERI E	100	-	-	1427
L09 - OFFICE PERI NE	100	-	-	569
L09 - OFFICE PERI S	100	-	-	869
L09 - OFFICE PERI SW	100	-	-	1112
L09 - OFFICE PERI W	100	-	-	619
L09 - WC1	-	80	-	53
L10 - CORE CORR 1	-	80	-	181
L10 - CORE CORR 1(UNCOND)	-	80	-	134
L10 - CORE CORR 2	-	80	-	176
L10 - CORE LR LIFT CORR	-	80	-	95
L10 - CORE STAIRS 1	-	80	-	59
L10 - CORE STAIRS 1	-	80	-	63
L10 - CORE WC 1	-	80	-	146
L10 - CORE WC 2	-	80	-	86
L10 - CORE WC 3	-	80	-	55
L10 - CORE WC 4	-	80	-	61

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L10 - CORE WC 5	-	80	-	53
L10 - OFFCE PERI NW	100	-	-	972
L10 - OFFICE CORE N	100	-	-	548
L10 - OFFICE CORE N	100	-	-	359
L10 - OFFICE CORE S	100	-	-	3510
L10 - OFFICE PERI E	100	-	-	1649
L10 - OFFICE PERI NE	100	-	-	282
L10 - OFFICE PERI NE	100	-	-	649
L10 - OFFICE PERI S	100	-	-	847
L10 - OFFICE PERI SW	100	-	-	1112
L10 - OFFICE PERI W	100	-	-	619
L11 - CORE CORR 1	-	80	-	181
L11 - CORE CORR 1(UNCOND)	-	80	-	134
L11 - CORE CORR 2	-	80	-	176
L11 - CORE LR LIFT CORR	-	80	-	87
L11 - CORE STAIRS 1	-	80	-	59
L11 - CORE STAIRS 1	-	80	-	63
L11 - CORE WC 1	-	80	-	146
L11 - CORE WC 2	-	80	-	86
L11 - CORE WC 3	-	80	-	55
L11 - CORE WC 4	-	80	-	61
L11 - CORE WC 5	-	80	-	53
L11 - OFFCE PERI NW	100	-	-	972
L11 - OFFICE CORE N	100	-	-	359
L11 - OFFICE CORE N	100	-	-	557
L11 - OFFICE CORE S	100	-	-	3531
L11 - OFFICE PERI E	100	-	-	1649
L11 - OFFICE PERI NE	100	-	-	282
L11 - OFFICE PERI NE	100	-	-	649
L11 - OFFICE PERI S	100	-	-	847
L11 - OFFICE PERI SW	100	-	-	1112
L11 - OFFICE PERI W	100	-	-	619
L12 - CORE CORR 1	-	80	-	181
L12 - CORE CORR 1(UNCOND)	-	80	-	134
L12 - CORE CORR 2	-	80	-	176
L12 - CORE STAIRS 1	-	80	-	59
L12 - CORE STAIRS 1	-	80	-	63
L12 - CORE WC 1	-	80	-	146
L12 - CORE WC 2	-	80	-	86
L12 - CORE WC 3	-	80	-	55
L12 - CORE WC 4	-	80	-	61
L12 - CORE WC 5	-	80	-	53
L12 - OFFICE CORE NE	100	-	-	237

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L12 - OFFICE CORE NW	100	-	-	248
L12 - OFFICE CORE S	100	-	-	3358
L12 - OFFICE CORE W	100	-	-	1242
L12 - OFFICE PERI E	100	-	-	1649
L12 - OFFICE PERI NE	100	-	-	698
L12 - OFFICE PERI NW	100	-	-	1017
L12 - OFFICE PERI S	100	-	-	847
L12 - OFFICE PERI SW	100	-	-	976
L12 - OFFICE PERI W	100	-	-	832
L13 - CORE CORR 1	-	80	-	181
L13 - CORE CORR 1(UNCOND)	-	80	-	134
L13 - CORE CORR 2	-	80	-	176
L13 - CORE STAIRS 1	-	80	-	59
L13 - CORE STAIRS 1	-	80	-	63
L13 - CORE WC 1	-	80	-	146
L13 - CORE WC 2	-	80	-	86
L13 - CORE WC 3	-	80	-	55
L13 - CORE WC 4	-	80	-	61
L13 - CORE WC 5	-	80	-	53
L13 - OFFICE CORE NE	100	-	-	237
L13 - OFFICE CORE NW	100	-	-	248
L13 - OFFICE CORE S	100	-	-	3358
L13 - OFFICE CORE W	100	-	-	1242
L13 - OFFICE PERI E	100	-	-	1649
L13 - OFFICE PERI NE	100	-	-	698
L13 - OFFICE PERI NW	100	-	-	1017
L13 - OFFICE PERI S	100	-	-	847
L13 - OFFICE PERI SW	100	-	-	976
L13 - OFFICE PERI W	100	-	-	832
L14 - CORE CORR 1	-	80	-	181
L14 - CORE CORR 1(UNCOND)	-	80	-	134
L14 - CORE CORR 2	-	80	-	176
L14 - CORE STAIRS 1	-	80	-	63
L14 - CORE STAIRS 1	-	80	-	59
L14 - CORE WC 1	-	80	-	146
L14 - CORE WC 2	-	80	-	86
L14 - CORE WC 3	-	80	-	55
L14 - CORE WC 4	-	80	-	61
L14 - CORE WC 5	-	80	-	53
L14 - OFFICE CORE NE	100	-	-	237
L14 - OFFICE CORE NW	100	-	-	248
L14 - OFFICE CORE S	100	-	-	3358
L14 - OFFICE CORE W	100	-	-	1242

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L14 - OFFICE PERI E	100	-	-	1649
L14 - OFFICE PERI NE	100	-	-	698
L14 - OFFICE PERI NW	100	-	-	1017
L14 - OFFICE PERI S	100	-	-	847
L14 - OFFICE PERI SW	100	-	-	976
L14 - OFFICE PERI W	100	-	-	832
L15 - CORE CORR 1	-	80	-	181
L15 - CORE CORR 1(UNCOND)	-	80	-	134
L15 - CORE CORR 2	-	80	-	176
L15 - CORE STAIRS 1	-	80	-	63
L15 - CORE STAIRS 1	-	80	-	59
L15 - CORE WC 1	-	80	-	146
L15 - CORE WC 2	-	80	-	86
L15 - CORE WC 3	-	80	-	55
L15 - CORE WC 4	-	80	-	61
L15 - CORE WC 5	-	80	-	53
L15 - OFFICE CORE NE	100	-	-	237
L15 - OFFICE CORE NW	100	-	-	248
L15 - OFFICE CORE S	100	-	-	3358
L15 - OFFICE CORE W	100	-	-	1242
L15 - OFFICE PERI E	100	-	-	1649
L15 - OFFICE PERI NE	100	-	-	698
L15 - OFFICE PERI NW	100	-	-	1017
L15 - OFFICE PERI S	100	-	-	847
L15 - OFFICE PERI SW	100	-	-	976
L15 - OFFICE PERI W	100	-	-	832
L16 - CORE CORR 1	-	80	-	181
L16 - CORE CORR 1(UNCOND)	-	80	-	134
L16 - CORE CORR 2	-	80	-	176
L16 - CORE STAIRS 1	-	80	-	59
L16 - CORE STAIRS 1	-	80	-	63
L16 - CORE WC 1	-	80	-	146
L16 - CORE WC 2	-	80	-	86
L16 - CORE WC 3	-	80	-	55
L16 - CORE WC 4	-	80	-	61
L16 - CORE WC 5	-	80	-	53
L16 - OFFICE CORE NE	100	-	-	237
L16 - OFFICE CORE NW	100	-	-	248
L16 - OFFICE CORE S	100	-	-	3358
L16 - OFFICE CORE W	100	-	-	1242
L16 - OFFICE PERI E	100	-	-	1649
L16 - OFFICE PERI NE	100	-	-	698
L16 - OFFICE PERI NW	100	-	-	1017

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L16 - OFFICE PERI S	100	-	-	847
L16 - OFFICE PERI SW	100	-	-	976
L16 - OFFICE PERI W	100	-	-	832
L17 - CORE CORR 1	-	80	-	181
L17 - CORE CORR 1(UNCOND)	-	80	-	134
L17 - CORE CORR 2	-	80	-	176
L17 - CORE STAIRS 1	-	80	-	59
L17 - CORE STAIRS 1	-	80	-	63
L17 - CORE WC 1	-	80	-	146
L17 - CORE WC 2	-	80	-	86
L17 - CORE WC 3	-	80	-	55
L17 - CORE WC 4	-	80	-	61
L17 - CORE WC 5	-	80	-	53
L17 - OFFICE CORE NE	100	-	-	237
L17 - OFFICE CORE NW	100	-	-	248
L17 - OFFICE CORE S	100	-	-	3358
L17 - OFFICE CORE W	100	-	-	1242
L17 - OFFICE PERI E	100	-	-	1649
L17 - OFFICE PERI NE	100	-	-	698
L17 - OFFICE PERI NW	100	-	-	1017
L17 - OFFICE PERI S	100	-	-	847
L17 - OFFICE PERI SW	100	-	-	976
L17 - OFFICE PERI W	100	-	-	832
L18 - CORE CORR 1	-	80	-	181
L18 - CORE CORR 1(UNCOND)	-	80	-	134
L18 - CORE CORR 2	-	80	-	176
L18 - CORE STAIRS 1	-	80	-	59
L18 - CORE STAIRS 1	-	80	-	63
L18 - CORE WC 1	-	80	-	146
L18 - CORE WC 2	-	80	-	86
L18 - CORE WC 3	-	80	-	55
L18 - CORE WC 4	-	80	-	61
L18 - CORE WC 5	-	80	-	53
L18 - OFFICE CORE NE	100	-	-	237
L18 - OFFICE CORE NW	100	-	-	248
L18 - OFFICE CORE S	100	-	-	3358
L18 - OFFICE CORE W	100	-	-	1242
L18 - OFFICE PERI E	100	-	-	1649
L18 - OFFICE PERI NE	100	-	-	698
L18 - OFFICE PERI NW	100	-	-	1017
L18 - OFFICE PERI S	100	-	-	847
L18 - OFFICE PERI SW	100	-	-	976
L18 - OFFICE PERI W	100	-	-	832

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L19 - CORE CORR 1(UNCOND)	-	80	-	153
L19 - CORE CORR 3(UNCOND)	-	80	-	94
L19 - CORE STAIRS 1	-	80	-	70
L19 - CORE STAIRS 3	-	80	-	67
LB1 - CAR PARK	-	80	-	2232
LB1 - CORE CORR	-	80	-	75
LB1 - CORE STAIRS	-	80	-	64
LB1 - CORE STAIRS	-	80	-	59
LB1 - CORE WC	-	80	-	71
LB1 - CORE WCS	-	80	-	200
LB1 - CORE WCS	-	80	-	298
LB1 - CYCLE PARK 2(UNCOND)	-	80	-	281
LB1 - LIFT VOID	-	80	-	128
LB1 - CORE CORR	-	80	-	39
LB1 - LIFT VOID	-	80	-	100
LB1 - FLEXIBLE USE	-	80	100	859
LB1 -CORE CORR	-	80	-	116
LB2 - AUDI	-	80	-	2614
LB2 - CORE CORR 1 (UNCOND)	-	80	-	111
LB2 - CORE CORR 2 (UNCOND)	-	80	-	71
LB2 - CORE STAIRS 1	-	80	-	63
LB2 - CORE STAIRS 2	-	80	-	59
LB2 - CORE WC	-	80	-	292
LB2 - STAIRS	-	80	-	96
LB2 - VOID (EXT)	-	80	-	20
LB3 - AUDITORIUM	-	80	-	3101
LB3 - CORE CORR 1 (UNCOND)	-	80	-	111
LB3 - CORE CORR 2(UNCOND)	-	80	-	71
LB3 - CORE STAIRS 1	-	80	-	63
LB3 - CORE STAIRS 2	-	80	-	59
LB3 - CORE WC	-	80	-	191
LB3 - RETAIL STAIRS	-	80	-	62
LB3 - STAIRS	-	80	-	96
LB3 - VOID (EXT)	-	80	-	20
L19 - CORE CORR 2	-	80	-	190
L20 - MACHINE ROOM	80	-	-	185
L20 - MACHINE ROOM	80	-	-	192
L20 - MACHINE ROOM	80	-	-	206
LB3 - CORE WELFARE	80	-	-	243
LB3 - OFFICE (LOADING BAY)	115	-	-	130
LB3 - PUBLIC USES REFUSE STORE	-	80	-	168
LB3 - UKPN	-	80	-	32
LB3 - OFFICE (MANAGEMENT)	115	-	-	130

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
LB3 - SPRINKLER AND WET RISER INLET	80	-	-	83
LB3 - SOLID VOID	-	80	-	6
LB3 - BOH CORR	-	80	-	206
LB3 - FIRE CONTROL ROOM	-	80	-	65
LB3 - RETAIL CORR(UNCOND)	-	80	-	564
LB3 - COMMS	80	-	-	301
LB3 - PLANT	80	-	-	3811
LB3 - PLANT (PH)	80	-	-	823
LB3 - EXTERNAL STAIRS	-	80	-	55
LB3 - BOH CORR	-	80	-	119
LB3 - COMMS ROOM	80	-	-	230
LB3 - REFUSE STORE	-	80	-	237
LB3 - CORR-UNCONDITIONED	-	80	-	132
LB3 - WCS	-	80	-	103
LB3 - PLANT CORR	-	80	-	188
LB3 - PLANT	80	-	-	2546
LB3 - PLANT CORR	-	80	-	195
LB3 - MER	80	-	-	338
LB3 - PLANT	80	-	-	103
LB2 - CYCLE PARK (UNCOND)	-	80	-	873
LB2 - EXTERNAL STAIRS	-	80	-	55
LB2 - SHOWERS	-	80	-	487
LB2 - CORR 1 (UNCOND)	-	80	-	179
LB2 - PLANT	80	-	-	321
LB2 - WCS	-	80	-	166
LB2 - BOH	-	80	-	53
LB2 - PLANT (GARDEN VENT)	80	-	-	989
LB2 - AUDITORIUM COATS/TICKETS	80	-	-	1492
LB2 - CORR (UNCON)	-	80	-	144
LB2 - PLANT	80	-	-	420
LB2 - WCS	-	80	-	918
LB2 - HEATING PLANT	80	-	-	656
LB2 - COOLING PLANT	-	80	-	1302
LB1 - CYCLE PARKING SHORT STAY	-	80	-	222
LB1 - PUBLIC ROUTE/GARDEN	-	80	-	1957
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	285
LB1 - CYCLE PARK 1(UNCOND)	-	80	-	54
L00 - OFFICE LOBBY	100	-	-	229
L00 - CAFE/RESTAURANT VOID	-	80	-	463
L00A - OFFICE ENTRANCE VOID	-	80	-	0
L00A - PUBLIC GARDEN VOID	-	80	-	14
L00A - FLEXIBLE USE	-	80	100	547
L00A - FLEXIBLE USE STAIRS	-	80	-	57

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
L00A - FLEXIBLE USE KITCHEN	-	80	-	471
L00 - FLEXIBLE USE STAIRS	-	80	-	66
L00 - FLEXIBLE USE	-	80	100	750
L00 - FLEXIBLE USE WCS	-	80	-	108
L00 - OFFICE ENTRANCE/GALLERY	100	-	-	250
L00 - LIFT LOBBY (OPEN)	100	-	-	320
L00 - CORE STAIRS	-	80	-	59
L00 - CORE CORR (UNCON)	-	80	-	75
L00 - LIFT LOBBY (OPEN)	100	-	-	476
L00 - CORE STAIR	-	80	-	64
L00 - CORE CORR (UNCON)	-	80	-	116
L00 - CORE WC	-	80	-	70
L00A - CORE WCS	-	80	-	200
L00A - CORE STAIRS	-	80	-	64
L00A - CORE CORR (UNCON)	-	80	-	116
L00A - CORE CORR 2	-	80	-	141
L00A - CORE STAIR	-	80	-	59
L00A - CORE CORR (UNCON)	-	80	-	75
LB3 - STAFF ROOM	80	-	-	169
LB2 - AUDITORIUM FOYER	-	80	-	496
L19 - OFFICE AMENITY	-	80	100	691
LB2 - PUBLIC GARDEN LOWER LEVEL	-	80	100	998
LB2 - VOID BELOW STAIRS	80	-	-	185
L00A - OFFICE (S)	100	-	-	1934
L00A -OFFICE (N)	100	-	-	2244
L00 - OFFICE ENTRANCE/GALLERY SOUTH	100	-	-	2356
L00 - OFFICE ENTRANCE/GALLERY NORTH	100	-	-	3126
L01 - FLEXIBLE WORKSPACE PERI NW	100	-	-	971
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	357
L01 - FLEXIBLE WORKSPACE PERI W	100	-	-	262
L01 - FLEXIBLE WORKSPACE CORE W	100	-	-	104
L01 - FLEXIBLE WORKSPACE PERI S	100	-	-	869
L01 - FLEXIBLE WORKSPACE PERI E	100	-	-	1427
L01 - FLEXIBLE WORKSPACE CORE E	100	-	-	704
L01 - FLEXIBLE WORKSPACE CORE S	100	-	-	3819
L01 - FLEXIBLE WORKSPACE PERI NE	100	-	-	569
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	187
L01 - FLEXIBLE WORKSPACE CORE N	100	-	-	773
L01 - FLEXIBLE WORKSPACE PERI SW	100	-	-	1112

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L01 - CORE LR LIFT CORR	N/A	N/A
L01 - CORE WC	N/A	N/A
L01 - WC1	N/A	N/A
L02 - CORE LR LIFT CORR	N/A	N/A
L02 - CORE WC	N/A	N/A
L02 - OFFCE PERI NW	NO (-62.6%)	NO
L02 - OFFICE CORE N	NO (-63.2%)	NO
L02 - OFFICE CORE N	NO (-64.8%)	NO
L02 - OFFICE CORE N	NO (-61.2%)	NO
L02 - OFFICE CORE S	NO (-83.3%)	NO
L02 - OFFICE CORE S	NO (-88.6%)	NO
L02 - OFFICE PERI E	NO (-55%)	NO
L02 - OFFICE PERI NE	NO (-65.9%)	NO
L02 - OFFICE PERI S	NO (-51.6%)	NO
L02 - OFFICE PERI SW	NO (-42.6%)	NO
L02 - OFFICE PERI W	NO (-53.5%)	NO
L02 - WC1	N/A	N/A
L03 - CORE LR LIFT CORR	N/A	N/A
L03 - CORE WC	N/A	N/A
L03 - OFFCE PERI NW	NO (-60.1%)	NO
L03 - OFFICE CORE N	NO (-61.2%)	NO
L03 - OFFICE CORE N	NO (-59.4%)	NO
L03 - OFFICE CORE N	NO (-62.6%)	NO
L03 - OFFICE CORE S	NO (-87.9%)	NO
L03 - OFFICE CORE S	NO (-82.6%)	NO
L03 - OFFICE PERI E	NO (-51.6%)	NO
L03 - OFFICE PERI NE	NO (-64.4%)	NO
L03 - OFFICE PERI S	NO (-46.6%)	NO
L03 - OFFICE PERI SW	NO (-38%)	NO
L03 - OFFICE PERI W	NO (-50.1%)	NO
L03 - WC1	N/A	N/A
L04 - CORE LR LIFT CORR	N/A	N/A
L04 - CORE WC	N/A	N/A
L04 - OFFCE PERI NW	NO (-60.1%)	NO
L04 - OFFICE CORE N	NO (-59%)	NO
L04 - OFFICE CORE N	NO (-62.6%)	NO
L04 - OFFICE CORE N	NO (-61.1%)	NO
L04 - OFFICE CORE S	NO (-81.9%)	NO
L04 - OFFICE CORE S	NO (-87.6%)	NO
L04 - OFFICE PERI E	NO (-47.8%)	NO
L04 - OFFICE PERI NE	NO (-64.1%)	NO
L04 - OFFICE PERI S	NO (-46.1%)	NO
L04 - OFFICE PERI SW	NO (-37.9%)	NO
L04 - OFFICE PERI W	NO (-50.1%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04 - WC1	N/A	N/A
L05 - CORE LR LIFT CORR	N/A	N/A
L05 - CORE WC	N/A	N/A
L05 - OFFCE PERI NW	NO (-60.1%)	NO
L05 - OFFICE CORE N	NO (-62.5%)	NO
L05 - OFFICE CORE N	NO (-58.6%)	NO
L05 - OFFICE CORE N	NO (-61.1%)	NO
L05 - OFFICE CORE S	NO (-81.2%)	NO
L05 - OFFICE CORE S	NO (-87.4%)	NO
L05 - OFFICE PERI E	NO (-45.1%)	NO
L05 - OFFICE PERI NE	NO (-63.7%)	NO
L05 - OFFICE PERI S	NO (-46%)	NO
L05 - OFFICE PERI SW	NO (-37.9%)	NO
L05 - OFFICE PERI W	NO (-50.1%)	NO
L05 - WC1	N/A	N/A
L06 - CORE LR LIFT CORR	N/A	N/A
L06 - CORE WC	N/A	N/A
L06 - OFFCE PERI NW	NO (-60%)	NO
L06 - OFFICE CORE N	NO (-58.1%)	NO
L06 - OFFICE CORE N	NO (-61%)	NO
L06 - OFFICE CORE N	NO (-62.4%)	NO
L06 - OFFICE CORE S	NO (-87%)	NO
L06 - OFFICE CORE S	NO (-80.2%)	NO
L06 - OFFICE PERI E	NO (-42.5%)	NO
L06 - OFFICE PERI NE	NO (-63.2%)	NO
L06 - OFFICE PERI S	NO (-45.3%)	NO
L06 - OFFICE PERI SW	NO (-37.8%)	NO
L06 - OFFICE PERI W	NO (-50.1%)	NO
L06 - WC1	N/A	N/A
L07 - CORE LR LIFT CORR	N/A	N/A
L07 - CORE WC	N/A	N/A
L07 - OFFCE PERI NW	NO (-59.8%)	NO
L07 - OFFICE CORE N	NO (-57.6%)	NO
L07 - OFFICE CORE N	NO (-61%)	NO
L07 - OFFICE CORE N	NO (-62.3%)	NO
L07 - OFFICE CORE S	NO (-79.3%)	NO
L07 - OFFICE CORE S	NO (-86.8%)	NO
L07 - OFFICE PERI E	NO (-40.6%)	NO
L07 - OFFICE PERI NE	NO (-62.5%)	NO
L07 - OFFICE PERI S	NO (-44.8%)	NO
L07 - OFFICE PERI SW	NO (-37.7%)	NO
L07 - OFFICE PERI W	NO (-50.1%)	NO
L07 - WC1	N/A	N/A
L08 - CORE LR LIFT CORR	N/A	N/A
L08 - CORE WC	N/A	N/A
L08 - OFFCE PERI NW	NO (-59.7%)	NO
L08 - OFFICE CORE N	NO (-61%)	NO
L08 - OFFICE CORE N	NO (-56.7%)	NO
L08 - OFFICE CORE N	NO (-62.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L08 - OFFICE CORE S	NO (-86.5%)	NO
L08 - OFFICE CORE S	NO (-78.3%)	NO
L08 - OFFICE PERI E	NO (-38.6%)	NO
L08 - OFFICE PERI NE	NO (-60.7%)	NO
L08 - OFFICE PERI S	NO (-44.4%)	NO
L08 - OFFICE PERI SW	NO (-37.6%)	NO
L08 - OFFICE PERI W	NO (-50.1%)	NO
L08 - WC1	N/A	N/A
L09 - CORE LR LIFT CORR	N/A	N/A
L09 - CORE WC	N/A	N/A
L09 - OFFCE PERI NW	NO (-59.5%)	NO
L09 - OFFICE CORE N	NO (-60.9%)	NO
L09 - OFFICE CORE N	NO (-62%)	NO
L09 - OFFICE CORE N	NO (-54%)	NO
L09 - OFFICE CORE S	NO (-77.5%)	NO
L09 - OFFICE CORE S	NO (-86.2%)	NO
L09 - OFFICE PERI E	NO (-37.3%)	NO
L09 - OFFICE PERI NE	NO (-58.1%)	NO
L09 - OFFICE PERI S	NO (-44.3%)	NO
L09 - OFFICE PERI SW	NO (-38%)	NO
L09 - OFFICE PERI W	NO (-50.1%)	NO
L09 - WC1	N/A	N/A
L10 - CORE CORR 1	N/A	N/A
L10 - CORE CORR 2	N/A	N/A
L10 - CORE LR LIFT CORR	N/A	N/A
L10 - CORE WC 1	N/A	N/A
L10 - CORE WC 2	N/A	N/A
L10 - CORE WC 3	N/A	N/A
L10 - CORE WC 4	N/A	N/A
L10 - CORE WC 5	N/A	N/A
L10 - OFFCE PERI NW	NO (-55%)	NO
L10 - OFFICE CORE N	NO (-58.2%)	NO
L10 - OFFICE CORE N	NO (-57.2%)	NO
L10 - OFFICE CORE S	NO (-84.4%)	NO
L10 - OFFICE PERI E	NO (-21%)	NO
L10 - OFFICE PERI NE	NO (-45.1%)	NO
L10 - OFFICE PERI NE	NO (-49.3%)	NO
L10 - OFFICE PERI S	NO (-35.8%)	NO
L10 - OFFICE PERI SW	NO (-29.8%)	NO
L10 - OFFICE PERI W	NO (-44.2%)	NO
L11 - CORE CORR 1	N/A	N/A
L11 - CORE CORR 2	N/A	N/A
L11 - CORE LR LIFT CORR	NO (-91.5%)	NO
L11 - CORE WC 1	N/A	N/A
L11 - CORE WC 2	N/A	N/A
L11 - CORE WC 3	N/A	N/A
L11 - CORE WC 4	N/A	N/A
L11 - CORE WC 5	N/A	N/A
L11 - OFFCE PERI NW	NO (-62.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L11 - OFFICE CORE N	NO (-59.9%)	NO
L11 - OFFICE CORE N	NO (-67.2%)	NO
L11 - OFFICE CORE S	NO (-86%)	NO
L11 - OFFICE PERI E	NO (-30.6%)	NO
L11 - OFFICE PERI NE	NO (-43.9%)	NO
L11 - OFFICE PERI NE	NO (-46.6%)	NO
L11 - OFFICE PERI S	NO (-40.4%)	NO
L11 - OFFICE PERI SW	NO (-34.4%)	NO
L11 - OFFICE PERI W	NO (-47.5%)	NO
L12 - CORE CORR 1	N/A	N/A
L12 - CORE CORR 2	N/A	N/A
L12 - CORE WC 1	N/A	N/A
L12 - CORE WC 2	N/A	N/A
L12 - CORE WC 3	N/A	N/A
L12 - CORE WC 4	N/A	N/A
L12 - CORE WC 5	N/A	N/A
L12 - OFFICE CORE NE	NO (-35.9%)	NO
L12 - OFFICE CORE NW	NO (-49.7%)	NO
L12 - OFFICE CORE S	NO (-85.6%)	NO
L12 - OFFICE CORE W	NO (-82.6%)	NO
L12 - OFFICE PERI E	NO (-30.5%)	NO
L12 - OFFICE PERI NE	NO (-45.3%)	NO
L12 - OFFICE PERI NW	NO (-62.1%)	NO
L12 - OFFICE PERI S	NO (-40.1%)	NO
L12 - OFFICE PERI SW	NO (-36.5%)	NO
L12 - OFFICE PERI W	NO (-43.5%)	NO
L13 - CORE CORR 1	N/A	N/A
L13 - CORE CORR 2	N/A	N/A
L13 - CORE WC 1	N/A	N/A
L13 - CORE WC 2	N/A	N/A
L13 - CORE WC 3	N/A	N/A
L13 - CORE WC 4	N/A	N/A
L13 - CORE WC 5	N/A	N/A
L13 - OFFICE CORE NE	NO (-35.9%)	NO
L13 - OFFICE CORE NW	NO (-49.7%)	NO
L13 - OFFICE CORE S	NO (-85.6%)	NO
L13 - OFFICE CORE W	NO (-82.6%)	NO
L13 - OFFICE PERI E	NO (-30.5%)	NO
L13 - OFFICE PERI NE	NO (-45.3%)	NO
L13 - OFFICE PERI NW	NO (-62.1%)	NO
L13 - OFFICE PERI S	NO (-40.1%)	NO
L13 - OFFICE PERI SW	NO (-36.5%)	NO
L13 - OFFICE PERI W	NO (-43.4%)	NO
L14 - CORE CORR 1	N/A	N/A
L14 - CORE CORR 2	N/A	N/A
L14 - CORE WC 1	N/A	N/A
L14 - CORE WC 2	N/A	N/A
L14 - CORE WC 3	N/A	N/A
L14 - CORE WC 4	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L14 - CORE WC 5	N/A	N/A
L14 - OFFICE CORE NE	NO (-35.9%)	NO
L14 - OFFICE CORE NW	NO (-49.7%)	NO
L14 - OFFICE CORE S	NO (-85.6%)	NO
L14 - OFFICE CORE W	NO (-82.6%)	NO
L14 - OFFICE PERI E	NO (-30.5%)	NO
L14 - OFFICE PERI NE	NO (-45.3%)	NO
L14 - OFFICE PERI NW	NO (-62.1%)	NO
L14 - OFFICE PERI S	NO (-40.1%)	NO
L14 - OFFICE PERI SW	NO (-36.5%)	NO
L14 - OFFICE PERI W	NO (-43.4%)	NO
L15 - CORE CORR 1	N/A	N/A
L15 - CORE CORR 2	N/A	N/A
L15 - CORE WC 1	N/A	N/A
L15 - CORE WC 2	N/A	N/A
L15 - CORE WC 3	N/A	N/A
L15 - CORE WC 4	N/A	N/A
L15 - CORE WC 5	N/A	N/A
L15 - OFFICE CORE NE	NO (-35.9%)	NO
L15 - OFFICE CORE NW	NO (-49.7%)	NO
L15 - OFFICE CORE S	NO (-85.6%)	NO
L15 - OFFICE CORE W	NO (-82.6%)	NO
L15 - OFFICE PERI E	NO (-30.5%)	NO
L15 - OFFICE PERI NE	NO (-45.3%)	NO
L15 - OFFICE PERI NW	NO (-62.1%)	NO
L15 - OFFICE PERI S	NO (-40.1%)	NO
L15 - OFFICE PERI SW	NO (-36.5%)	NO
L15 - OFFICE PERI W	NO (-43.4%)	NO
L16 - CORE CORR 1	N/A	N/A
L16 - CORE CORR 2	N/A	N/A
L16 - CORE WC 1	N/A	N/A
L16 - CORE WC 2	N/A	N/A
L16 - CORE WC 3	N/A	N/A
L16 - CORE WC 4	N/A	N/A
L16 - CORE WC 5	N/A	N/A
L16 - OFFICE CORE NE	NO (-35.9%)	NO
L16 - OFFICE CORE NW	NO (-49.7%)	NO
L16 - OFFICE CORE S	NO (-85.6%)	NO
L16 - OFFICE CORE W	NO (-82.6%)	NO
L16 - OFFICE PERI E	NO (-30.5%)	NO
L16 - OFFICE PERI NE	NO (-45.3%)	NO
L16 - OFFICE PERI NW	NO (-62.1%)	NO
L16 - OFFICE PERI S	NO (-40.1%)	NO
L16 - OFFICE PERI SW	NO (-36.5%)	NO
L16 - OFFICE PERI W	NO (-43.4%)	NO
L17 - CORE CORR 1	N/A	N/A
L17 - CORE CORR 2	N/A	N/A
L17 - CORE WC 1	N/A	N/A
L17 - CORE WC 2	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L17 - CORE WC 3	N/A	N/A
L17 - CORE WC 4	N/A	N/A
L17 - CORE WC 5	N/A	N/A
L17 - OFFICE CORE NE	NO (-35.9%)	NO
L17 - OFFICE CORE NW	NO (-49.7%)	NO
L17 - OFFICE CORE S	NO (-85.6%)	NO
L17 - OFFICE CORE W	NO (-82.6%)	NO
L17 - OFFICE PERI E	NO (-30.5%)	NO
L17 - OFFICE PERI NE	NO (-45.3%)	NO
L17 - OFFICE PERI NW	NO (-62.1%)	NO
L17 - OFFICE PERI S	NO (-40.1%)	NO
L17 - OFFICE PERI SW	NO (-36.5%)	NO
L17 - OFFICE PERI W	NO (-43.4%)	NO
L18 - CORE CORR 1	N/A	N/A
L18 - CORE CORR 2	N/A	N/A
L18 - CORE WC 1	N/A	N/A
L18 - CORE WC 2	N/A	N/A
L18 - CORE WC 3	N/A	N/A
L18 - CORE WC 4	N/A	N/A
L18 - CORE WC 5	N/A	N/A
L18 - OFFICE CORE NE	NO (-35.9%)	NO
L18 - OFFICE CORE NW	NO (-49.7%)	NO
L18 - OFFICE CORE S	NO (-85.6%)	NO
L18 - OFFICE CORE W	NO (-82.6%)	NO
L18 - OFFICE PERI E	NO (-30.5%)	NO
L18 - OFFICE PERI NE	NO (-45.3%)	NO
L18 - OFFICE PERI NW	NO (-62.1%)	NO
L18 - OFFICE PERI S	NO (-40.1%)	NO
L18 - OFFICE PERI SW	NO (-36.5%)	NO
L18 - OFFICE PERI W	NO (-43.4%)	NO
LB1 - CORE WC	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE WCS	N/A	N/A
LB1 - CORE CORR	N/A	N/A
LB1 - FLEXIBLE USE	NO (-25.2%)	NO
LB1 -CORE CORR	N/A	N/A
LB2 - AUDI	N/A	N/A
LB2 - CORE WC	N/A	N/A
LB3 - AUDITORIUM	N/A	N/A
LB3 - CORE WC	N/A	N/A
L19 - CORE CORR 2	N/A	N/A
LB3 - CORE WELFARE	N/A	N/A
LB3 - OFFICE (LOADING BAY)	N/A	N/A
LB3 - OFFICE (MANAGEMENT)	N/A	N/A
LB3 - COMMS	N/A	N/A
LB3 - COMMS ROOM	N/A	N/A
LB3 - WCS	N/A	N/A
LB3 - MER	N/A	N/A
LB2 - SHOWERS	N/A	N/A

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
LB2 - WCS	N/A	N/A
LB2 - AUDITORIUM COATS/TICKETS	N/A	N/A
LB2 - WCS	N/A	N/A
LB1 - PUBLIC ROUTE/GARDEN	YES (+6.4%)	NO
L00 - OFFICE LOBBY	NO (-11.5%)	NO
L00 - CAFE/RESTAURANT VOID	NO (-49.1%)	NO
L00A - OFFICE ENTRANCE VOID	NO (-36.2%)	NO
L00A - PUBLIC GARDEN VOID	NO (-51%)	NO
L00A - FLEXIBLE USE	NO (-81.4%)	NO
L00A - FLEXIBLE USE KITCHEN	N/A	N/A
L00 - FLEXIBLE USE	NO (-60.8%)	NO
L00 - FLEXIBLE USE WCS	N/A	N/A
L00 - OFFICE ENTRANCE/GALLERY	NO (-50.1%)	NO
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - LIFT LOBBY (OPEN)	N/A	N/A
L00 - CORE WC	N/A	N/A
L00A - CORE WCS	N/A	N/A
L00A - CORE CORR 2	NO (-91.2%)	NO
LB3 - STAFF ROOM	N/A	N/A
LB2 - AUDITORIUM FOYER	NO (-62.1%)	NO
L19 - OFFICE AMENITY	NO (-16.3%)	NO
LB2 - PUBLIC GARDEN LOWER LEVEL	YES (+55%)	NO
L00A - OFFICE (S)	NO (-5.6%)	NO
L00A -OFFICE (N)	NO (-44%)	NO
L00 - OFFICE ENTRANCE/GALLERY SOUTH	NO (-32.3%)	NO
L00 - OFFICE ENTRANCE/GALLERY NORTH	NO (-35.9%)	NO
L01 - FLEXIBLE WORKSPACE PERI NW	NO (-62.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-50.4%)	NO
L01 - FLEXIBLE WORKSPACE PERI W	NO (-55.4%)	NO
L01 - FLEXIBLE WORKSPACE CORE W	NO (-52.2%)	NO
L01 - FLEXIBLE WORKSPACE PERI S	NO (-52.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI E	NO (-56.5%)	NO
L01 - FLEXIBLE WORKSPACE CORE E	NO (-83.7%)	NO
L01 - FLEXIBLE WORKSPACE CORE S	NO (-89.1%)	NO
L01 - FLEXIBLE WORKSPACE PERI NE	NO (-66.1%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-61.6%)	NO
L01 - FLEXIBLE WORKSPACE CORE N	NO (-66.5%)	NO
L01 - FLEXIBLE WORKSPACE PERI SW	NO (-46.8%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	53090.2	53090.2
External area [m^2]	28847.5	28847.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	24310.9	15595.5
Average U-value [W/m^2K]	0.84	0.54
Alpha value* [%]	10.19	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	2.04	0.68
Cooling	4.34	8.78
Auxiliary	10.64	11.85
Lighting	8.44	19.02
Hot water	2.66	3.71
Equipment*	42.42	42.42
TOTAL**	**28.12**	**44.04**

* 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/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	101.8	126
Primary energy* [kWh/m^2]	98.22	144.99
Total emissions [kg/m^2]	14.2	22.3

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	34.1	83.1	2.4	4.8	10.6	3.9	4.8	4.23	6
	Notional	6.7	145.7	0.7	10.7	13.6	2.56	3.79	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	30	110.4	2.1	6.4	12.9	3.9	4.8	4.23	6
	Notional	13.2	121.6	1.4	8.9	13	2.56	3.79	----	----
[ST] Single-duct VAV, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	2.9	51.7	0.2	3.3	22.7	3.71	4.39	4.23	6
	Notional	2.2	59.8	0.2	4.4	17.6	2.56	3.79	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	24.8	0	1.7	0	1	3.97	0	4.23	0
	Notional	22.1	0	2.4	0	1	2.56	0	----	----
[ST] Single-duct VAV, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	49.6	157.2	4.5	11.5	49.6	3.06	3.81	4.23	6
	Notional	6.6	175.2	0.7	12.8	17.7	2.56	3.79	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	3.7	244.2	0.3	14.1	27.2	3.9	4.8	4.23	6
	Notional	0.5	195.6	0.1	14.3	32.3	2.56	3.79	----	----
[ST] Constant volume system (fixed fresh air rate), [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	11.1	173.5	0.7	13.1	157.3	4.66	3.69	4.23	6
	Notional	0	339.4	0	24.9	98.9	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	L1000106:Surf[0]
Floor	0.2	0.2	LB00003D:Surf[0]
Roof	0.15	0.18	L100011D:Surf[0]
Windows, roof windows, and rooflights	1.5	1.4	L0000046:Surf[0]
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

5KS_Be Lean_Box

As designed

Date: Fri Jul 24 16:59:24 2020

Administrative information

Building Details

Address: 5 Kingdom Street, London, W2 6BD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

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

Owner Details

Name: British Land

Telephone number:

Address: York House, 45 Seymour Street, London, W1H 7LX

Certifier details

Name: Jane Goodman (Contact Riccardo Zara)

Telephone number: 07977514095

Address: 240 Blackfriars Road, London, SE1 8NW

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	37.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	37.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	28.3
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	LB00002F:Surf[0]
Floor	0.25	0.2	0.2	LB000063:Surf[9]
Roof	0.25	0.18	0.18	LB00005D:Surf[21]
Windows***, roof windows, and rooflights	2.2	-	-	No windows or rooflights in building
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 5KS RADIATORS

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	-	0	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

2- 5KS COMMON WATER LOOP(HR = 0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.74	0	1.6	0.7
Standard value	0.91*	3.2	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

3- 5KS FCU OTHER AREAS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.96	4.92	0	1.6	0.7
Standard value	0.91*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

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

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LB3 - LOWER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LB2 - UPPER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - UPPER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - LOWER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LB2 - STAIRS	-	80	-	105
LB3 - LOWER BOX GYM PERI	-	100	-	726
LB2 - UPPER BOX GYM PERI	-	100	-	204
LB3 - LOWER BOX OFFICE PERI	100	-	-	4742
LB2 - UPPER BOX OFFICE PERI	100	-	-	2906
LB2 - UPPER BOX OFFICE SPACE	100	-	-	7794
LB3 - LOWER BOX OFFICE SPACE	100	-	-	7869
LB3 - LOWER BOX GYM	-	100	-	1032
LB3 - LOWER BOX RETAIL	-	100	100	1837
LB3 - LOWER BOX CONFERENCE	-	100	100	2200
LB2 - UPPER BOX RETAIL	-	100	100	724
LB2 - UPPER BOX CONFERENCE	-	100	100	1772
LB2 - UPPER BOX GYM	-	100	-	693

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
LB3 - LOWER BOX GYM PERI	NO (-33.1%)	NO
LB2 - UPPER BOX GYM PERI	NO (-73.3%)	NO
LB3 - LOWER BOX OFFICE PERI	NO (-48.7%)	NO
LB2 - UPPER BOX OFFICE PERI	NO (-73.8%)	NO
LB2 - UPPER BOX OFFICE SPACE	NO (-96.8%)	NO
LB3 - LOWER BOX OFFICE SPACE	NO (-94.8%)	NO
LB3 - LOWER BOX GYM	NO (-62.7%)	NO
LB3 - LOWER BOX RETAIL	N/A	N/A
LB3 - LOWER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX RETAIL	N/A	N/A
LB2 - UPPER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX GYM	NO (-73.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	7640.6	7640.6
External area [m^2]	6254.3	6254.3
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1834.02	2304.58
Average U-value [W/m^2K]	0.29	0.37
Alpha value* [%]	10	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	1.82	1.45
Cooling	4.53	10.19
Auxiliary	27.31	21.04
Lighting	13.68	32.82
Hot water	22.41	20.45
Equipment*	53.71	53.71
TOTAL**	**69.74**	**85.94**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	78.04	143.57
Primary energy* [kWh/m^2]	165.79	218.42
Total emissions [kg/m^2]	28.3	37.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	5.3	92.8	1.7	5.4	9.4	0.88	4.8	0.96	6
	Notional	4.4	135.1	1.4	9.9	11.6	0.86	3.79	----	----
[ST] Water loop heat pump, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	6.3	49.7	1.8	3.6	47.5	1	3.79	0.96	4.74
	Notional	3.6	145.3	1.2	10.7	31.7	0.86	3.79	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	64	0	19.8	0	1	0.9	0	0.96	0
	Notional	82.7	0	26.6	0	1	0.86	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	LB00002F:Surf[0]
Floor	0.2	0.2	LB000063:Surf[9]
Roof	0.15	0.18	LB00005D:Surf[21]
Windows, roof windows, and rooflights	1.5	-	No windows or rooflights in building
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

5KS_Be Green_Box

As designed

Date: Thu Jul 23 18:56:51 2020

Administrative information

Building Details

Address: 5 Kingdom Street, London, W2 6BD

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.12

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.12

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

Owner Details

Name: British Land

Telephone number:

Address: York House, 45 Seymour Street, London, W1H 7LX

Certifier details

Name: Jane Goodman (Contact Riccardo Zara)

Telephone number: 07977514095

Address: 240 Blackfriars Road, London, SE1 8NW

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	36.1
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	36.1
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	25.9
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.18	0.18	LB00002F:Surf[0]
Floor	0.25	0.2	0.2	LB000063:Surf[9]
Roof	0.25	0.18	0.18	LB00005D:Surf[21]
Windows***, roof windows, and rooflights	2.2	-	-	No windows or rooflights in building
Personnel doors	2.2	-	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	3

Building services

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

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- 5KS RADIATORS

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	-	0	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.					

2- 5KS COMMON WATER LOOP(HR = 0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.84	4.74	0	1.6	0.7
Standard value	2.5*	3.2	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards. ^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

3- 5KS FCU OTHER AREAS (HR=0.7)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.23	4.92	0	1.6	0.7
Standard value	2.5*	4.7	N/A	1.6^	0.65
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES
* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards. ^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.					

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

Local mechanical ventilation, exhaust, and terminal units

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

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LB3 - LOWER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
LB2 - UPPER BOX OFFICE PERI	-	-	-	-	-	-	-	0.2	-	-	N/A
LB2 - UPPER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A
LB3 - LOWER BOX OFFICE SPACE	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
LB2 - STAIRS	-	80	-	105
LB3 - LOWER BOX GYM PERI	-	100	-	726
LB2 - UPPER BOX GYM PERI	-	100	-	204
LB3 - LOWER BOX OFFICE PERI	100	-	-	4742
LB2 - UPPER BOX OFFICE PERI	100	-	-	2906
LB2 - UPPER BOX OFFICE SPACE	100	-	-	7794
LB3 - LOWER BOX OFFICE SPACE	100	-	-	7869
LB3 - LOWER BOX GYM	-	100	-	1032
LB3 - LOWER BOX RETAIL	-	100	100	1837
LB3 - LOWER BOX CONFERENCE	-	100	100	2200
LB2 - UPPER BOX RETAIL	-	100	100	724
LB2 - UPPER BOX CONFERENCE	-	100	100	1772
LB2 - UPPER BOX GYM	-	100	-	693

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
LB3 - LOWER BOX GYM PERI	NO (-33.1%)	NO
LB2 - UPPER BOX GYM PERI	NO (-73.3%)	NO
LB3 - LOWER BOX OFFICE PERI	NO (-48.7%)	NO
LB2 - UPPER BOX OFFICE PERI	NO (-73.8%)	NO
LB2 - UPPER BOX OFFICE SPACE	NO (-96.8%)	NO
LB3 - LOWER BOX OFFICE SPACE	NO (-94.8%)	NO
LB3 - LOWER BOX GYM	NO (-62.7%)	NO
LB3 - LOWER BOX RETAIL	N/A	N/A
LB3 - LOWER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX RETAIL	N/A	N/A
LB2 - UPPER BOX CONFERENCE	N/A	N/A
LB2 - UPPER BOX GYM	NO (-73.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	YES
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	7640.6	7640.6
External area [m^2]	6254.3	6254.3
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	1834.02	2304.58
Average U-value [W/m^2K]	0.29	0.37
Alpha value* [%]	10	10

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

Building Use

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

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	0.55	0.49
Cooling	4.53	10.19
Auxiliary	27.31	21.04
Lighting	13.68	32.82
Hot water	5.07	6.89
Equipment*	53.71	53.71
TOTAL**	**51.13**	**71.42**

* 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/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	78.04	143.57
Primary energy* [kWh/m^2]	169.86	235.88
Total emissions [kg/m^2]	25.9	36.1

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	5.3	92.8	0.4	5.4	9.4	3.9	4.8	4.23	6
	Notional	4.4	135.1	0.5	9.9	11.6	2.56	3.79	----	----
[ST] Water loop heat pump, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	6.3	49.7	0.7	3.6	47.5	2.56	3.79	2.84	4.74
	Notional	3.6	145.3	0.4	10.7	31.7	2.56	3.79	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	64	0	4.5	0	1	3.97	0	4.23	0
	Notional	82.7	0	9	0	1	2.56	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.18	LB00002F:Surf[0]
Floor	0.2	0.2	LB000063:Surf[9]
Roof	0.15	0.18	LB00005D:Surf[21]
Windows, roof windows, and rooflights	1.5	-	No windows or rooflights in building
Personnel doors	1.5	-	No Personnel doors in building
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	3

APPENDIX 2 – DISTRICT HEATING NETWORK CORRESPONDENCE WITH WESTMINSTER CITY COUNCIL

Harry Popplewell

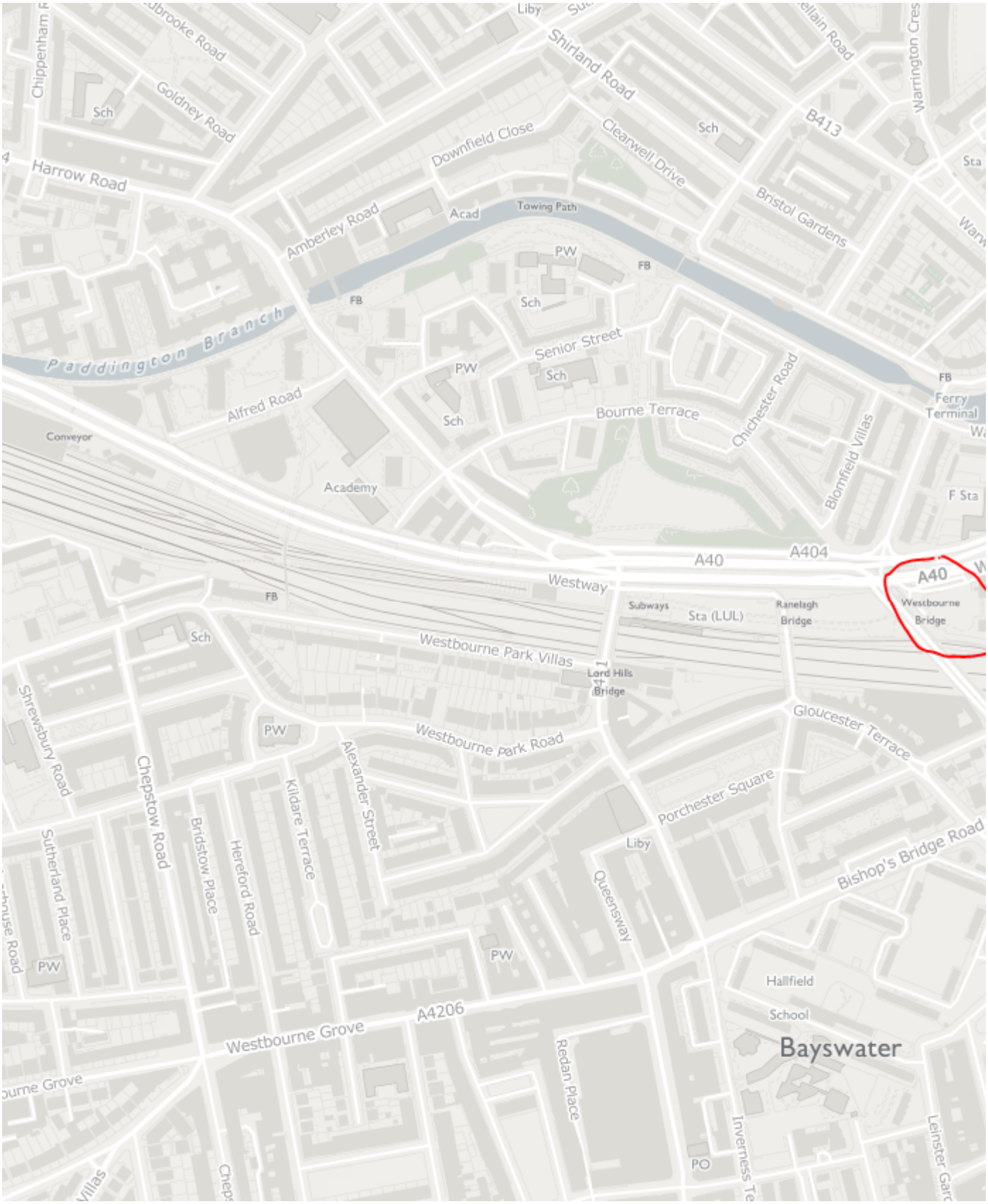
From: Riccardo Zara
Sent: 27 September 2019 17:58
To: cjohn@westminster.gov.uk
Subject: 5 Kingdom Street - Paddington - District Heating

Dear John,

I'm writing regarding the proposed British Land development at 5 Kingdom Street, W2.

The project includes a centralised energy centre that will provide heating and cooling, however we would like to know if a district heating network will be available in the area.

The London heat map (https://maps.london.gov.uk/heatmap) does not include any existing or planned district heating network in the area. Can you please confirm if there will be any future DH scheme?



Kind regards
Riccardo Zara

Associate Engineer
London Services

D +447977514095
riccardo.zara@ramboll.co.uk

Ramboll
240 Blackfriars Road
London
SE1 8NW
United Kingdom
https://uk.ramboll.com

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Harry Popplewell

From: John, Ceridwen: WCC <cjohn@westminster.gov.uk>
Sent: 27 September 2019 17:58
To: Riccardo Zara
Subject: Automatic reply: 5 Kingdom Street - Paddington - District Heating

Thank you for your email.

I am now on maternity leave, returning December 2019.

In the meantime, my maternity cover is Jo Gay - jgay@westminster.gov.uk.

For air quality, please redirect your email to Adam Webber - awebber@westminster.gov.uk.

This inbox will not be monitored.

Yours sincerely,

Ceridwen

****

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Harry Popplewell

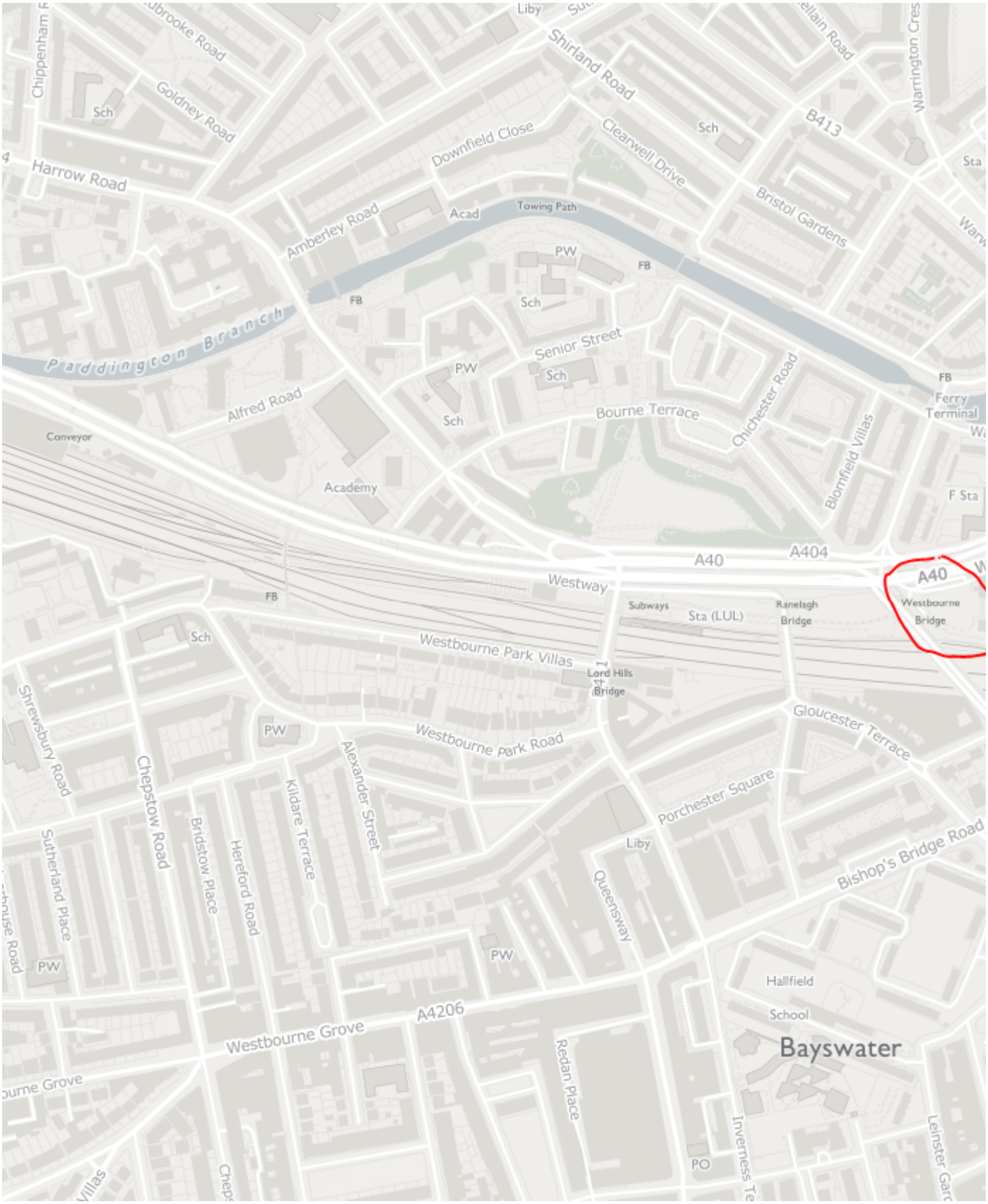
From: Riccardo Zara
Sent: 27 September 2019 18:01
To: awebber@westminster.gov.uk; jgay@westminster.gov.uk.
Cc: John, Ceridwen: WCC
Subject: RE: 5 Kingdom Street - Paddington - District Heating

Dear Adam, Jo,

I'm writing regarding the proposed British Land development at 5 Kingdom Street, W2.

The project includes a centralised energy centre that will provide heating and cooling, however we would like to know if a district heating network will be available in the area.

The London heat map (https://maps.london.gov.uk/heatmap) does not include any existing or planned district heating network in the area. Can you please confirm if there will be any future DH scheme?



Kind regards
Riccardo Zara
Associate Engineer

D +447977514095
riccardo.zara@ramboll.co.uk

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From: John, Ceridwen: WCC <cjohn@westminster.gov.uk>
Sent: 27 September 2019 17:58
To: Riccardo Zara <Riccardo.Zara@ramboll.co.uk>
Subject: Automatic reply: 5 Kingdom Street - Paddington - District Heating

Thank you for your email.

I am now on maternity leave, returning December 2019.

In the meantime, my maternity cover is Jo Gay - jgay@westminster.gov.uk.

For air quality, please redirect your email to Adam Webber - awebber@westminster.gov.uk.

This inbox will not be monitored.

Yours sincerely,

Ceridwen

****

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APPENDIX 3 - HEAT PUMP SYSTEM SCHEMATICS AND LAYOUTS

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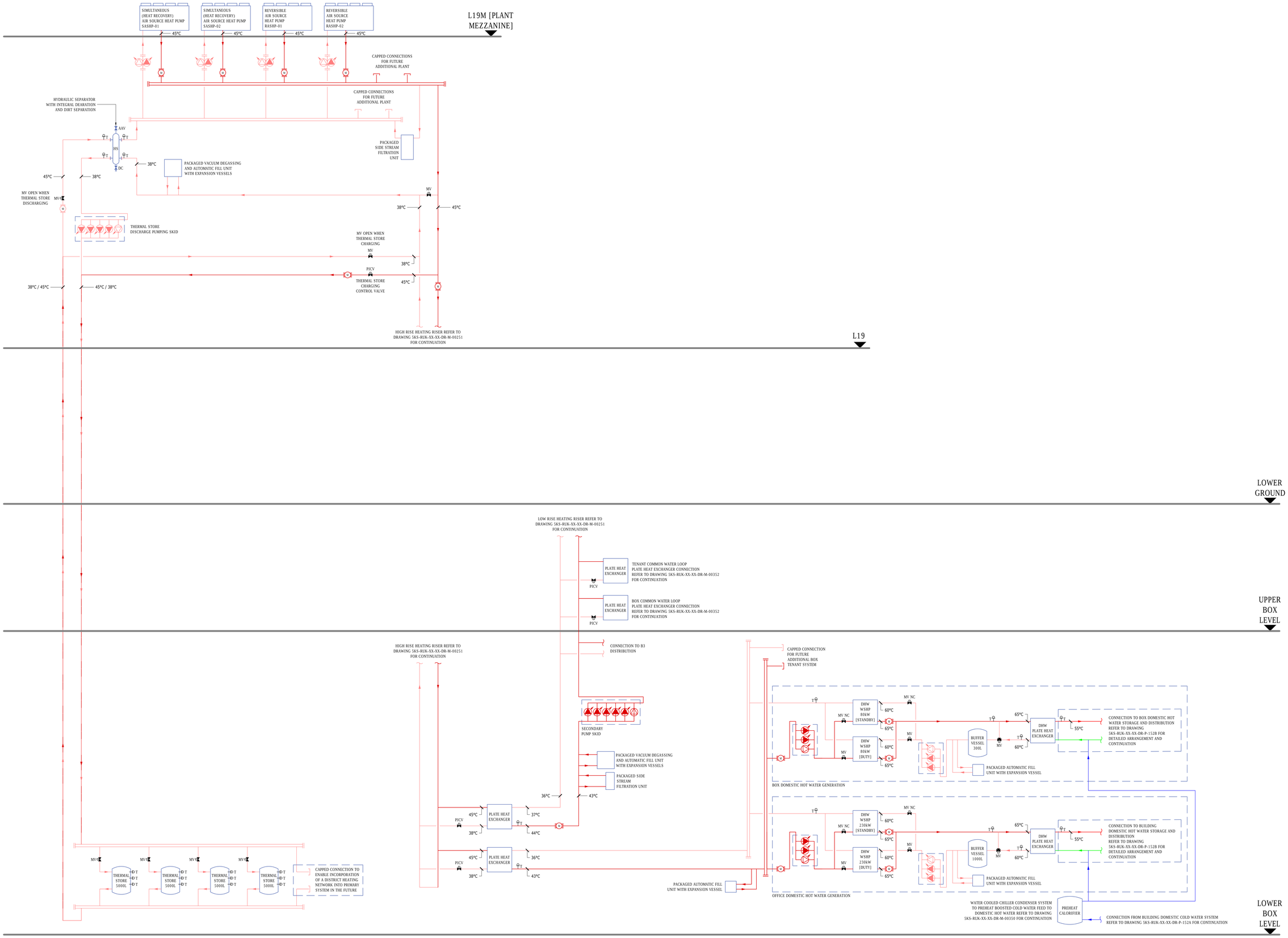

Rev	Description	Date	By / Chk	App
P04	ISSUED FOR INFORMATION	10/07/2020	EHC / RZ	PK
P03	ISSUED FOR STAGE 2	18/03/2019	JF / EHC	RZ
P02	DRAFT ISSUE	05/03/2019	JF / EHC	RZ

INFORMATION

5 KINGDOM STREET

RAMBOLL

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MECHANICAL SERVICES
LTHW SCHEMATIC
PLANT ROOM

Project No:	Scale (@ A0):	Date:	Drawn:
1620004691	NTS	10/07/20	EHC

Drawing No: 5KS-RAM-XX-XX-DR-M-00250

Rev: P04

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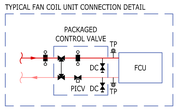
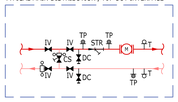
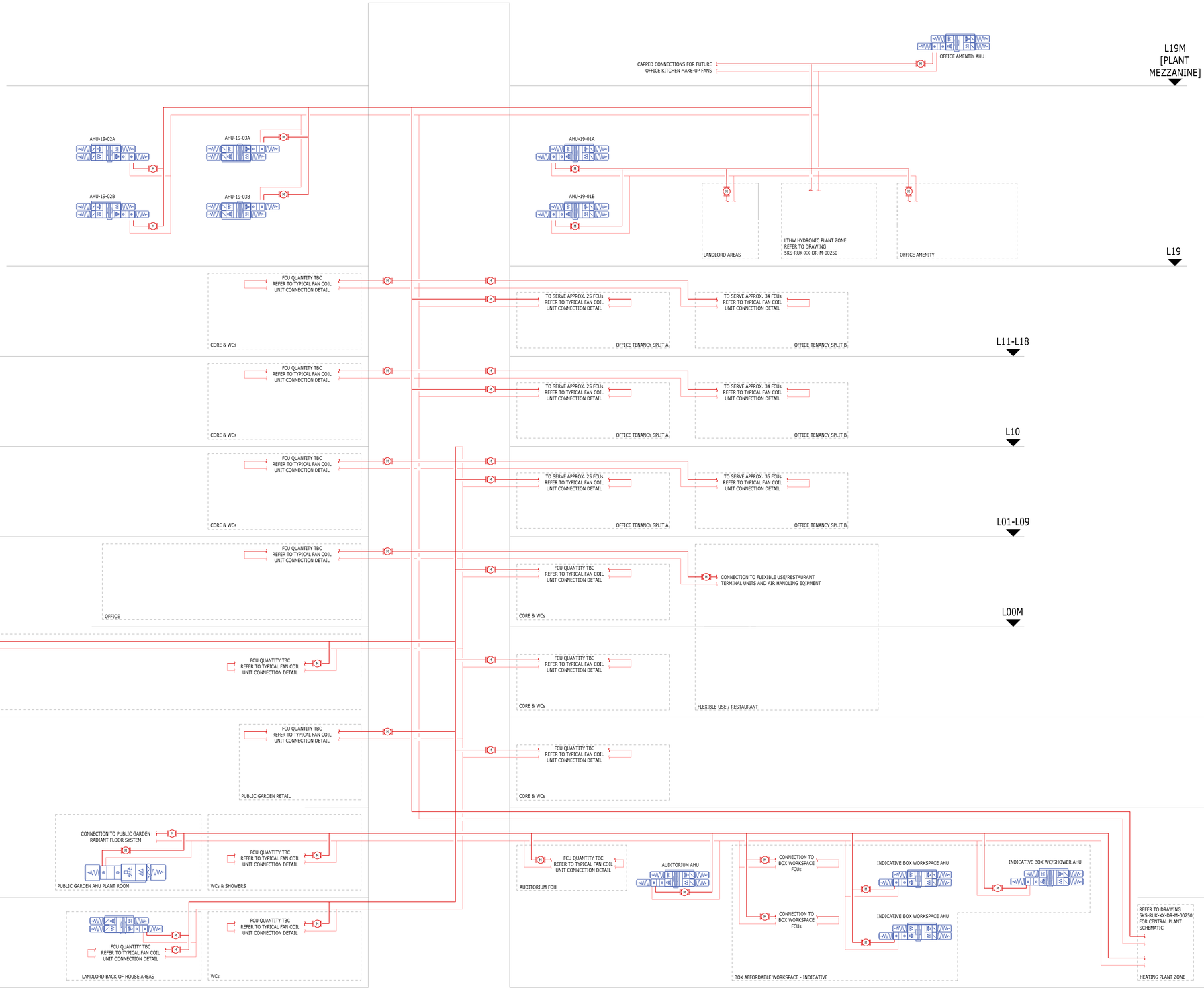
TYPICAL FAN COIL UNIT CONNECTION DETAIL



TYPICAL MAIN DISTRIBUTION / FIT-OUT INTERFACE





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P03	ISSUED FOR STAGE 2	18/03 2019	JF EH	RZ
P02	DRAFT ISSUE	05/03 2019	JF EH	RZ

INFORMATION

5 KINGDOM STREET

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MECHANICAL SERVICES
LTHW SCHEMATIC
BUILDING

Project No:	Scale (@ A0):	Date:	Drawn:
1620004691	NTS	10/07/20	EHC

Drawing No:	Rev:
5KS-RAM-XX-XX-DR-M-00251	P04

SCALE 1:150

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COLOUR LEGEND - MEP RISER DISTRIBUTION

- MECHANICAL RISER
- VENTILATION RISER
- PUBLIC HEALTH RISER
- ELECTRICAL RISER
- SMOKE RISER
- FLUE RISER

COLOUR LEGEND - FLOOR PLATE DISTRIBUTION

- ELECTRICAL DISTRIBUTION
- MECHANICAL DISTRIBUTION
- PUBLIC HEALTH DISTRIBUTION

COLOUR LEGEND - PLANT AREAS

- MECHANICAL PLANT
- PUBLIC HEALTH PLANT
- ELECTRICAL PLANT
- ACCESS ZONE

COLOUR LEGEND - FCU ZONING

- OFFICE PERIMETER FCU ZONE
- OFFICE INNER FCU ZONE

COLOUR LEGEND - FRESH AIR ZONING

- FRESH AIR ZONE 1
- FRESH AIR ZONE 2
- FRESH AIR ZONE 3

Rev	Description	Date	By	Chk	App
P05	ISSUED FOR INFORMATION	10/07/2020	EHC	RZ	PK
P04	ISSUED FOR STAGE 2	04/04/2019	BA	FH	RZ
P03	ISSUED FOR STAGE 2	18/03/2019	BA	FH	RZ
P02	DRAFT ISSUE	05/03/2019	BA	FH	RZ
P01	DRAFT ISSUE	01/02/2019	BA	FH	RZ

INFORMATION

5 KINGDOM STREET

RAMBOLL

www.ramboll.co.uk

COMBINED SERVICES LAYOUT LOWER BOX LEVEL

Project No:	Scale @ A0):	Date:	Drawn:
1620004691	AS indicated	10/07/20	EHC

Drawing No: 5KS-RAM-XX-B3-SK-ME-00100 Rev: P05

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Notes

1. DO NOT SCALE FROM THIS DRAWING
2. ALL DIMENSIONS ARE MILLIMETRES U.N.O.
3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.

COLOUR LEGEND - MEP RISER DISTRIBUTION

- MECHANICAL RISER
- VENTILATION RISER
- PUBLIC HEALTH RISER
- ELECTRICAL RISER
- SMOKE RISER
- FLUE RISER

COLOUR LEGEND - FLOOR PLATE DISTRIBUTION

- ELECTRICAL DISTRIBUTION
- MECHANICAL DISTRIBUTION
- PUBLIC HEALTH DISTRIBUTION

COLOUR LEGEND - PLANT AREAS

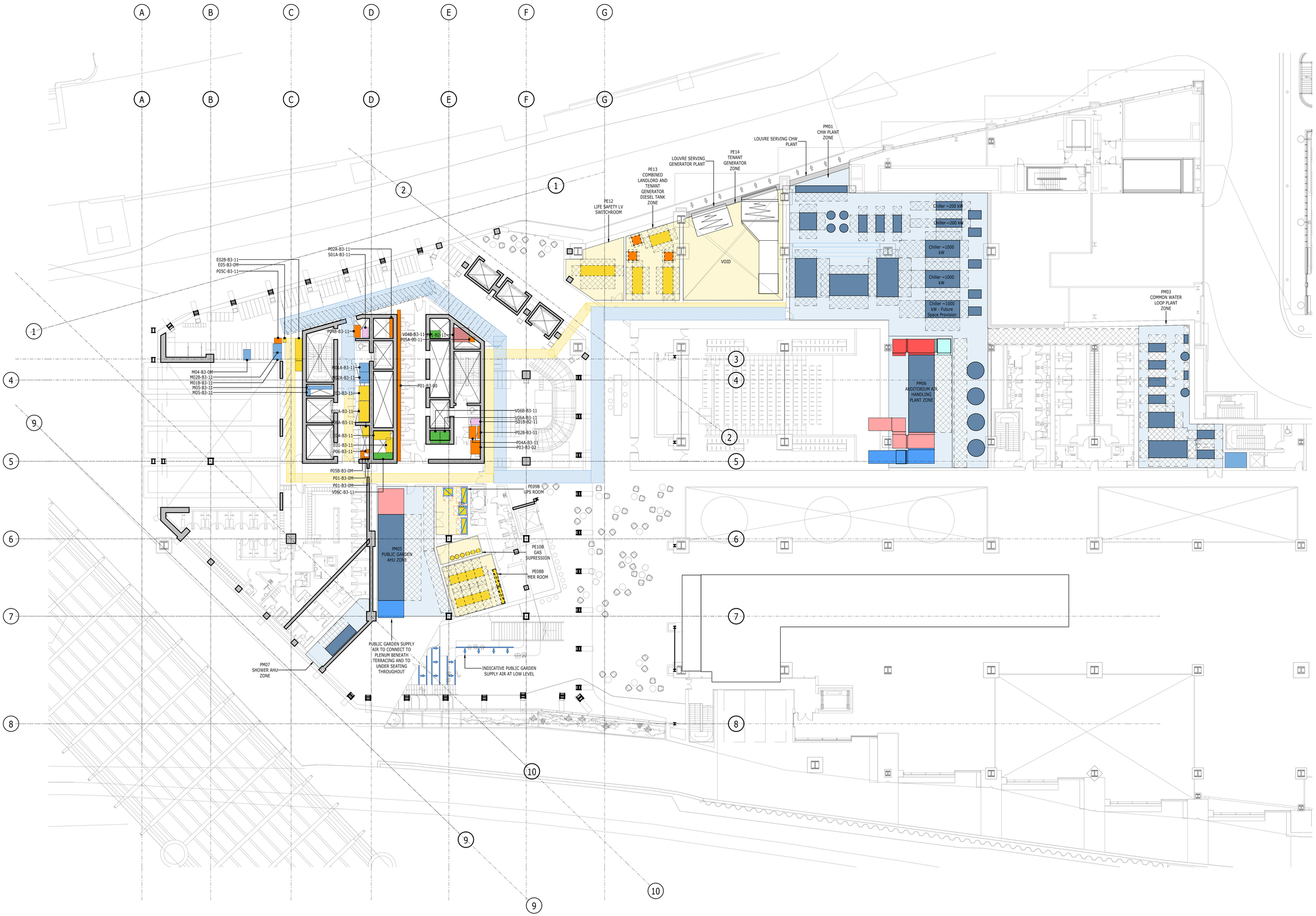
- MECHANICAL PLANT
- PUBLIC HEALTH PLANT
- ELECTRICAL PLANT
- ACCESS ZONE

COLOUR LEGEND - FCU ZONING

- OFFICE PERIMETER FCU ZONE
- OFFICE INNER FCU ZONE

COLOUR LEGEND - FRESH AIR ZONING

- FRESH AIR ZONE 1
- FRESH AIR ZONE 2
- FRESH AIR ZONE 3



SCALE 1:150

Rev	Description	Date	By Chk	App
P05	ISSUED FOR INFORMATION	10/07/2020	EHC RZ	PK
P04	ISSUED FOR STAGE 2	04/04/2019	BA EH	RZ
P03	ISSUED FOR STAGE 2	18/03/2019	BA EH	RZ
P02	DRAFT ISSUE	05/03/2019	BA EH	RZ
P01	DRAFT ISSUE	01/02/2019	BA EH	RZ

INFORMATION

5 KINGDOM STREET

RAMBOLL

www.ramboll.co.uk

COMBINED SERVICES LAYOUT UPPER BOX LEVEL

Project No:	Scale (at A0):	Date:	Drawn:
1620004691	As indicated	10/07/20	EHC

Drawing No: 5KS-RAM-XX-B2-SK-ME-00101

Rev: P05

10/07/2020 18:02:37

APPENDIX 4 – HEAT PUMP TECHNICAL SPECIFICATIONS

MITSUBISHI ELECTRIC
HYDRONICS & IT COOLING SYSTEMS S.p.A.

PROCESS

UNITS FOR SIMULTANEOUS AND INDEPENDENT PRODUCTION OF HOT AND COLD WATER

INTEGRA

UNITS FOR 4-PIPE SYSTEMS, AIR AND WATER SOURCE, WITH SCROLL, SCREW AND INVERTER SCREW COMPRESSORS, FROM 33 TO 1125 kW

climaveneta.com

CLIMAVENETA®
SUSTAINABLE COOLING

WHEN COMBINING PERFECT COMFORT AND MAXIMUM, EFFICIENCY IS THE BIGGEST CHALLENGE

Modern mixed-use buildings, shopping centres, large business centres, hotels, swimming pools, and wellness centres are characterised by increasingly complex comfort requirements.

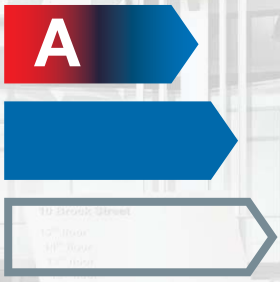
Many years of experience in these applications has led Climaveneta to develop its own solution to the main challenges posed by these structures, without making any compromises:

SIMULTANEOUS HEATING AND COOLING

Due to the fact that in a single building there are areas dedicated to different functions with very variable heat loads, combined with a large percentage of glass surfaces, the simultaneous demand for heating and cooling during the year is increasingly common.

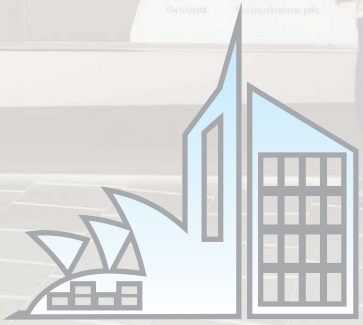
GROWING ATTENTION TO COMFORT

The need to guarantee ideal temperature, humidity, and air quality conditions throughout the year means that system solutions must be provided in order to offer a zero-compromise answer for the comfort requirements of different users.



CHALLENGING ENERGY EFFICIENCY AND SUSTAINABILITY TARGETS

Reduced investment and operating costs, respect for progressively stricter regulatory restrictions, attention to environmental impact, and use of renewables are increasingly vital factors not only for the value of the property but also for the feasibility of carrying it out.



AMBITIOUS ARCHITECTURAL SOLUTIONS

Innovative concepts and a systematic quest for excellence push technology and materials to the limit, in order to guarantee excellent usability of the building and strong visual characterization, as well as zero-compromise on the aesthetic front.

INTEGRA

MULTI-USE UNITS ARE THE MOST EVOLVED SOLUTION FOR 4-PIPE SYSTEMS

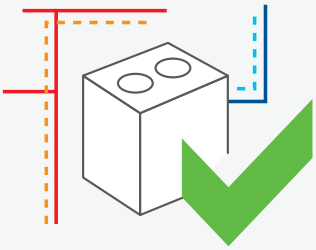
Maximum comfort, simultaneous hot and cold water production, unbeatable energy and system efficiency. The advantages of the INTEGRA-Y all-in-one units installed in a 4-pipe system are limitless.

MAXIMUM ENERGY EFFICIENCY

The construction approach that characterizes Climaveneta multi-use units has been designed to maximize their usefulness. The maximum efficiency of the system is reached with simultaneous loads, the energy produced is used to satisfy the hot and cold demands of the total system. In modern buildings with opposite overlapping thermal loads, the INTEGRA-Y units are the greenest and most efficient solution compared to any other.

SELF-ADAPTABILITY WITH SIMULTANEOUS LOADS

Thanks to their advanced control logic, multi-use units are always able to respond to building climate control requirements, especially if overlapping loads occur. The unit can independently produce cooling and heating simultaneously, according the actual needs.



SYSTEM SIMPLIFICATION

The use of a unit that independently produces both heating and cooling eliminates the need for separate heating and cooling resources.
This significantly simplifies the system: plant areas are reduced, hydronic circuits are simplified, maintenance is reduced by half, and control is rationalized.

REDUCTION OF ON-SITE OPERATIONS

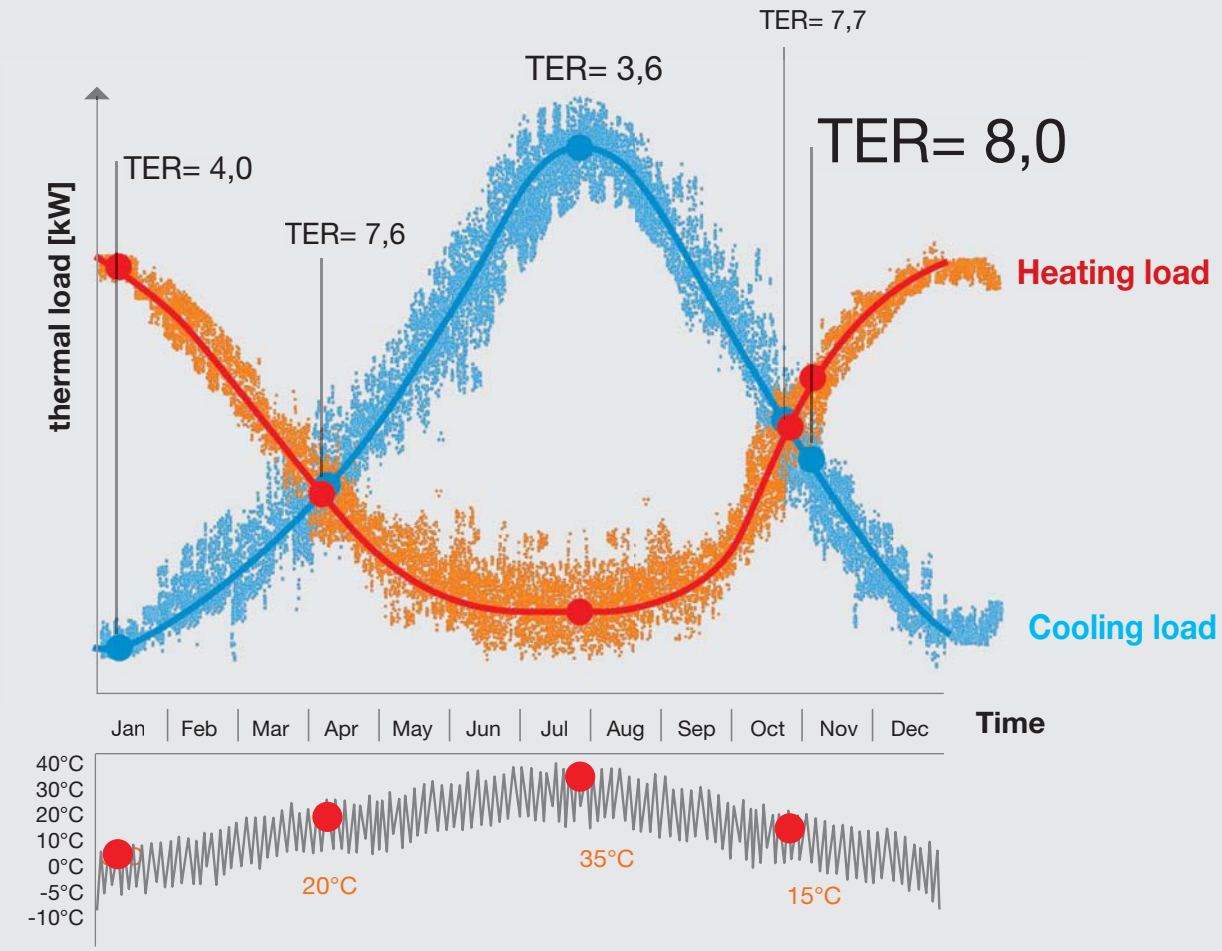
A simplified system results in a significant reduction in the operations to be carried out on site. In fact, it is no longer necessary to connect it to the gas network, install and commission auxiliary boilers, or manage areas to be used for conventional heating units. This means substantial savings in terms of time and cost for the client.

TOTAL EFFICIENCY RATIO
TER

COOLING POWER + HEATING CAPACITY

POWER CONSUMPTION

In all cases in which INTEGRA-Y simultaneously produces cold and hot water, the real efficiency of the unit is the sum of the performance in hot and cold water production.



Using traditional ratings such as EER and COP to measure efficiency of 4-pipe units would be limiting.

To objectively measure performance under simultaneous load conditions, Climaveneta, a pioneer in the development of this technology, has conceived TER - total efficiency ratio.

The TER is calculated as the ratio between the sum of the delivered heating and cooling power and electrical power input.
Considered today the most effective way of representing the real efficiency of the unit, the TER reaches its maximum value when the loads are completely balanced.

THE MOST PRECISE WAY TO MEASURE EFFICIENCY

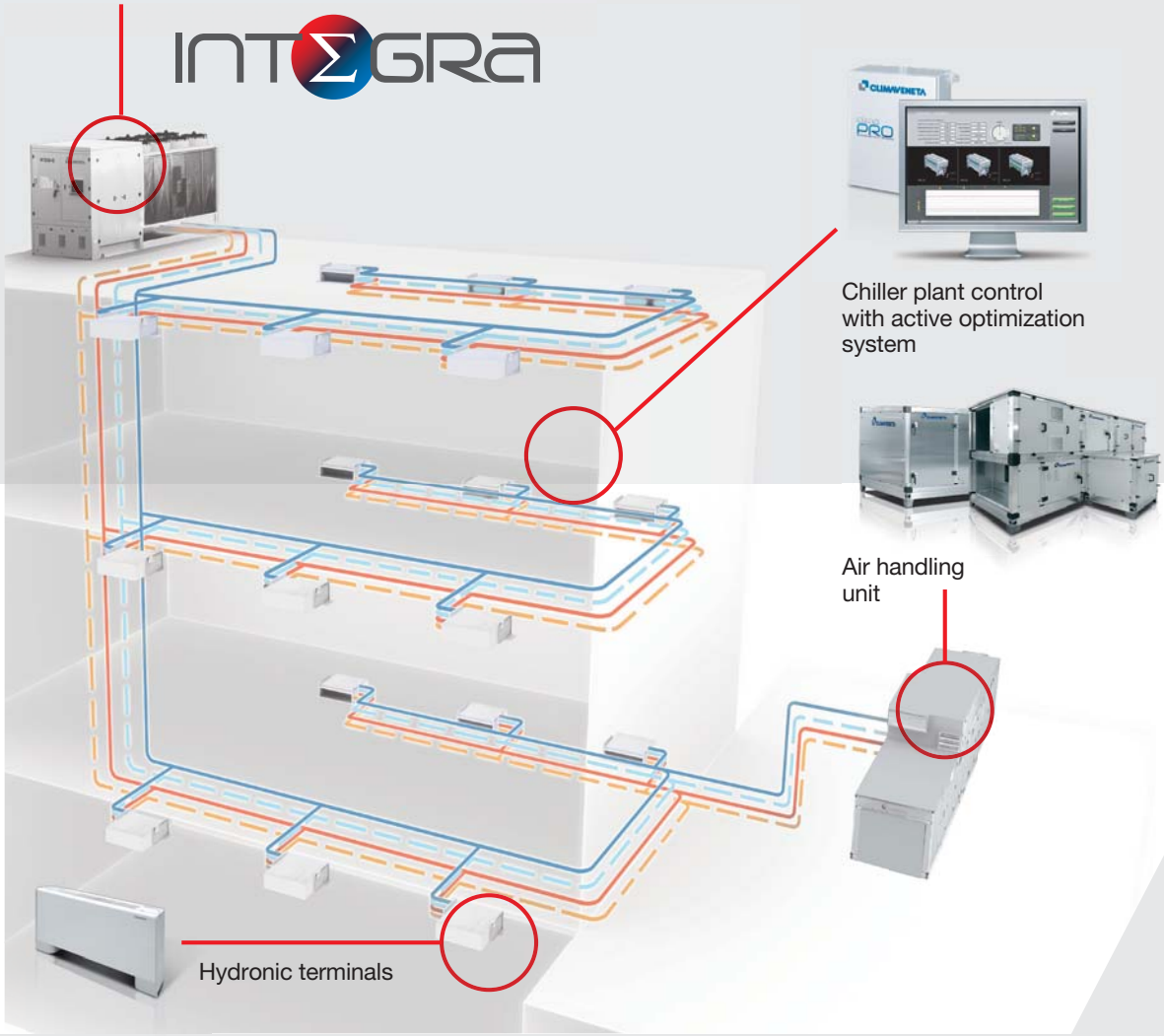
Completely integrated functions and maximum performance synergy require an advanced measurement rating for the total efficiency of the unit: TER - Total Efficiency Ratio.

FOCUS ON: 4-PIPE SYSTEMS

This type of system is suitable for air-conditioning in buildings that require separate areas to be heated and cooled at the same time.

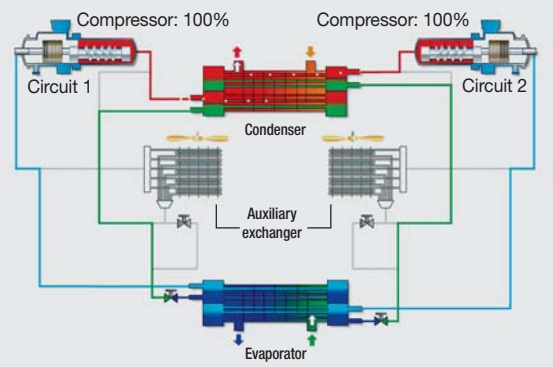
It is combined with centralized solutions capable of producing hot and cold water in the two hydronic circuits of the system, assuring maximum comfort in every room of the building, independently and in any period of the year.

From today, a single intelligent unit is sufficient for the management of these complex systems: INTEGRA-Y.

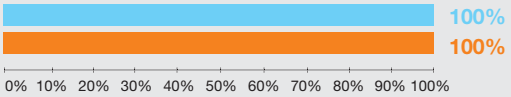


INTEGRA

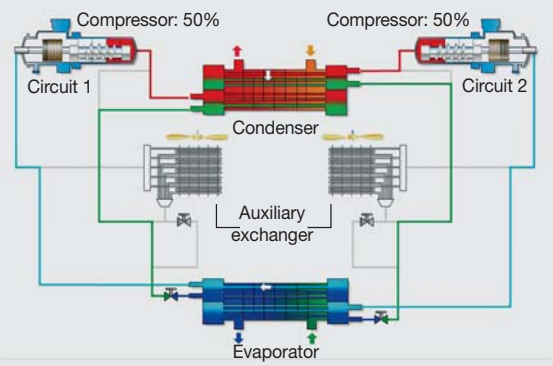
The main feature of INTEGRA-Y units is the ability to manage the overall capacity, which refers to both cooling and heating demands, based on the actual load requirements of the total system. The operational flexibility is total: all combinations of heating and cooling loads can be met.



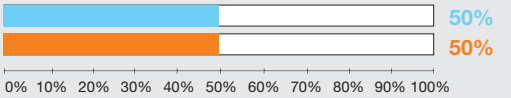
100% cold side / 100% hot side



The two circuits operate at maximum power, evaporating in the cold-side exchanger and condensing in the hot-side one.
The source-side heat exchanger (air coil or water exchanger, depending on the type of unit) is not used, which means that in these conditions there is no energy waste.

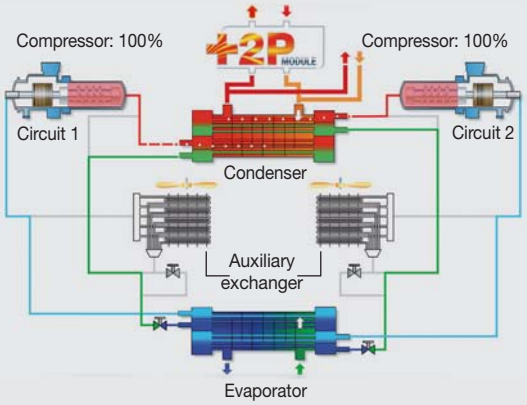


50% cold side / 50% hot side

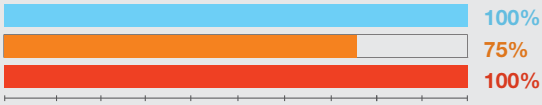


Also in this situation the unit operates like a water-water unit, as all the evaporating and condensing energy is used for the system.
Since the system only requires 50% of the total energy, each circuit operates in partial load conditions. In this particular state, the exchangers are oversized, thus achieving an even higher efficiency.

OPERATING MODES WITH +2P MODULE



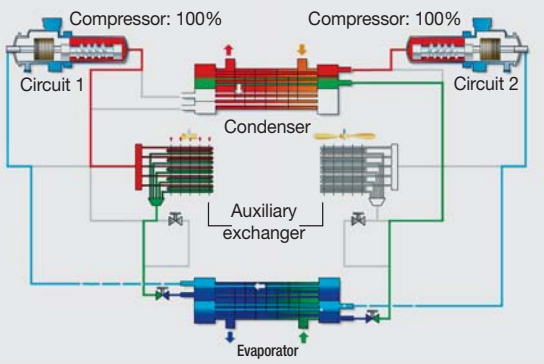
100% cold side
75% hot side
100% very hot side



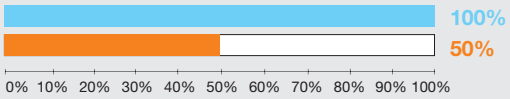
In this state, both the compressors operate at full load in order to meet the demands of the plant. Both circuits evaporate all the refrigerant in the cold-side heat exchanger and condense in the hot-side one, so the auxiliary source-side heat exchanger is not used.
Part of the hot temperature water flow produced in the hot-side heat exchanger is used by the +2P module to produce very hot water (up to 78°C).

OPERATING MODE

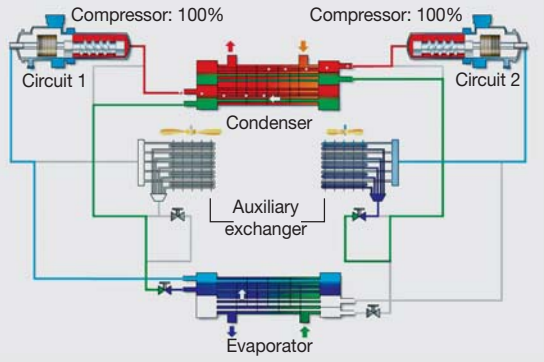
The multi-purpose units are therefore a simple and integrated response for all applications that require simultaneously and independently a hot and a cold load, such as the air conditioning of large plant with complex loads. The following are four of the many possible modes of operation of INTEGRA-Y units.



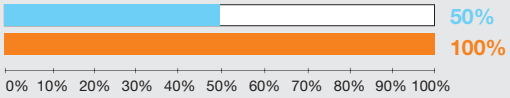
100% cold side / 50% hot side



Both the circuits operate to produce the amount of energy necessary for the cooling of the plant, evaporating all the refrigerant in the cold-side heat exchanger. While one circuit carries out the condensation on the hot-side heat exchanger, thus supplying the total energy necessary to heat the building, the other circuit exchanges the remaining heating energy in the external environment by using the auxiliary source-side heat exchanger (air coil or water exchanger, depending on the type of unit).

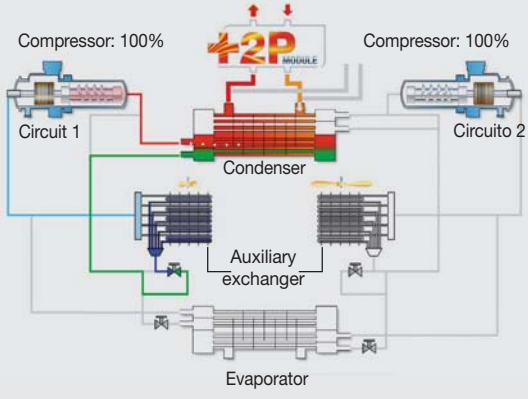


50% cold side / 100% hot side

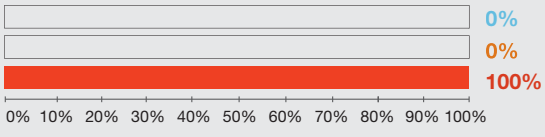


Just like the previous case, in this state both circuits operate differently, to supply the system with the correct amount of required energy.
The unit uses two sources to produce the requested hot water flow: in fact, one circuit evaporates the refrigerant in the cold-side heat exchanger, thus producing the cold water demand, while the other circuit uses the auxiliary source-side heat exchanger. In this way both circuits move energy through the hot-side heat exchanger, fulfilling the request for hot water flow.

With the +2P module option, INTEGRA-Y units can simultaneously and independently fulfill 3 different thermal loads (cold, hot and very hot water). The following operating modes are two working examples of INTEGRA-Y units with a +2P module fitted in.



0% cold side
0% hot side
100% very hot side



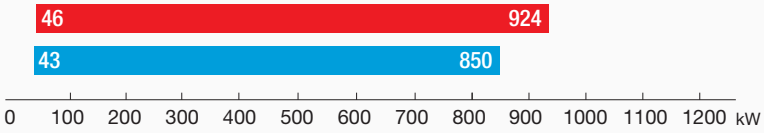
This particular state, shows the flexibility of the INTEGRA-Y units with a +2P module: even in the case of no thermal loads (neither cooling, nor heating) requested by the plant, the unit can still provide the very hot water if necessary.
In this case, only one circuit is operating partially in order to provide the right amount of hot water needed by the +2P module. A +2P module can produce very hot water (up to 78°C).

AIR SOURCE

AIR SOURCE UNITS

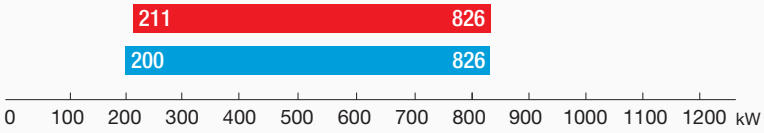
i-FX-Q2-Y / NX-Q / NECS-Q / ERACS2-Q

SCROLL



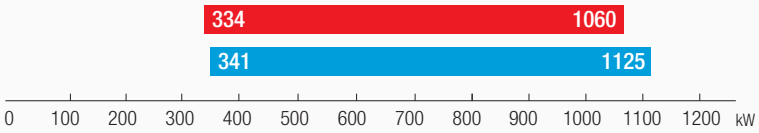
Acoustic versions
B: Standard
LN: Low Noise
SL: Super low noise
CA: High Efficiency
SL-CA: High Efficiency Super Low Noise

SCREW



Acoustic versions
CA: High efficiency
LN-CA: Low Noise, High Efficiency
SL-CA: Super Low Noise, High Efficiency
XL-CA: Extra Low Noise, High Efficiency
XL-CA-E: Extra Low Noise, High Efficiency-Enhanced

SCREW INVERTER



Acoustic versions
CA: High efficiency
SL-CA: Super Low Noise, High Efficiency
XL-CA: Extra Low Noise, High Efficiency

Smart Defrost

The INTEGRA-Y air source units are characterized by their wide operating range, achieved by the efficient energy management of the defrosting activity.

Energy Storage System

Energy storage function

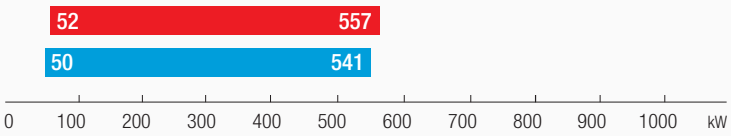
INTEGRA-Y heat pumps are equipped with dedicated control functions, specially developed by Climaveneta in order to further enhance the key characteristics of these units.
Thanks to the dynamic detection of all control parameters, the energy storage function allows the unit to promote its heat recovery function whenever is possible.
Thus, INTEGRA-Y can smartly interpret the plant requirements, always favouring the most efficient operation mode.

WATER SOURCE

UNITS WITH WATER SOURCE

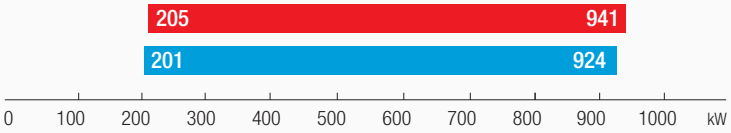
NECS-WQ / ERACS2-WQ

SCROLL



Acoustic versions
B:Standard + compressors' acoustic enclosure [up to -10 dB(A)]

SCREW



Acoustic versions
B:Standard + compressors' acoustic enclosure 'Basic' [up to -10 dB(A)] + compressors' acoustic enclosure 'Plus' [up to -16 dB(A)]

PLUG & PLAY

These units are coupled with natural water sources (ground water or surface water) to which the unit may be directly connected, without using an intermediate heat exchanger, hence improving the overall efficiency.

Water Saving function

For all applications with natural water source, it is key to reduce the flow rates to a minimum. This makes it possible to cut the operating costs of pumping and reduce the discharge costs of drained water. Thanks to the "Water Saving function" the water flow rate directed to the auxiliary heat exchanger is reduced in proportion to the unit's partialisation, ensuring the maximum overall efficiency of the system.

INTEGRA QI

Special Qi function
INTEGRA-Y units in special QI execution are designed and created to exchange heat using the most convenient source between air or water. In this way, for some periods of the year, it is possible to stop the pumps for draining the water from the well, reducing the impact both of the pump consumption and the costs related to the use of public water. Qi evolved technology can manage the operation with a double heat source in the best way.

TOTAL INVERTER TECHNOLOGY

FULL INVERTER TECHNOLOGY
THE HIGHEST ENERGY EFFICIENCY, ALWAYS.

The inverter technology with continuous variable speed shows its advantages particularly when applied to multi-purpose units.

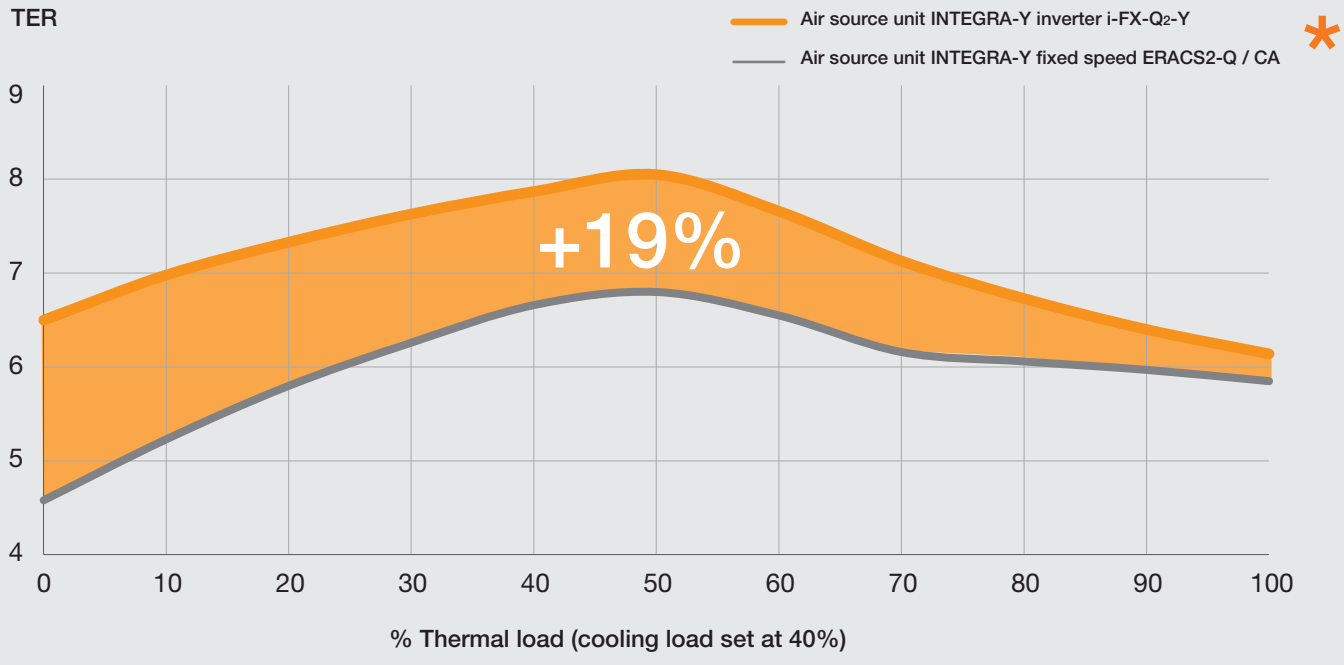
The new inverter driven i-FX-Q2-Y units always reach higher efficiencies than fixed speed units, with any combination of cold / hot load, and in any season.

The presence of Variable Speed Drive (VSD) compressors allows the INTEGRA-Y unit, i-FX-Q$_2$-Y to effectively follow each combination of thermal loads required by the system, with increasingly higher TER efficiencies (up to 19%) compared to those units with fixed speed compressors.

Cooling load [%](*)	Thermal load [%](*)	Median increase in TER VSD vs. fixed speed
0%	0%-100%	+14%
20%	0%-100%	+18%
40%	0%-100%	**+19%** *
60%	0%-100%	+17%
80%	0%-100%	+9%
100%	0%-100%	+5%
Average value		**+14%**

The comparison was made between an INTEGRA-Y ERACS-Q /CA air source unit with fixed speed screw compressor and an i-FX-Q$_2$-Y one with VSD screw compressors.

* Load refers to the maximum cooling capacity of the unit in the following conditions:
Evaporator water (in / out) = 12/7 ° C
Condenser water (in / out) = 40/45 ° C
Air room temperature = 15 ° C



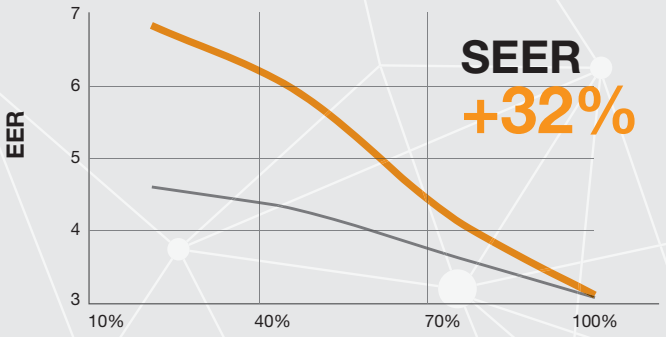
FULL INVERTER TECHNOLOGY
THE HIGHEST ENERGY EFFICIENCY, ALWAYS.

UNBEATABLE EFFICIENCY AT PARTIAL LOADS

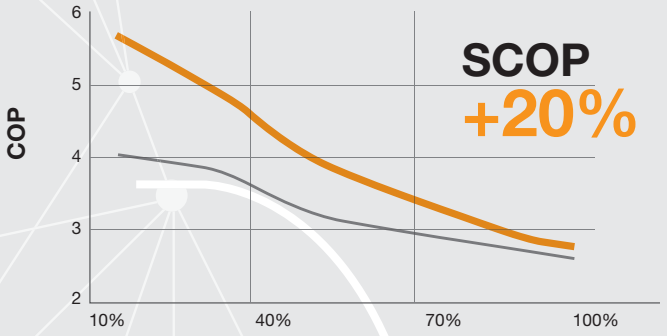
In traditional comfort applications the HVAC plant usually works at full load only for few hours every year.
Most of the time the unit works at partial loads.

It is in this situation that the efficiency achieved by the units with inverter technology is much higher than traditional fixed speed units:
SCOP up to +20%
SEER up to +32%

The minimum efficiency requirements of the EU regulation, ErP 2009/125 / EC, are also pinpointed in TIER 2021



SEER seasonal efficiency as per EN14825:2013 — Part load ratio



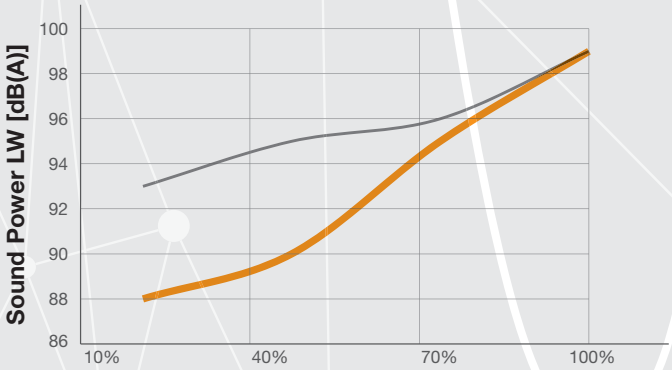
SCOP seasonal efficiency as per EN14825: 2013 — Part load ratio

Air units INTEGRA-Y inverter i-FX-Q2-Y
Air units INTEGRA-Y fixed speed ERACS2-Q / CA

MINIMUM SOUND EMISSIONS HIGHEST ACOUSTICAL COMFORT

The more you increase the partialisation activity the lower your sound emissions will be, thanks to capacity of inverter technology to continually modulate the compressor rotation.
Most of the time the units are characterized by lower capacities compared to fixed speed compressor units, this always ensures the highest acoustical comfort.
The sound emissions can be further reduced thanks to dedicated versions and a vast array of accessories.

Sound Power of the two units partialisation



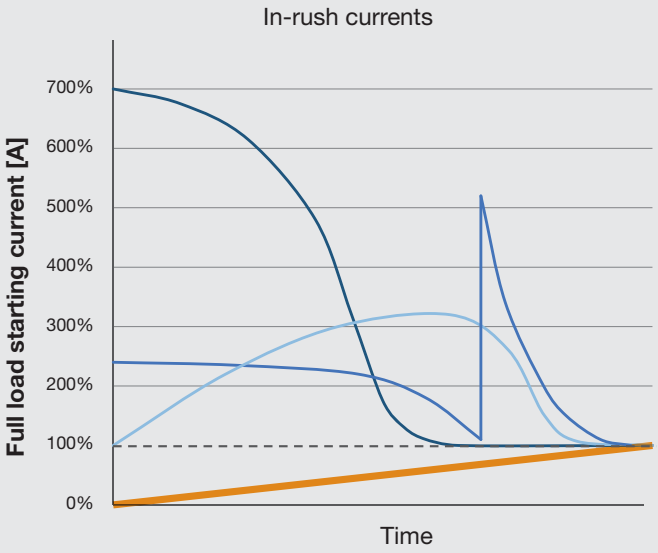
Partialisation SEER values as per EN14825: 2013 — Part load ratio

Air units INTEGRA-Y inverter i-FX-Q2-Y
Air units INTEGRA-Y fixed speed ERACS2-Q / CA

NO IN-RUSH CURRENT

The inverter technology involves a start-up phase with very low in-rush current, lower than any other mode (direct start, star / delta, part winding or soft start). The absence of sudden peaks and abrupt changes in the starting torque, in addition to eliminating possible disturbances to the electricity power network, reduces the stress to zero on the electrical components and improves the reliability of the system.

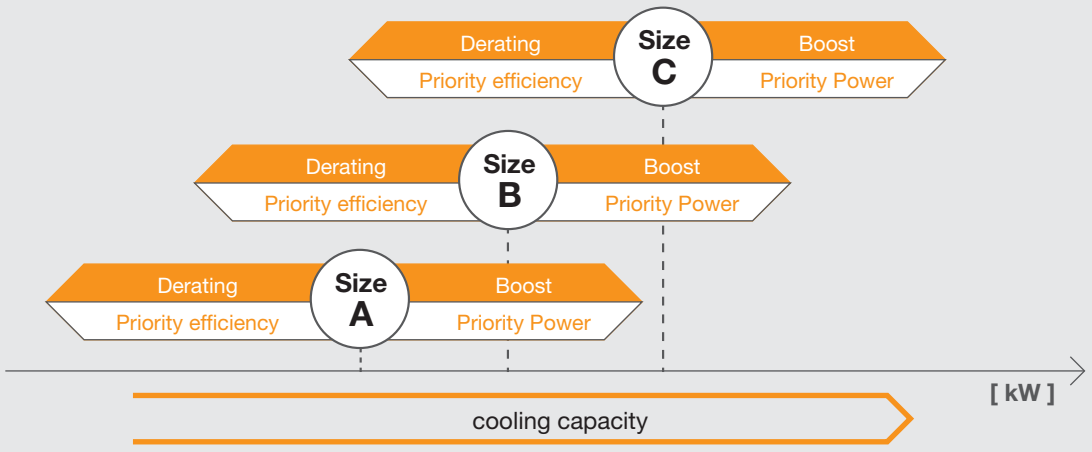
The frequency converters chosen by Climaveneta are characterized by values of Displacement Power Factor of between 0.97 and 0.99. The resulting unit power factor at rated nominal operating conditions is always higher than that of similar technology without an inverter unit. The need to install power factor correction devices of the loads is therefore reduced.



FLEXIBILITY IN SELECTING UNITS

Thanks to specific technical solutions and proprietary control functions, Climaveneta's inverter units can be selected at various speed conditions, which is different from the nominal ones.

Whatever the needs to be met: maximum operating efficiency, reducing the initial investment, future power increase of the plant, it is always possible to identify the most suitable units.



INTEGRA

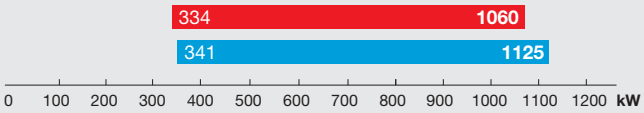
i-FX-Q2-Y

4-PIPE AIR SOURCE UNIT, INVERTER-DRIVEN SCREW COMPRESSORS AND EC FANS. COOLING CAPACITY FROM 341 TO 1125 KW

ErP 2021 COMPLIANT | TOTAL INVERTER TECHNOLOGY | SCREW INVERTER | EC AXIAL | SHELL & TUBES | R HFC R-134a | AIR SOURCE

VERSIONS:

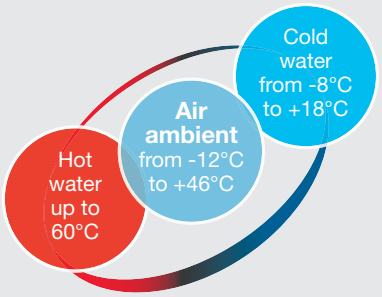
CA Class A Efficiency
SL-CA Super Low noise, Class A Efficiency
XL-CA Extra Low noise, Class A Efficiency



i-FX-Q2-Y is a multi-purpose outdoor unit able to simultaneously produce chilled and hot water by means of two independent hydronic circuits. Thanks to the full inverter technology of the screw compressors and the EC fans, these units effectively follow each combination of thermal loads, always providing the exact thermal energy required by the system. This results in top-level efficiency values and very low energy consumption throughout the year, whatever the cooling mode and the weather condition.

Main accessories:

- "LT" kit for working down to -12°C in heat pump mode
- NOISE REDUCER (only on not silenced versions)
- Special fan diffusers
- Thicker soundproofing cladding
- Hydronic group
- VPF (Variable Primary Flow) system
- Set-up for remote connectivity with
- ModBus, Echelon, Bacnet, Bacnet over-IP.
- Touch Screen visual display
- Leak detector



Extended working range
An extended working range which ensures the working operation of the unit all year long and in any working mode.

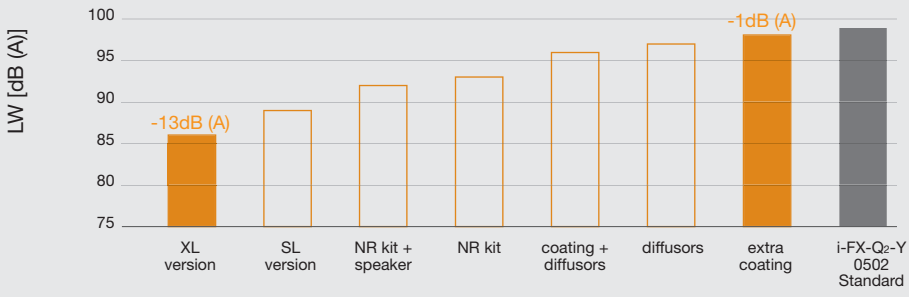
Full INVERTER Technology

Full inverter technology
Independent circuits with screw compressors inverters and EC standard fans.

GREEN REFRIGERANTS

HFO refrigerant
Use of innovative green refrigerants, with minimal environmental impact (very low GWP).

ACOUSTICAL CASINGS



Super silent
Up to 8 different acoustic casings for a total sound emission control (of -1dB (A) up to -13 dB (A) compared to the standard configuration).

i-FX-Q2-Y CA			0502	0532	0602	0652	0702	0802	0902	1002	1102
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE											
SELECTION RANGE											
Cooling capacity range	(1)	kW	400-520	429-536	456-570	517-671	598-712	630-787	786-982	881-1036	1046-1125
EER (up to)	(1)	kW/kW	3,34	3,30	3,36	3,25	3,24	3,32	3,25	3,22	3,03
Heating capacity range	(3)	kW	379-492	394-492	421-526	491-638	570-678	606-757	745-931	836-983	986-1060
COP (up to)	(3)	kW/kW	3,45	3,42	3,42	3,47	3,45	3,51	3,50	3,51	3,49
SELECTION RATED											
COOLING ONLY (GROSS VALUE)											
Cooling capacity	(1)(10)	kW	488	531	570	627	689	787	915	985	1083
Total power input	(1)(10)	kW	155	168	182	199	219	251	288	312	360
EER	(1)(10)	kW/kW	3,14	3,15	3,14	3,15	3,14	3,13	3,18	3,16	3,01
COOLING ONLY (EN14511 VALUE)											
Cooling capacity	(1)(2)(10)	kW	486	529	568	625	687	786	912	982	1079
EER	(1)(2)(10)	kW/kW	3,10	3,10	3,10	3,10	3,10	3,10	3,14	3,12	2,97
HEATING ONLY (GROSS VALUE)											
Total heating capacity	(3)(10)	kW	458	486	526	593	652	757	862	928	1018
Total power input	(3)(10)	kW	133	143	154	171	189	216	248	265	292
COP	(3)(10)	kW/kW	3,44	3,40	3,42	3,47	3,45	3,51	3,47	3,50	3,48
HEATING ONLY (EN14511 VALUE)											
Total heating capacity	(2)(3)(10)	kW	460	487	527	594	654	759	865	931	1020
COP	(2)(3)(10)	kW/kW	3,42	3,38	3,41	3,45	3,43	3,49	3,44	3,48	3,46
COOLING WITH TOTAL HEAT RECOVERY											
Cooling capacity	(4)(10)	kW	489	533	571	624	683	785	914	987	1102
Total power input	(4)(10)	kW	137	151	161	174	193	221	258	274	310
Recovery heat exchanger capacity	(4)(10)	kW	617	675	722	788	864	993	1157	1245	1393
TER	(4)(10)	kW/kW	8,08	8,01	8,04	8,11	8,02	8,03	8,02	8,13	8,06
SEASONAL EFFICIENCY IN HEATING (EN14825 VALUE)											
PDesign	(5)(10)	kW	365	365	385	-	-	-	-	-	-
SCOP	(5)(10)		4,10	4,08	4,07	-	-	-	-	-	-
Performance ηs (Reg. 811/2013 UE)	(5)(10)	%	161	160	160	-	-	-	-	-	-
Seasonal efficiency class (Regulation (UE) 811/2013)	(5)(10)		-	-	-	-	-	-	-	-	-
EXCHANGERS											
HEAT EXCHANGER USER SIDE IN REFRIGERATION											
Water flow	(1)(10)	l/s	23,31	25,41	27,26	29,97	32,95	37,65	43,76	47,12	51,77
Pressure drop	(1)(10)	kPa	40,8	51,6	32,5	40,5	45,4	29,0	39,7	42,3	51,4
HEAT EXCHANGER USER SIDE IN HEATING											
Water flow	(3)(10)	l/s	22,13	23,47	25,38	28,61	31,49	36,55	41,61	44,81	49,14
Pressure drop	(3)(10)	kPa	22,5	25,4	21,4	27,0	32,0	32,2	41,7	34,9	30,0
REFRIGERANT CIRCUIT											
Compressors nr.		N°	2	2	2	2	2	2	2	2	2
No. Circuits		N°	2	2	2	2	2	2	2	2	2
Regulation			STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS	STEPLESS
Refrigerant			R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a	R134a
Refrigerant charge		kg	230,0	235,0	240,0	260,0	260,0	325,0	350,0	470,0	470,0
NOISE LEVEL											
Sound pressure	(6)(10)	dB(A)	66	66	68	68	68	68	69	69	69
Sound power level in cooling	(7)(8)(10)	dB(A)	99	99	101	101	101	101	102	102	102
Sound power level in heating	(7)(9)(10)	dB(A)	99	99	101	101	101	101	102	102	102
SIZE AND WEIGHT											
Lenght	(11)	mm	8150	8150	8900	9650	10400	10400	10400	11900	11900
Width	(11)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260
Height	(11)	mm	2530	2530	2530	2530	2530	2530	2530	2530	2530
Operating weight	(11)	kg	8350	8380	9080	9590	10060	11010	12310	14110	14150

Notes:
1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C.
2 Values in compliance with EN14511-3:2013.
3 Plant (side) heat exchanger water (in/out) 40°C/45°C; Source (side) heat exchanger air (in) 7°C - 87% R.H.
4 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Plant (side) heat exchanger water (in/out) 40°C/45°C.
5 Seasonal space heating energy efficiency class LOW TEMPERATURE in AVERAGE climate conditions [REGULATION (UE) N. 811/2013]
6 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
7 Sound power on the basis of measurements made in compliance with ISO 9614.
8 Sound power level in cooling, outdoors.
9 Sound power level in heating, outdoors.
10 Data referred to the selection rated.
11 Unit in standard configuration/execution, without optional accessories.

The units highlighted in this publication contain HFC R134a [GWP100 1430] fluorinated greenhouse gases.

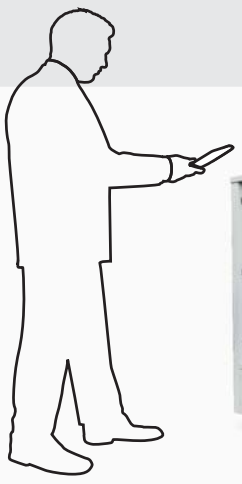
KIPlink, the keyboard in your pocket

KIPlink is the innovative system that allows you to directly control the unit via smartphone or tablet through the QR code and using the Wi-Fi directly installed in the equipment.

Thanks to dedicated visuals and graphics, KIPlink allows the user to directly access the same functions as with a traditional keyboard.

KIPlink is installed as standard in all i-FX-Q2-Y units.

KIP LINK
Keyboard In your Pocket



NX-Q
NECS-Q

R HFC R410A | P PLATES | SCROLL | T SHELL&T. | AIR S. | REV-HEAT | SCREW | AXIAL

			NX-Q									NECS-Q / B						
			0152	0182	0202	0252	0262	0302	0402	0502	0602	0604	0704	0804	0904	1004	1104	1204
Power supply		V/ph/Hz	400/3+N/50															
PERFORMANCE																		
COOLING ONLY (GROSS VALUE)																		
Cooling capacity	(1)	kW	43,9	50,8	58,1	64,0	71,6	85,5	111	138	169	150	166	189	211	240	277	311
Total power input	(1)	kW	12,7	14,8	17,6	19,2	22,2	25,6	33,4	42,3	56,5	58,9	69,0	75,8	85,2	95,6	107	120
EER	(1)	kW/kW	3,45	3,43	3,30	3,33	3,23	3,34	3,31	3,26	2,98	2,54	2,41	2,49	2,48	2,51	2,58	2,58
COOLING ONLY (EN14511 VALUE)																		
Cooling capacity	(1)(2)	kW	43,8	50,6	57,9	63,8	71,4	85,2	110	137	168	149	166	188	210	239	276	310
EER	(1)(2)	kW/kW	3,41	3,38	3,26	3,28	3,18	3,29	3,27	3,21	2,94	2,50	2,37	2,45	2,44	2,48	2,54	2,54
HEATING ONLY (GROSS VALUE)																		
Total heating capacity	(3)	kW	46,4	53,2	60,6	67,3	75,2	90,1	115	145	177	167	185	209	234	266	306	344
Total power input	(3)	kW	13,5	15,3	17,5	19,3	21,4	25,6	32,7	41,3	52,1	58,0	64,9	72,1	79,8	92,0	104	116
COP	(3)	kW/kW	3,44	3,48	3,46	3,49	3,51	3,52	3,52	3,51	3,40	2,88	2,86	2,90	2,93	2,90	2,94	2,96
HEATING ONLY (EN14511 VALUE)																		
Total heating capacity	(2)(3)	kW	46,6	53,4	60,8	67,6	75,5	90,4	116	145	178	168	186	210	235	268	308	346
COP	(2)(3)	kW/kW	3,41	3,44	3,43	3,46	3,48	3,49	3,49	3,47	3,37	2,86	2,83	2,88	2,91	2,87	2,91	2,93
COOLING WITH TOTAL HEAT RECOVERY																		
Cooling capacity	(4)	kW	44,0	51,1	58,9	64,3	73,1	86,9	112	140	176	151	173	194	220	246	280	317
Total power input	(4)	kW	11,6	13,4	15,7	17,3	19,8	23,4	30,5	39,5	50,7	49,8	57,1	64,5	72,1	79,8	92,8	105
Recovery heat exchanger capacity	(4)	kW	54,9	63,7	73,7	80,5	91,7	109	141	177	224	198	226	255	288	321	368	415
TER		kW/kW	8,53	8,57	8,45	8,37	8,32	8,37	8,28	8,01	7,90	7,00	6,99	6,96	7,04	7,10	6,98	6,99
SEASONAL EFFICIENCY IN HEATING (EN14825 VALUE)																		
PDesign	(5)	kW	33,2	38,2	43,6	49,4	55,6	65,8	83,0	106	135	127	143	156	171	205	231	255
SCOP	(5)		3,59	3,60	3,63	3,75	3,77	3,71	3,69	3,66	3,64	3,25	3,26	3,35	3,21	3,23	3,28	3,26
Performance ηs (Reg. 811/2013 UE)	(5)	%	141	141	142	147	148	145	144	143	143	127	127	131	126	126	128	128
Seasonal efficiency class (Regulation (UE) 811/2013)	(5)		A+	A+	A+	A+	A+	A+	-	-	-	-	-	-	-	-	-	-
EXCHANGERS																		
HEAT EXCHANGER USER SIDE IN REFRIGERATION																		
Water flow	(1)	m³/h	2,10	2,43	2,78	3,06	3,42	4,09	5,29	6,59	8,06	25,8	28,6	32,5	36,3	41,3	47,7	53,5
Pressure drop	(1)	kPa	14,7	19,7	15,8	19,2	17,1	19,4	22,3	26,2	31,8	41,9	43,0	43,7	42,8	44,4	47,3	47,2
HEAT EXCHANGER USER SIDE IN HEATING																		
Water flow	(3)	m³/h	2,24	2,57	2,93	3,25	3,63	4,35	5,56	6,99	8,56	29,1	32,2	36,4	40,7	46,3	53,2	59,8
Pressure drop	(3)	kPa	16,7	21,9	17,5	21,6	19,3	21,9	24,6	29,5	35,9	53,1	54,5	54,8	53,7	55,8	58,9	58,9
COMPRESSORS																		
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
NOISE LEVEL																		
Noise Pressure	(6)	dB(A)	53	53	53	53	53	54	55	56	56	60	60	60	61	62	63	63
Sound power level in cooling	(7)(8)	dB(A)	85	85	85	85	85	86	87	88	88	92	92	92	93	94	95	95
Sound power level in heating	(7)(9)	dB(A)	85	85	85	85	85	86	87	88	88	92	92	92	93	94	95	95
SIZE AND WEIGHT																		
Length	(10)	mm	2625	2625	2625	2625	2625	3250	3875	4500	4500	3110	3110	3110	4110	4110	4110	4110
Width	(10)	mm	1350	1350	1350	1350	1350	1350	1350	1350	1350	2220	2220	2220	2220	2220	2220	2220
Height	(10)	mm	2070	2070	2070	2070	2070	2070	2070	2070	2070	2150	2150	2150	2150	2150	2150	2150
Operating weight	(10)	kg	850	870	890	960	970	1130	1430	1670	1730	1600	1840	2120	2320	2480	2680	2860

NECS-Q / CA			1314	1414	1614	1716	1816	2016	2116	2416	2418	2618	2818	3018	3218
Power supply		V/ph/Hz	400/3/50												
PERFORMANCE															
COOLING ONLY (GROSS VALUE)															
Cooling capacity	(1)	kW	362	387	425	471	524	559	581	637	680	724	775	813	850
Total power input	(1)	kW	122	128	145	157	173	185	192	217	230	244	256	272	289
EER	(1)	kW/kW	2,96	3,03	2,94	3,01	3,04	3,03	3,03	2,94	2,95	2,96	3,03	2,99	2,94
COOLING ONLY (EN14511 VALUE)															
Cooling capacity	(1)(2)	kW	361	385	423	470	522	557	579	635	677	720	773	810	846
EER	(1)(2)	kW/kW	2,91	2,98	2,89	2,97	2,99	2,99	2,99	2,89	2,91	2,91	2,99	2,94	2,89
HEATING ONLY (GROSS VALUE)															
Total heating capacity	(3)	kW	394	420	462	507	546	603	630	693	729	788	840	882	924
Total power input	(3)	kW	120	127	140	155	166	183	189	210	221	239	253	266	280
COP	(3)	kW/kW	3,30	3,31	3,30	3,28	3,29	3,30	3,32	3,30	3,29	3,29	3,33	3,31	3,30
HEATING ONLY (EN14511 VALUE)															
Total heating capacity	(2)(3)	kW	396	422	464	509	549	606	633	696	732	792	843	886	928
COP	(2)(3)	kW/kW	3,26	3,28	3,26	3,25	3,26	3,27	3,29	3,27	3,26	3,26	3,30	3,28	3,27
COOLING WITH TOTAL HEAT RECOVERY															
Cooling capacity	(4)	kW	355	379	423	460	500	547	568	636	667	711	758	802	848
Total power input	(4)	kW	107	113	126	139	150	163	170	189	200	213	226	240	252
Recovery heat exchanger capacity	(4)	kW	455	485	542	590	640	700	728	814	854	911	971	1027	1085
TER		kW/kW	7,55	7,66	7,64	7,55	7,63	7,67	7,64	7,68	7,62	7,61	7,63	7,63	7,67
SEASONAL EFFICIENCY IN HEATING (EN14825 VALUE)															
PDesign	(5)	kW	283	317	363	376	390	-	-	-	-	-	-	-	-
SCOP	(5)		3,75	3,86	3,73	3,86	3,77	-	-	-	-	-	-	-	-
Performance ηs (Reg. 811/2013 UE)	(5)	%	147	151	146	152	148	-	-	-	-	-	-	-	-
Seasonal efficiency class (Regulation (UE) 811/2013)	(5)		-	-	-	-	-	-	-	-	-	-	-	-	-
EXCHANGERS															
HEAT EXCHANGER USER SIDE IN REFRIGERATION															
Water flow	(1)	m³/h	62,4	66,6	73,2	81,1	90,2	96,3	100	110	117	125	133	140	146
Pressure drop	(1)	kPa	56,4	49,2	59,4	41,5	51,3	44,5	48,1	49,3	50,7	57,4	44,5	48,9	53,5
HEAT EXCHANGER USER SIDE IN HEATING															
Water flow	(3)	m³/h	68,5	73,0	80,3	88,1	95,0	105	109	120	127	137	146	153	161
Pressure drop	(3)	kPa	68,0	59,1	71,5	48,9	56,8	52,7	57,5	59,4	59,3	69,4	53,3	58,7	64,4
COMPRESSORS															
Compressors nr.		N°	4	4	4	6	6	6	6	6	8	8	8	8	8
No. Circuits		N°	2	2	2	3	3	3	3	3	4	4	4	4	4
NOISE LEVEL															
Noise Pressure	(6)	dB(A)	65	65	65	64	65	65	65	66	66	66	67	67	67
Sound power level in cooling	(7)(8)	dB(A)	97	97	97	97	98	98	98	99	99	99	100	100	100
Sound power level in heating	(7)(9)	dB(A)	97	97	97	97	98	0	0	0	0	0	0	0	0
SIZE AND WEIGHT															
Length	(10)	mm	5080	5080	5080	6255	7430	7430	7430	7430	9780	9780	9780	9780	9780
Width	(10)	mm	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260	2260
Height	(10)	mm	2450	2450	2450	2450	2450	2450	2450	2450	2450	2450	2450	2450	2450
Operating weight	(10)	kg	3850	3950	3980	5460	5740	5890	5970	6020	7350	7500	7700	7740	7770

ERACS2-Q

VPF Variable Primary Flow

AIR S. | R HFC R410A | REV-HEAT | SCROLL | SCREW | T SHELL&T. | AXIAL

ERACS2-Q / CA			1062	1162	1362	1562	1762	1962	2022	2222	2422	2622	2722	3222
Power supply		V/ph/Hz						400/3/50						
PERFORMANCE														
COOLING ONLY (GROSS VALUE)														
Cooling capacity	(1)	kW	210	248	302	329	380	425	483	525	554	624	701	826
Total power input	(1)	kW	72,1	84,8	101	109	129	144	156	167	176	201	222	264
EER	(1)	kW/kW	2,91	2,93	2,98	3,01	2,95	2,95	3,10	3,14	3,16	3,10	3,15	3,13
COOLING ONLY (EN14511 VALUE)														
Cooling capacity	(1)(2)	kW	209	247	301	328	379	424	485	527	556	628	704	828
EER	(1)(2)	kW/kW	2,88	2,89	2,94	2,97	2,91	2,92	3,08	3,11	3,12	3,07	3,14	3,11
HEATING ONLY (GROSS VALUE)														
Total heating capacity	(3)	kW	218	258	308	339	396	434	492	541	571	615	711	826
Total power input	(3)	kW	67,0	80,7	92,2	101	122	131	149	159	169	178	207	240
COP	(3)	kW/kW	3,25	3,20	3,35	3,35	3,25	3,32	3,31	3,41	3,38	3,46	3,43	3,44
HEATING ONLY (EN14511 VALUE)														
Total heating capacity	(2)(3)	kW	218	259	310	340	397	435	489	539	569	611	708	823
COP	(2)(3)	kW/kW	3,23	3,17	3,32	3,32	3,23	3,31	3,25	3,34	3,31	3,37	3,39	3,39
COOLING WITH TOTAL HEAT RECOVERY														
Cooling capacity	(4)	kW	209	248	305	329	381	428	484	522	550	631	701	826
Total power input	(4)	kW	60,6	72,2	87,1	92,5	111	122	134	145	153	170	193	228
Recovery heat exchanger capacity	(4)	kW	266	316	386	416	486	542	609	658	694	791	883	1041
TER		kW/kW	7,83	7,81	7,93	8,06	7,80	7,97	8,18	8,14	8,12	8,35	8,19	8,17
SEASONAL EFFICIENCY IN HEATING (EN14825 VALUE)														
PDesign	(5)	kW	155	210	219	241	282	311	354	383	-	-	-	-
SCOP	(5)		3,41	3,21	3,45	3,53	3,40	3,54	3,37	3,46	-	-	-	-
Performance ηs (Reg. 811/2013 UE)	(5)	%	133	125	135	138	133	139	132	136	-	-	-	-
Seasonal efficiency class (Regulation (UE) 811/2013)		(5)	-	-	-	-	-	-	-	-	-	-	-	-
EXCHANGERS														
HEAT EXCHANGER USER SIDE IN REFRIGERATION														
Water flow	(1)	m³/h	36,2	42,8	52,1	56,7	65,5	73,2	83,1	90,4	95,3	107	121	142
Pressure drop	(1)	kPa	28,8	40,2	36,6	43,4	40,3	27,9	26,7	29,0	32,3	23,1	30,5	30,9
HEAT EXCHANGER USER SIDE IN HEATING														
Water flow	(3)	m³/h	37,8	44,9	53,6	58,9	68,7	75,4	85,5	94,1	99,2	107	124	143
Pressure drop	(3)	kPa	31,5	44,3	38,8	46,9	44,4	29,6	28,2	31,4	34,9	22,8	31,9	31,5
COMPRESSORS														
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	2	2	2
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2	2	2
NOISE LEVEL														
Noise Pressure	(6)	dB(A)	65	65	65	66	66	66	66	68	68	68	68	69
Sound power level in cooling	(7)(8)	dB(A)	97	97	97	98	99	99	99	101	101	101	101	102
Sound power level in heating	(7)(9)	dB(A)	97	97	97	98	99	99	99	101	0	0	0	0
SIZE AND WEIGHT														
Length	(10)	mm	4610	4610	5610	5610	6610	6610	6300	7200	7200	7200	8400	9700
Width	(10)	mm	2220	2220	2220	2220	2220	2220	2260	2260	2260	2260	2260	2260
Height	(10)	mm	2150	2420	2430	2430	2430	2430	2350	2350	2350	2350	2350	2350
Operating weight	(10)	kg	3600	3870	4620	5040	5520	5670	8650	9230	9330	9770	10310	12480

Notes

1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C.
2 Values in compliance with EN14511-3:2011.
3 Plant (side) heat exchanger water (in/out) 40°C/45°C; Source (side) heat exchanger air (in) 7°C - 87% R.H.
4 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Plant (side) heat exchanger water (in/out) 40°C/45°C.
5 Seasonal space heating energy efficiency class LOW TEMPERATURE in AVERAGE climate conditions [REGULATION (UE) N. 811/2013]
6 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
7 Sound power on the basis of measurements made in compliance with ISO 9614.
8 Sound power level in cooling, outdoors.
9 Sound power level in heating, outdoors.
10 Unit in standard configuration/execution, without optional accessories.

The units highlighted in this publication contain HFC R134a [GWP100 1430] fluorinated greenhouse gases.

NECS-WQ

SCROLL PLATES
R HFC R410A WATER S. REV-HEAT

NECS-WQ			0152	0182	0202	0252	0262	0302	0412	0512	0612	0604	0704	0804	0904	1004	1104	1204	1404	1604
Power supply		V/ph/Hz									400/3/50									
PERFORMANCE																				
COOLING ONLY (GROSS VALUE)																				
Cooling capacity	(1)	kW	48,4	55,6	64,6	73,4	82,8	97,0	127	158	205	193	224	254	284	315	363	412	466	520
Total power input	(1)	kW	8,56	9,73	11,2	13,2	14,7	17,4	22,8	28,2	36,6	34,7	40,1	45,5	50,9	56,4	64,8	73,0	84,8	96,5
EER	(1)	kW/kW	5,65	5,71	5,77	5,56	5,63	5,57	5,56	5,59	5,60	5,57	5,59	5,59	5,58	5,59	5,60	5,64	5,49	5,39
COOLING ONLY (EN14511 VALUE)																				
Cooling capacity	(1)(2)	kW	48,2	55,4	64,3	73,1	82,4	96,6	126	157	204	192	223	253	283	314	362	410	464	518
EER	(1)(2)	kW/kW	5,45	5,53	5,59	5,39	5,45	5,40	5,38	5,41	5,43	5,40	5,43	5,43	5,43	5,44	5,45	5,49	5,35	5,26
HEATING ONLY (GROSS VALUE)																				
Total heating capacity	(3)	kW	52,1	59,7	69,3	79,0	88,9	104	135	169	219	208	240	270	303	338	388	440	498	557
Total power input	(3)	kW	12,4	13,8	16,2	18,5	20,4	23,9	31,0	38,4	49,9	47,7	54,7	61,8	69,2	76,8	88,4	99,6	113	126
COP	(3)	kW/kW	4,20	4,33	4,28	4,27	4,36	4,37	4,35	4,40	4,39	4,36	4,38	4,37	4,38	4,40	4,39	4,41	4,41	4,42
HEATING ONLY (EN14511 VALUE)																				
Total heating capacity	(2)(3)	kW	52,4	60,0	69,6	79,4	89,3	105	136	170	220	209	241	271	305	339	390	442	500	559
COP	(2)(3)	kW/kW	4,10	4,23	4,19	4,18	4,26	4,27	4,25	4,30	4,29	4,27	4,29	4,28	4,30	4,31	4,31	4,33	4,33	4,34
COOLING WITH TOTAL HEAT RECOVERY																				
Cooling capacity	(4)	kW	40,4	46,7	54,1	61,7	69,7	82,0	106	133	172	163	188	212	238	266	305	346	392	438
Total power input	(4)	kW	12,4	13,8	16,2	18,5	20,4	23,9	31,0	38,4	49,9	47,7	54,7	61,8	69,2	76,8	88,4	99,6	113	126
Recovery heat exchanger capacity	(4)	kW	52,1	59,7	69,3	79,0	88,9	104	135	169	219	208	240	270	303	338	388	440	498	557
TER		kW/kW	7,46	7,71	7,62	7,61	7,77	7,80	7,75	7,85	7,83	7,79	7,82	7,80	7,83	7,86	7,84	7,89	7,88	7,90
SEASONAL EFFICIENCY IN HEATING (EN14825 VALUE)																				
PDesign	(5)	kW	62,2	71,1	82,8	94,4	106	125	162	202	262	248	289	325	360	-	-	-	-	-
SCOP	(5)		5,71	5,88	5,93	5,74	5,79	5,79	5,73	5,72	5,76	5,80	5,65	5,78	5,93	-	-	-	-	-
Performance ηs (Reg. 811/2013 UE)	(5)	%	220	227	229	222	224	224	221	221	222	224	218	223	229	-	-	-	-	-
Seasonal efficiency class (Regulation (UE) 811/2013)	(5)		A++	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EXCHANGERS																				
HEAT EXCHANGER USER SIDE IN REFRIGERATION																				
Water flow	(1)	m³/h	2,31	2,66	3,09	3,51	3,96	4,64	6,06	7,54	9,79	9,24	10,72	12,16	13,58	15,08	17,35	19,69	22,26	24,86
Pressure drop	(1)		28,4	25,6	25,0	28,7	31,9	33,8	39,1	42,4	44,0	41,7	44,1	43,7	43,0	43,9	43,7	44,2	45,6	44,0
HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION																				
Water flow	(1)	m³/h	0,85	0,97	1,13	1,28	1,45	1,70	2,22	2,76	3,58	3,38	3,93	4,45	4,97	5,52	6,35	7,20	8,17	9,15
Pressure drop	(1)	kPa	3,79	3,42	3,32	3,85	4,26	4,53	5,25	5,68	5,89	5,60	5,91	5,85	5,77	5,89	5,86	5,91	6,15	5,97
HEAT EXCHANGER SOURCE SIDE IN HEATING																				
Water flow	(3)	m³/h	2,51	2,88	3,35	3,82	4,29	5,04	6,51	8,15	10,57	10,05	11,56	13,04	14,64	16,30	18,74	21,22	24,04	26,88
Pressure drop	(3)	kPa	33,5	30,1	29,3	34,0	37,5	39,8	45,1	49,5	51,2	49,3	51,3	50,2	50,0	51,3	51,0	51,4	53,2	51,5
HEAT EXCHANGER USER SIDE IN HEATING																				
Water flow	(4)	m³/h	1,38	1,60	1,85	2,11	2,38	2,80	3,61	4,53	5,88	5,58	6,43	7,24	8,14	9,07	10,42	11,82	13,39	14,98
Pressure drop	(4)	kPa	10,1	9,25	8,95	10,4	11,5	12,3	13,9	15,3	15,8	15,2	15,8	15,5	15,5	15,9	15,8	15,9	16,5	16,0
COMPRESSORS																				
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
NOISE LEVEL																				
Noise Pressure	(6)	dB(A)	42	43	43	43	44	45	46	47	48	54	55	56	57	58	59	59	59	59
Sound power level in cooling	(7)(8)	dB(A)	73	74	74	74	75	76	77	78	79	86	87	88	89	90	91	91	91	91
Sound power level in heating	(7)(9)	dB(A)	73	74	74	74	75	76	77	78	79	86	87	88	89	0	0	0	0	0
SIZE AND WEIGHT																				
Length	(10)	mm	1220	1220	1220	1220	1220	1220	1220	1220	1220	2560	2560	2560	2560	2560	2560	2560	2560	2560
Width	(10)	mm	877	877	877	877	877	877	877	877	877	891	891	891	891	891	891	891	891	891
Height	(10)	mm	1496	1496	1496	1496	1496	1496	1496	1496	1496	1810	1810	1810	1810	1810	1810	1810	1810	1810
Operating weight	(10)	kg	450	470	490	505	525	550	745	825	910	975	1165	1365	1445	1610	1710	1810	1895	2000

Notes

1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C.
2 Values in compliance with EN14511-3:2011.
3 Plant (side) heat exchanger water (in/out) 40°C/45°C; Source (side) heat exchanger air (in) 7°C - 87% R.H.
4 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Plant (side) heat exchanger water (in/out) 40°C/45°C.
5 Seasonal space heating energy efficiency class LOW TEMPERATURE in AVERAGE climate conditions [REGULATION (UE) N. 811/2013]
6 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
7 Sound power on the basis of measurements made in compliance with ISO 9614.
8 Sound power level in cooling, outdoors.
9 Sound power level in heating, outdoors.
10 Unit in standard configuration/execution, without optional accessories

The units highlighted in this publication contain HFC R134a [GWP100 1430] fluorinated greenhouse gases.

ERACS2-WQ

AXIAL · SCROLL · SHELL&T. · R HFC R410A · WATER S. · A ENERG.CL. · REV-HEAT

ERACS2-WQ			0802	1002	1102	1302	1502	1702	1902	2152	2502	2602	2702	3202
Power supply		V/ph/Hz	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50
PERFORMANCE														
COOLING ONLY (GROSS VALUE)														
Cooling capacity	(1)	kW	189	234	268	318	363	424	468	542	633	686	763	870
Total power input	(1)	kW	35,7	44,9	50,6	59,7	68,7	80,2	89,7	98,8	116	125	140	160
EER	(1)	kW/kW	5,31	5,22	5,30	5,32	5,29	5,29	5,21	5,48	5,46	5,48	5,44	5,44
COOLING ONLY (EN14511 VALUE)														
Cooling capacity	(1)(2)	kW	189	233	267	317	362	422	467	541	632	685	761	867
EER	(1)(2)	kW/kW	5,19	5,09	5,15	5,20	5,18	5,15	5,13	5,40	5,35	5,39	5,34	5,31
HEATING ONLY (GROSS VALUE)														
Total heating capacity	(3)	kW	205	255	291	344	393	459	514	589	686	738	831	941
Total power input	(3)	kW	45,7	56,9	65,8	76,3	86,9	103	117	128	148	158	180	205
COP	(3)	kW/kW	4,49	4,48	4,43	4,51	4,52	4,44	4,41	4,59	4,62	4,68	4,63	4,60
HEATING ONLY (EN14511 VALUE)														
Total heating capacity	(2)(3)	kW	206	256	293	346	394	461	515	590	688	740	834	944
COP	(2)(3)	kW/kW	4,42	4,40	4,33	4,42	4,44	4,35	4,35	4,54	4,55	4,62	4,56	4,52
COOLING WITH TOTAL HEAT RECOVERY														
Cooling capacity	(4)	kW	162	201	229	272	311	362	404	468	547	589	662	748
Total power input	(4)	kW	45,7	56,9	65,8	76,3	86,9	103	117	128	148	158	180	205
Recovery heat exchanger capacity	(4)	kW	205	255	291	344	393	459	514	589	686	738	831	941
TER		kW/kW	8,05	8,01	7,91	8,08	8,10	7,94	7,88	8,24	8,31	8,43	8,32	8,26
SEASONAL EFFICIENCY IN HEATING (EN14825 VALUE)														
PDesign	(5)	kW	249	309	353	418	-	-	-	-	-	-	-	-
SCOP	(5)		5,59	5,56	5,18	5,45	-	-	-	-	-	-	-	-
Performance ηs (Reg. 811/2013 UE)	(5)	%	216	214	199	210	-	-	-	-	-	-	-	-
Seasonal efficiency class			-	-	-	-	-	-	-	-	-	-	-	-
(Regulation (UE) 811/2013)	(5)													
PDesign	(6)	kW	220	274	315	368	-	-	-	-	-	-	-	-
SCOP	(6)		4,33	4,46	3,97	4,26	-	-	-	-	-	-	-	-
Performance ηs (Reg. 811/2013 UE)	(6)	%	165	170	151	162	-	-	-	-	-	-	-	-
Seasonal efficiency class			-	-	-	-	-	-	-	-	-	-	-	-
(Regulation (UE) 811/2013)	(6)													
EXCHANGERS														
HEAT EXCHANGER USER SIDE IN REFRIGERATION														
Water flow	(1)	m³/h	9,06	11,20	12,82	15,20	17,38	20,28	22,37	25,92	30,29	32,82	36,50	41,61
Pressure drop	(1)	kPa	27,6	34,9	46,8	40,4	36,5	47,1	27,2	25,5	34,8	29,0	35,9	46,7
HEAT EXCHANGER SOURCE SIDE IN REFRIGERATION														
Water flow	(1)	m³/h	3,34	4,14	4,73	5,61	6,41	7,49	8,28	9,52	11,13	12,05	13,42	15,29
Pressure drop	(1)	kPa	3,76	4,78	6,38	5,50	4,98	6,42	3,73	3,44	4,70	3,92	4,85	6,31
HEAT EXCHANGER SOURCE SIDE IN HEATING														
Water flow	(3)	m³/h	9,91	12,30	14,06	16,61	18,96	22,17	24,79	28,41	33,12	35,60	40,13	45,40
Pressure drop	(3)	kPa	33,1	42,1	56,3	48,3	43,5	56,3	33,4	30,7	41,6	34,2	43,4	55,6
HEAT EXCHANGER USER SIDE IN HEATING														
Water flow	(4)	m³/h	5,55	6,88	7,83	9,31	10,63	12,37	13,80	16,00	18,67	20,14	22,63	25,57
Pressure drop	(4)	kPa	10,4	13,2	17,5	15,2	13,7	17,5	10,4	9,72	13,2	10,9	13,8	17,6
COMPRESSORS														
Compressors nr.		N°	2	2	2	2	2	2	2	2	2	2	2	2
No. Circuits		N°	2	2	2	2	2	2	2	2	2	2	2	2
NOISE LEVEL														
Noise Pressure	(7)	dB(A)	62	63	65	65	65	65	65	66	67	67	67	67
Sound power level in cooling	(8)(9)	dB(A)	94	95	97	97	97	97	97	98	99	99	99	99
Sound power level in heating	(8)(10)	dB(A)	94	95	97	97	0	0	0	0	0	0	0	0
SIZE AND WEIGHT														
Length	(11)	mm	3680	3680	3680	3680	3680	3680	3800	3800	3800	5000	5000	5000
Width	(11)	mm	1170	1170	1170	1170	1170	1170	1490	1490	1490	1490	1490	1490
Height	(11)	mm	1950	1950	1950	1950	1950	1950	1950	1950	1950	2050	2050	2050
Operating weight	(11)	kg	2420	2470	2880	3580	3690	3750	4920	5310	5730	6470	6590	7370

Notes

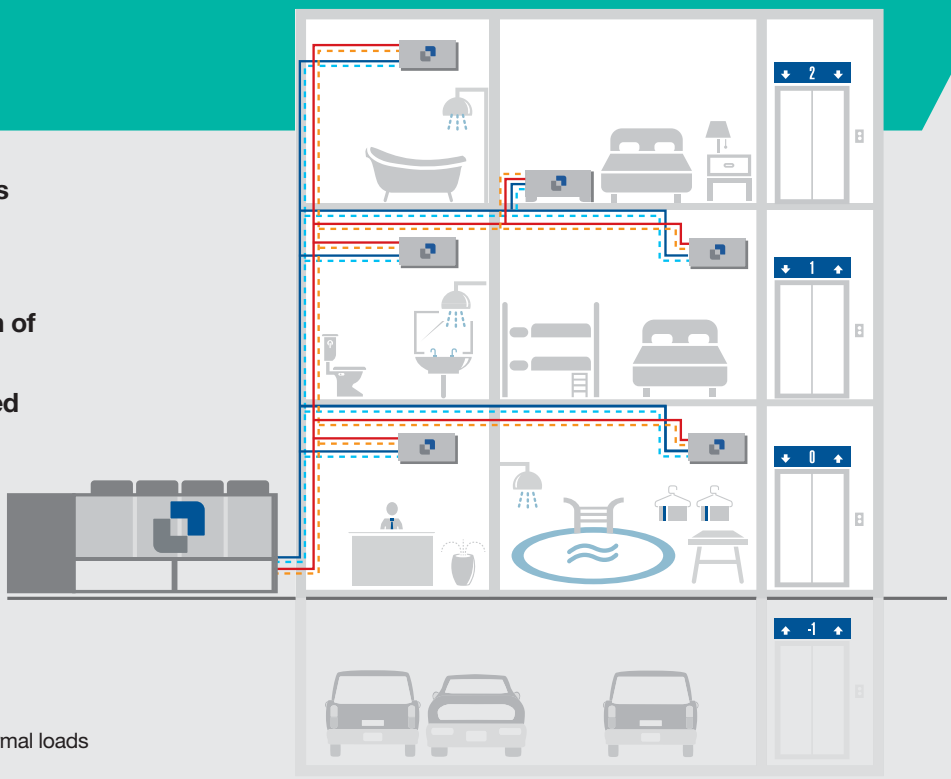
1 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Source (side) heat exchanger air (in) 35°C.
2 Values in compliance with EN14511-3:2011.
3 Plant (side) heat exchanger water (in/out) 40°C/45°C; Source (side) heat exchanger air (in) 7°C - 87% R.H.
4 Plant (side) cooling exchanger water (in/out) 12°C/7°C; Plant (side) heat exchanger water (in/out) 40°C/45°C.
5 Seasonal space heating energy efficiency class LOW TEMPERATURE in AVERAGE climate conditions [REGULATION (UE) N. 811/2013]
6 Average sound pressure level at 10m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level.
7 Sound power on the basis of measurements made in compliance with ISO 9614.
8 Sound power level in cooling, outdoors.
9 Sound power level in heating, outdoors.
10 Unit in standard configuration/execution, without optional accessories

The units highlighted in this publication contain HFC R134a [GWP$_{100}$ 1430] fluorinated greenhouse gases.

INTEGRA

COMFORT APPLICATIONS

- **Auto adaptability to variable loads**
- **Highest efficiency in all load conditions**
- **Plant simplification and reduction of technical spaces**
- **A gas network is no longer needed**
- **Smart management of thermal energy**



Ideal for:

- Mixed-use buildings
- Residential applications
- Environments with complex and variable thermal loads
- Areas with large glass surfaces

To cool and simultaneously heat mixed-use environments is a frequent trend in the building and constructions segment. In these cases, the use of a smart INTEGRA-Y heat pumps is key for producing hot and cold water simultaneously and independently, matching any kind of load combinations whilst ensuring optimal comfort and highest energy efficiency all year long.

IT COOLING

- **Two in one unit**
- **Smart management of thermal energy**
- **Zero kW/h wasted**

Ideal for:

- IT Rooms with offices connected
- Multifunctional spaces in combination with other Climaveneta units

INTEGRA-Y heat pumps are ideal solutions for mixed-use buildings featuring variable thermal and cooling capacities.

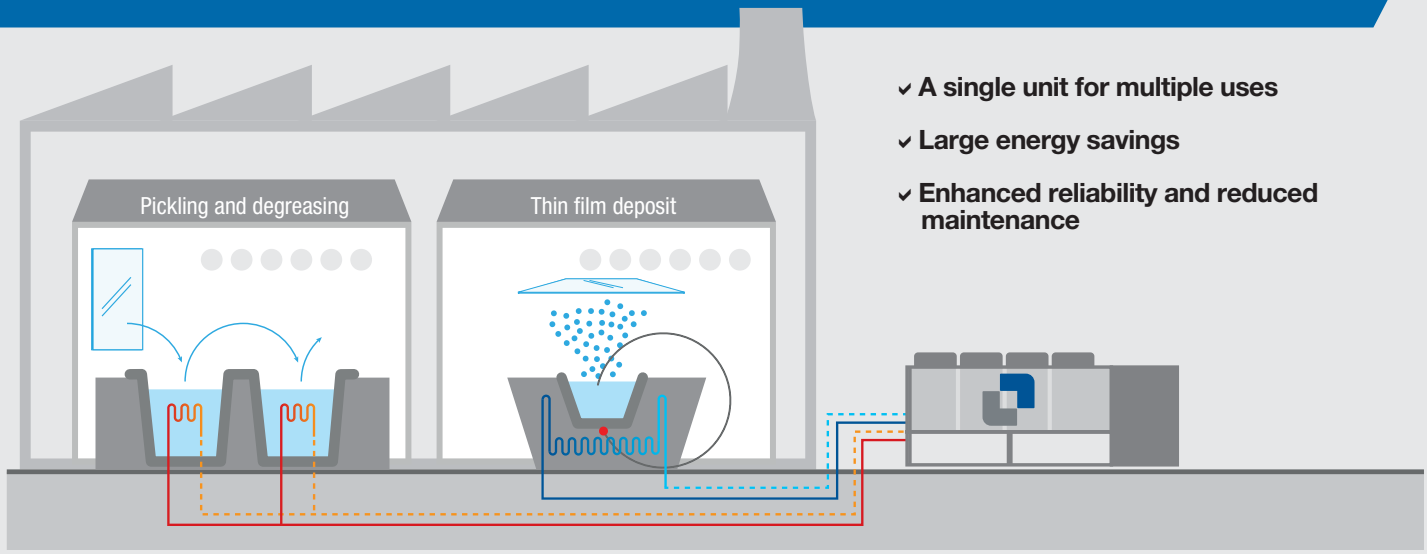
In a typical IT Cooling application with a data center located within an office building, INTEGRA-Y heat pumps are the perfect solution to recover the thermal energy of IT equipment and transfer it to other office areas nearby.

The thermal energy can therefore be reused, turning it into a precious economic asset.

A forward-looking system that combines perfect comfort with zero energy waste, improving the energy class of the building and providing large annual energy savings.

THE VERSATILE AND MULTI-FUNCTIONAL HEAT PUMP FOR ALL APPLICATIONS

INDUSTRIAL PROCESS



- **A single unit for multiple uses**
- **Large energy savings**
- **Enhanced reliability and reduced maintenance**

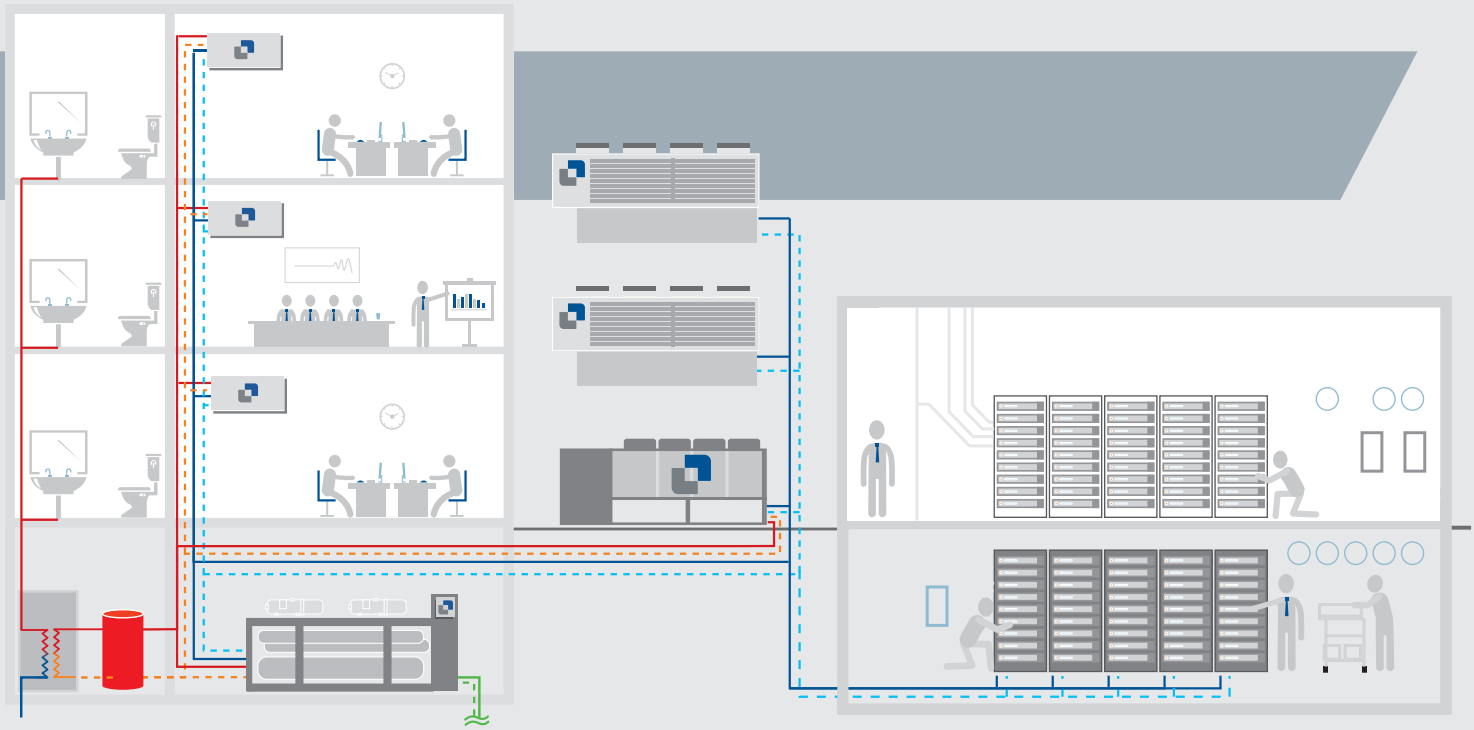
Most industrial applications are characterized by processes requiring simultaneous and variable heating and cooling. The capacity of INTEGRA-Y to manage and efficiently balance both hot and cold loads allows you to respond to all the process requirements and those of the office spaces nearby, by means of one single heat pump.

The diagram above shows a typical industrial application of thin film deposit on surfaces, in particular in the process of mirror manufacturing. This process requires thermal energy during clean-up and preparation of the surfaces to be treated and cooling energy in the thin film deposition step.

INTEGRA-Y is the ideal solution to meet both thermal demands, all by itself. All these advantages can be achieved without the installation of an auxiliary plant and with the guarantee of premium efficiency all year long.

Ideal for:

- Industrial processes that require cooling and heating
- Industrial complexes that need to be air-conditioned and that have adjacent offices



+2P MODULE

An integrated module for the independent production of high temperature water (up to 78°C). From 70 to 279 kW

78° HEATING

PATENTS PENDING

+2P it is the innovative solution for the production of high temperature water (up to 78 °C). Designed as a fully integrated module, +2P is installed inside the unit for support and grants efficiencies without compromise. The multipurpose heat pump with integrated +2P module is therefore able to satisfy, independently and simultaneously, 3 different thermal requirements at 3 different temperatures, without limiting operational flexibility.
Thanks to +2P, other supplementary sources will no longer be necessary for the production of high temperature water

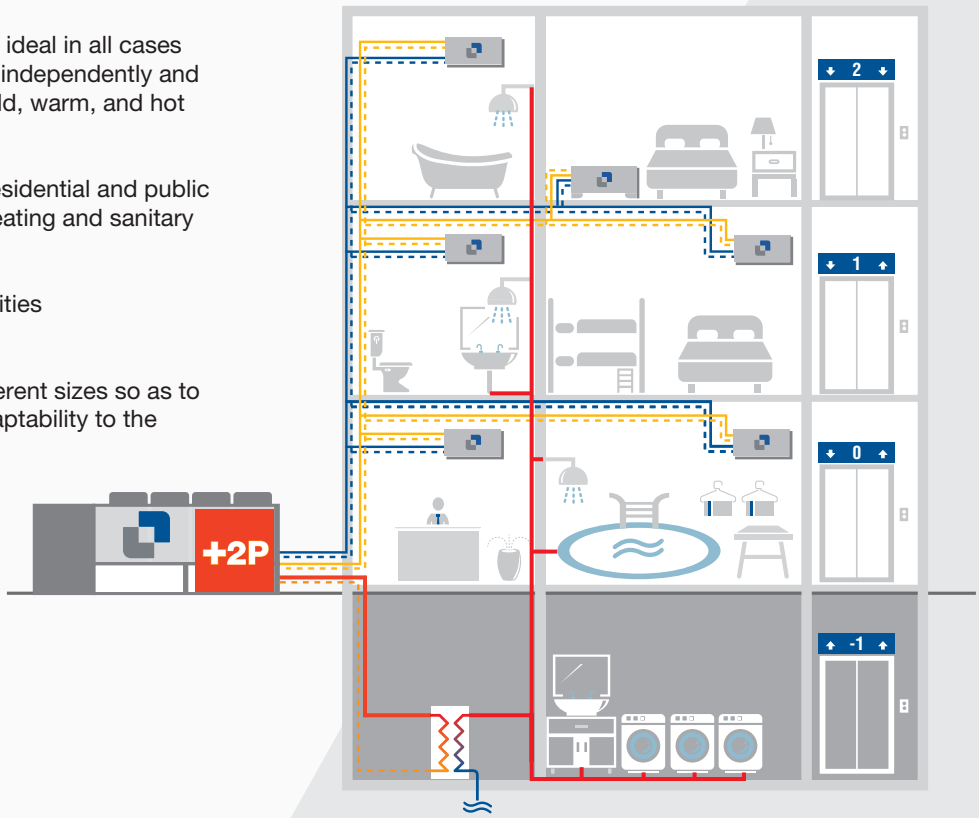
The INTEGRA-Y +2P solution is ideal in all cases where there is the need to achieve independently and simultaneously 3 thermic loads (cold, warm, and hot water):

- Centralized HVAC systems for residential and public buildings that require cooling, heating and sanitary hot water
- Hospitals/ Healthcare centres
- Hotels with laundry and spa facilities
- Industrial processes

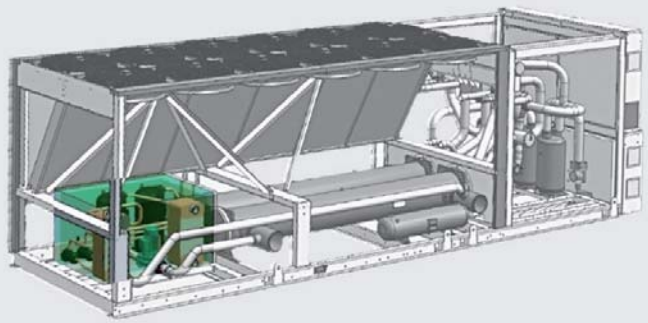
The +2P module is available in different sizes so as to ensure maximum flexibility and adaptability to the different installation requirements.

12/7 °C
40/45 °C
70/78 °C

Full independence of thermal flows



+2P MODULE **is a two-circuit solution that ensures absolute reliability in operation and continuity of service.**



INTEGRA-Y ERACS2-Q/SL-CA 3222 with +2P	COP +2P 200 kW	COP +2P 285 kW
Cold 12-7°C Very Hot 65-75°C External air temperature 30°C	3,79	4,08
Hot 40-45°C Very hot 65-75°C External air temperature 7°C	2,34	2,43
Cold 12-7°C Hot 40-45°C Very hot 65-75°C	4,83	4,83
VERY HOT only 65-75°C External air temperature 7°C	1,83	1,95

Efficiency values of the +2P module are calculated considering the 200kW size and the 285kW size, combined with a INTEGRA-Y unit ERACS2Q/SL-CA (size 3222, nominal cooling capacity = 790kW, nominal thermal capacity= 815 kW)

CASE STUDY:
RETROFIT OF AN EXISTING PLANT

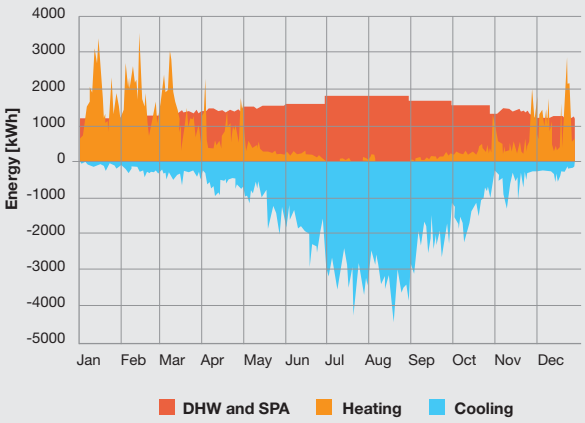
INTEGRA-Y and +2P, module, together to improve system performance and increase efficiency.

PROJECT

Renewal of the thermal plant of an historic building converted into a hotel in the central coastal area of the Mediterranean Sea.

	Set	Current	Retrofit
Cooling	12/7°C	Air cooled chiller	INTEGRA +2P MODULE
Heating	40/45°C	Gas Boiler	
DHW and SPA	60/65°C		

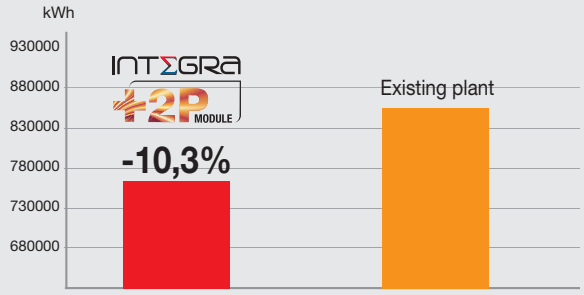
Termal Loads



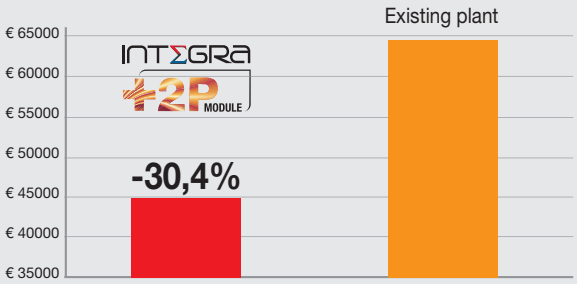
RESULTS

The use of integrated + 2P module allows you to achieve, with a single unit, 3 different thermal requirements, providing enhanced efficiencies and reduced costs with respect to the current plant, with annual savings of 30.4% and a reduction of 10.3% of primary energy consumption.

Primary energy consumption



Annual operating costs



Terms

Seasonal efficiency of gas boiler 85%
Fuel cost 0,77 €/lt

Cost of Electricity Production 0,12 €/kWh_el
Efficiency Electricity 46%

AT A GLANCE

Primary Energy Consumption	Annual cost	Annual CO_2 emissions
-10,3%	-30,4%	-42,4%

EXPERIENCE IS BY FAR THE BEST PROOF”

Sir Francis Bacon
British philosopher (1561-1626)

MEDACTA SA

2017 Castel S. Pietro (Switzerland)

Application: Industrial Process
Plant type: Hydronic System
Cooling capacity: 839 kW
Heating capacity: 422 kW
Installed machines:
1x ERACS2-Q/SL-CA 1962,
1x FX-FC/NG/SL-T 1902

ICR LODI

2017 Lodi (Italy)

Application: Industrial Process
Plant type: Hydronic System
Cooling capacity: 597 kW
Installed machines:
1x ERACS2-Q SL CA 2622

SKF ARGENTINA

2014 Tortuguitas (Argentina)

Application: Tools e machinary
Cooling capacity: 1042 kW
Heating capacity: 1056 kW
Installed machines:
2x NECS-Q 1816,
2x AX 26 Close control Units,
9x WIZARD

Every project is characterized by different usage conditions and system specifications for many different latitudes. All these projects share high energy efficiency, maximum integration, and total reliability due to the unique experience of Climaveneta branded solutions.

AVIO COLLEFERRO

2014 - Rome (Italy)

Application: Industrial technology
Plant type: Hydronic System
Cooling capacity: 966 kW
Heating capacity: 984 kW
Installed machines:
2x ERACS2-Q 2022 CA,
1x MANAGER 3000 VPF,
6x WIZARD 1220-16580

HUSQWARNA MOTORCYCLES CASSINETTA DI BIANDRONNO

2009 Varese (Italy)

Application: Automotive
Plant type: Hydronic System
Cooling capacity: 380 kW
Heating capacity: 396 kW
Installed machines:
1x ERACS-Q/LT 1762

NUCLEAR POWER PLANT EMBALSE

2015-2016 Cordoba (Argentina)

Application: Energy
Plant type: Hydronic System
Cooling capacity: 449 kW
Heating capacity: 476 kW
Installed machines:
1x ERACS2-Q 1762,
1x NECS-Q/SL 302

INTEGRA-Y_ENG_01-2018

CLIMAVENETA®

eco Changes for a greener tomorrow

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.

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i-FX-Q2 /XL-CA /0502

Software version: ELCA World 1.1.1.0
Database version: 1.1.0.0
User: Chris Tomlins
Print data: 26/11/2018 11:19

Code		i-FX-Q2 /XL-CA /0502
Version		XL-CA
Size		0502
UNIT DESCRIPTION		INTEGRA unit for 4-pipe systems, air source, VSD screw compressors and EC fans, for outdoor installation
Power supply	V/ph/Hz	400/3/50

PERFORMANCE AT DESIGNED CONDITIONS

RUNNING CONDITIONS

CHILLED WATER HEAT EX. USER SIDE

Fluid inlet temperature (cooling mode)	°C	13.00
Fluid outlet temperature (cooling mode)	°C	7.00
Fluid type		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.018

WARM WATER HEAT EX. USER SIDE

Fluid inlet temperature (heating mode)	°C	38.00
Fluid outlet temperature (heating mode)	°C	45.00
Fluid		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.018

OUTDOOR CONDITION

Air temperature (cooling mode)	°C	25.0
Air temperature (heating mode)	°C	4.0

COOLING (EN 14511)

Cooling capacity	kW	497.1
Compressors power input	kW	113.9
Fans power input (cooling mode)	kW	6.00
Total power input	kW	120.9
EER	kW/kW	4.110
ESEER EN 14511 (referiment)	kW/kW	4.930

REFRIGERAZIONE CON RECUPERO (EN14511)

Cooling capacity	kW	460.2
Recovery heat exchanger capacity	kW	584.6
Total power input	kW	132.2
TER	kW/kW	7.902

HEATING (EN14511)

Total heating capacity	kW	379.5
Compressors power input (heating mode)	kW	114
Fan power input (heating mode)	kW	7.00
Total power input	kW	120.5
COP	kW/kW	3.150

SCOP

SCOP Official (Reg. 813/2013 EU)

LOW TEMPERATURE

Type climate		Average
Temperature application	°C	35
Type flow		Fixed
Type Temperature		Variable
Bivalent temperature	°C	-7.0
PDesign	kW	316
Qhe	kWh	154305
SCOP		4.23
Performance ηs	%	166

The performance shown are obtained from theoretical calculations and tolerances will apply.
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LOW TEMPERATURE

Seasonal efficiency class	-

PART LOAD DATA

COOLING PARTIAL LOADS

Load	%	100.0	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0
Outdoor air temperature	°C	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Cooling load	kWh	497	447	398	348	298	249	199	149	99	50
Fans power input (cooling mode)	kW	6.00	6.00	6.00	5.77	5.22	5.00	5.00	5.00	2.44	1.34
Total power input	kW	121.0	104.3	87.50	72.30	59.10	47.40	37.40	29.60	20.00	11.00
Temp. evaporator inlet	°C	13.00	12.40	11.80	11.20	10.60	10.01	9.41	8.81	8.24	8.24
Temp. evaporator outlet	°C	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Evaporator water flow	l/s	19.86	19.86	19.86	19.86	19.86	19.86	19.86	19.86	19.86	19.86
EER	kW/kW	4.110	4.290	4.540	4.810	5.040	5.250	5.320	5.040	4.970	4.510

HEATING PART LOAD

Load	%	100.0	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0
Outdoor air temp.	°C	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Heating load	kWh	380	342	304	266	228	190	152	114	76	38
Total power input	kW	120.4	108.9	97.40	85.80	74.30	62.00	49.70	37.40	24.80	13.90
Condenser input temperature	°C	38.00	38.70	39.40	40.10	40.80	41.50	42.20	42.90	43.29	43.29
Condenser output temperature	°C	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
Condenser fluid flow	l/s	14.08	14.08	14.08	14.08	14.08	14.08	14.08	14.08	14.08	14.08
COP	kW/kW	3.150	3.140	3.120	3.090	3.070	3.060	3.060	3.050	3.050	2.730

PART LOAD DATA INTEGRA

Refrigeration load	%	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0	100.0
Heating load	%	100.0	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0	0.0
Air temp.	°C	4.0	6.1	8.2	10.3	12.4	14.5	16.6	18.7	20.8	22.9	25.0
Cooling capacity	kW	0.000	49.70	99.40	149.1	198.8	248.6	298.3	348.0	397.7	447.4	497.1
Heating capacity	kW	379.5	341.5	303.6	265.6	227.7	189.7	151.8	113.8	75.90	37.90	0.000
Total power input	kW	120.4	96.40	79.20	65.50	58.10	60.70	64.50	70.80	80.10	98.40	121.0
TER	kW/kW	3.150	4.060	5.090	6.330	7.340	7.220	6.980	6.520	5.910	4.930	4.110

EXCHANGERS

CHILLED WATER HEAT EX. USER SIDE

Typology		SHELL&TUBE
Quantity	N°	1
Fluid type		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.018
Type of connections		FLEXIBLE JOINT
Diameter of connections		6"
Min flow	l/s	11.11
Max flow	l/s	33.33
K pressure drop		5.79
Water content	l	220

COOLING

Fluid inlet temperature (cooling mode)	°C	13.00
Fluid outlet temperature (cooling mode)	°C	7.00
Water flow	l/s	19.86
Pressure drop	kPa	29.6
Available unit's head	kPa	0.00

COOLING + HEAT REC.

Water flow	l/s	18.47
Pressure drop	kPa	25.6

i-FX-Q2 /XL-CA /0502

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WARM WATER HEAT EX. USER SIDE

Typology		SHELL&TUBE
Quantity	N°	1
Fluid		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.018
Type of connections		FLEXIBLE JOINT
Diameter of connections		6"
Min flow	l/s	10.97
Max flow	l/s	39.58
K pressure drop		3.55
Water content	l	216

HEATING

Fluid inlet temperature (heating mode)	°C	38.00
Fluid outlet temperature (heating mode)	°C	45.00
Water flow	l/s	14.08
Pressure drop	kPa	9.12
Available unit's head	kPa	0.00

FANS

Fans type		EC FAN
Fans number	N°	10
Fans power input	kW	0.60
F.L.I.	kW	1.780
F.L.A.	A	3

COOLING

Fans number	N°	10
Fans power input	kW	0.60
Air flow	m³/s	39.12
Available static pressure	Pa	0

HEATING

Quantity	N°	10
Fans power input	kW	0.70
Air flow	m³/s	41.76
Static pressure	Pa	0

COMPRESSORS

Compressor type		SCREW
Compressors nr.	N°	2
No. Circuits	N°	2
Refrigerant		R134a
Number of capacity steps	N°	0
Min. capacity step	%	
Regulation		STEPLESS
Oil charge	kg	36.0
Refrigerant charge	kg	230
F.L.I. - Max absorbed power	kW	2x92
F.L.A. - Max absorbed current	A	2x152
L.R.A. - Locked rotor amperes for single compressor	A	1x20+1x20

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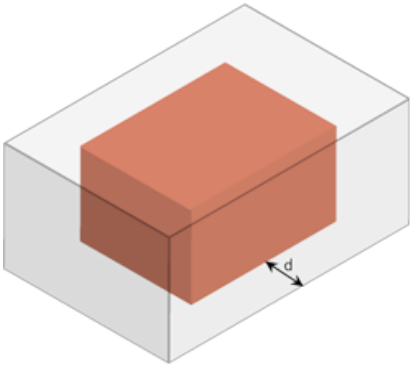
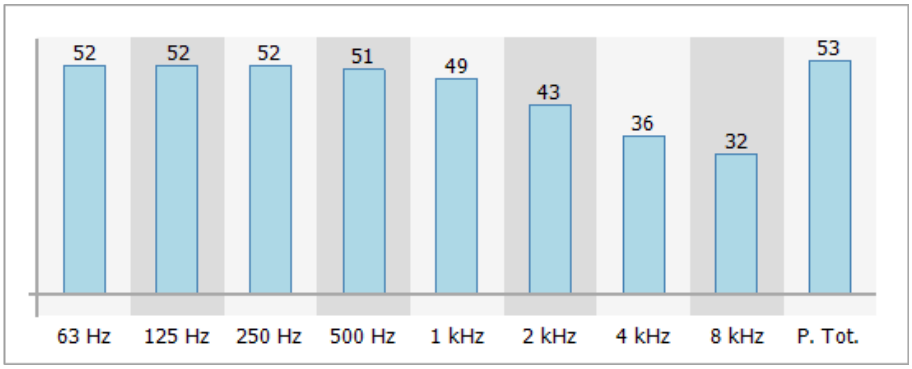
R HFC R-134a | EC FAN | HEATING | SCREW

NOISE DATA

SOUND DATA COLD

Frequencies	Hz	63	125	250	500	1000	2000	4000	8000	Tot (A)
Sound power (spectrum)	dB	85	85	85	84	82	76	69	65	86
Sound pressure level (spectrum)	dB	52	52	52	51	49	43	36	32	53





SOUND DATA OUTDOOR HOT

Sound power level in heating	dB(A)	87

Note

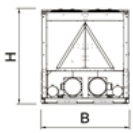
Distance	m	10
Note		Average sound pressure level at 10 m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level. Sound power on the basis of measurements made in compliance with ISO 9614.

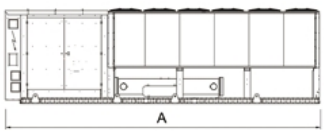
ELECTRICAL DATA

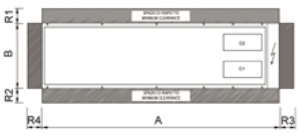
Power supply	V/ph/Hz	400/3/50
F.L.I. - Max absorbed power	kW	202.0
F.L.A. - Max absorbed current	A	333
S.A. - Inrush current	A	-

WEIGHT & DIMENSIONS

A	mm	8150
B	mm	2260
H	mm	2530
Operating weight	kg	8800
R1	mm	2000
R2	mm	2000
R3	mm	1500
R4	mm	1500







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Rpt.version: 1.0.3.0

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TECHNICAL DOCUMENTATION - REGULATION (EU) No 813/2013 - Heat pumps for space heating

i-FX-Q2 /XL-CA /0502			
Air-to-water heat pump:	yes / no		yes
Water-to-water heat pump:	yes / no		no
Brine-to-water heat pump:	yes / no		no
Low-temperature heat pump:	yes / no		yes
With supplementary heater:	yes / no		no
Mixed unit with heat pump:	yes / no		no
Temperature application (1)	(low 35°C/ medium 55°C)		low 35°C
Water flow rate	fixed / variable		fixed
Outlet temperature	fixed / variable		variable
Parameters are declared for average/warmer/colder climate conditions (1)	average / warmer / colder		average
Rated heat output at Tdesignh	**Prated = Pdesignh**	**[kW]**	**316**
Seasonal space heating energy efficiency	**ηs**	**[%]**	**166**
Seasonal space heating energy efficiency class	**-**	**-**	
Declared capacity for heating for part load at indoor temperature 20 °C and outdoor temperature Tj			
Declared capacity for heating with outdoor temperature Tj = – 7 °C	Pdh	[kW]	280
Declared capacity for heating with outdoor temperature Tj = +2 °C	Pdh	[kW]	170
Declared capacity for heating with outdoor temperature Tj = +7 °C	Pdh	[kW]	117
Declared capacity for heating with outdoor temperature Tj = +12 °C	Pdh	[kW]	136
Declared capacity for heating with outdoor temperature Tj = Bivalent temperature	Pdh	[kW]	280
Declared capacity for heating with outdoor temperature Tj = Operation limit temperature	Pdh	[kW]	265
For air-to-water heat pumps: Tj = – 15 °C (if TOL < – 20 °C)	Pdh	[kW]	-
Bivalent temperature	Tbiv	[°C]	-7
Degradation coefficient	Cdh	-	0.90
Declared coefficient of performance or primary energy ratio for part load at indoor temperature 20 °C and outdoor temperature Tj			
Declared coefficient of performance with outdoor temperature Tj = – 7 °C	COPd	-	3.00
Declared coefficient of performance with outdoor temperature Tj = +2 °C	COPd	-	4.00
Declared coefficient of performance with outdoor temperature Tj = +7 °C	COPd	-	5.65
Declared coefficient of performance with outdoor temperature Tj = +12 °C	COPd	-	6.78
Declared coefficient of performance with outdoor temperature Tj = Bivalent temperature	COPd	-	3.00
Declared coefficient of performance with outdoor temperature Tj = Operation limit temperature	COPd	-	2.82
For air-to-water heat pumps: Tj = – 15 °C (if TOL < – 20 °C)	COPd	-	-
For air-to-water HP : Operation limit temperature	TOL	[°C]	-10
Heating water operating limit temperature	WTOL	[°C]	50
Power consumption in modes other than active mode			
Off mode	POFF	[kW]	0.000
Thermostat-off mode	PTO	[kW]	0.896
Standby mode	PSB	[kW]	0.216
Crankcase heater mode	PCK	[kW]	0.200
Supplementary heater			
Nominal heating capacity	Psup	[kW]	51.5
Other items			
Capacity control	fixed / variable		variable
Sound power level, indoors	LWA	[dB(A)]	-
Sound power level, outdoors	LWA	[dB(A)]	87
Annual electricity consumption for heating	QHE	[kWh]	154305
Outdoor heat exchanger			
For air-to-water HP: Rated air flow rate, outdoors	Qairsource	[m³/h]	41.76
For water-/brine-to-water heat pumps: Rated brine or water flow rate, outdoor heat exchanger	Qwater/brine source	[m³/h]	-

(1) The parameters are declared for application at medium temperature, except in the case of low temperature heat pumps. For low temperature heat pumps, the parameters are declared for application at low temperature.

NOTE: Techical data referred to selected unit.

TX-W /3A00

Software version: ELCA World 1.1.1.0
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DR code: 94.3

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COOLING CENTRIFUGAL R HFC R-134a

Code		TX-W /3A00
Version		
Size		3A00
UNIT DESCRIPTION		High efficiency water cooled chiller
Power supply	V/ph/Hz	400/3/50

PERFORMANCE AT DESIGNED CONDITIONS

RUNNING CONDITIONS

HEAT EXCHANGER USER SIDE

Fluid inlet temperature (cooling mode)	°C	13.00
Fluid outlet temperature (cooling mode)	°C	7.00
Fluid type		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.018

HEAT EXCHANGER SOURCE SIDE

Fluid inlet temperature (cooling mode)	°C	30.00
Fluid outlet temperature (cooling mode)	°C	35.00
Fluid		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.000

COOLING (EN 14511)

Capacity control	%	94.3
Cooling capacity	kW	1000
Compressors power input	kW	191.3
Total power input	kW	196.5
EER	kW/kW	5.090
ESEER EN 14511 (referiment)	kW/kW	8.160
Cooling energy class		A
Note		*Unit selected at DIFFERENT compressor speed rotation from nominal one.

COOLING MODE (EN14511) - MAX PERFORMANCE

Cooling capacity	kW	1060
Compressors power input	kW	210.2
Total power input	kW	216.3
EER	kW/kW	4.900

SEER

SEER Official (Reg. EU 2016/2281)

Fan coil (12/7) - Cooling tower (30/35)

Type climate		Average
Temp. Plant side		Fan coil (12/7)
Temp. Source side		Cooling tower (30/35)
Type flow		Fixed
Type Temperature		Variable
Prated,c	kW	732
T Design		35.00
Qce		49180.84
SEER		8.93
Performance ηs	%	349

TX-W /3A00

Software version: ELCA World 1.1.1.0
Database version: 1.1.0.0
User: Chris Tomlins
Print data: 26/11/2018 11:49
DR code: 94.3

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COOLING CENTRIFUGAL R HFC R-134a

EFFICIENCIES

ESEER (EN 14511 VALUE)

Load	%	100	75	50	25
Temp. evaporator inlet	°C	12.00	10.75	9.51	8.26
Temp. evaporator outlet	°C	7.00	7.00	7.00	7.00
Evaporator water flow	l/s	47.92	47.92	47.92	47.92
Condenser input temperature	°C	30.00	26.00	22.00	18.00
Condenser output temperature	°C	35.00	29.60	24.33	19.14
Condenser fluid flow	l/s	56.88	56.87	56.87	56.87
Cooling capacity	kW	999.1	749.3	499.5	249.8
Total power input	kW	197.7	113.0	58.10	25.00
EER	kW/kW	5.050	6.630	8.600	9.990
ESEER EN14511 CALCULATED	kW/kW		8.160		
ESEER	kW/kW		8.770		

PART LOAD DATA

COOLING PARTIAL LOADS

Load	%	100.0	90.0	80.0	70.0	60.0	50.0	40.0	30.0	20.0	10.0
Temp. evaporator inlet	°C	13.00	12.40	11.80	11.20	10.60	10.00	9.40	8.81	8.21	7.70
Temp. evaporator outlet	°C	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Evaporator water flow	l/s	39.94	39.94	39.94	39.94	39.94	39.94	39.94	39.94	39.94	39.94
Pressure drop	kPa	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9	27.9
Condenser input temperature	°C	30.00	30.55	31.07	31.57	32.06	32.55	33.04	33.53	34.02	34.42
Condenser output temperature	°C	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Condenser fluid flow	l/s	56.86	56.86	56.86	56.87	56.87	56.86	56.86	56.86	56.86	56.86
Pressure drop	kPa	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1	38.1
Cooling load	kWh	1000	900	800	700	600	500	400	300	200	100
Total power input	kW	196.5	165.1	140.6	120.4	103.0	86.40	69.80	53.20	37.00	22.60
EER	kW/kW	5.090	5.450	5.690	5.810	5.820	5.790	5.730	5.640	5.400	4.420

EXCHANGERS

HEAT EXCHANGER USER SIDE

Typology		FLOODED
Quantity	N°	1
Fluid type		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.018
Type of connections		VICTAULIC
Diameter of connections		8"
Min flow	l/s	27.22
Max flow	l/s	61.94
K pressure drop		1.35
Water content	l	200

COOLING

Fluid inlet temperature (cooling mode)	°C	13.00
Fluid outlet temperature (cooling mode)	°C	7.00
Water flow	l/s	39.94
Pressure drop	kPa	28.1
Available unit's head	kPa	0.00

TX-W /3A00

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COOLING CENTRIFUGAL R HFC R-134a

HEAT EXCHANGER SOURCE SIDE

Typology		FLOODED
Quantity	N°	1
Fluid		WATER
Glycol	%	0
Fouling factor	m²K/kW	0.000
Type of connections		VICTAULIC
Diameter of connections		8"
Min flow	l/s	30.00
Max flow	l/s	75.00
K pressure drop		0.91
Water content	l	265

COOLING

Fluid inlet temperature (cooling mode)	°C	30.00
Fluid outlet temperature (cooling mode)	°C	35.00
Water flow	l/s	56.87
Pressure drop	kPa	38.5
Available unit's head	kPa	0.00

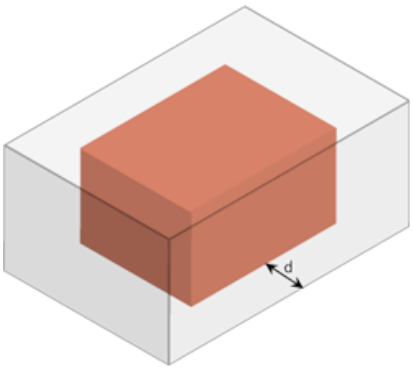
COMPRESSORS

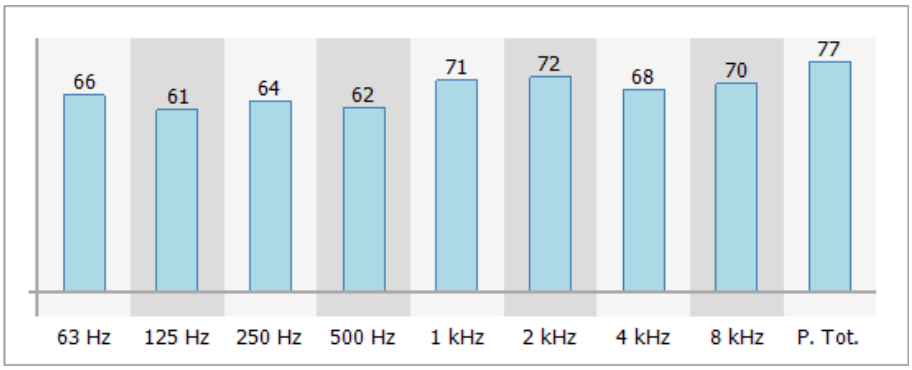
Compressor type		CENTRIFUGAL
Compressors nr.	N°	3
No. Circuits	N°	1
Refrigerant		R134a
Number of capacity steps	N°	0
Min. capacity step	%	
Regulation		STEPLESS
Oil charge	kg	0.00
Refrigerant charge	kg	565
F.L.I. - Max absorbed power	kW	3x102
F.L.A. - Max absorbed current	A	3x160
L.R.A. - Locked rotor amperes for single compressor	A	n.a.

NOISE DATA

SOUND DATA COLD

Frequencies	Hz	63	125	250	500	1000	2000	4000	8000	Tot (A)
Sound power (spectrum)	dB	85	80	83	81	90	91	87	89	96
Sound pressure level (spectrum)	dB	66	61	64	62	71	72	68	70	77





The performance shown are obtained from theoretical calculations and tolerances will apply.
Rpt.version: 1.0.3.0

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TX-W /3A00

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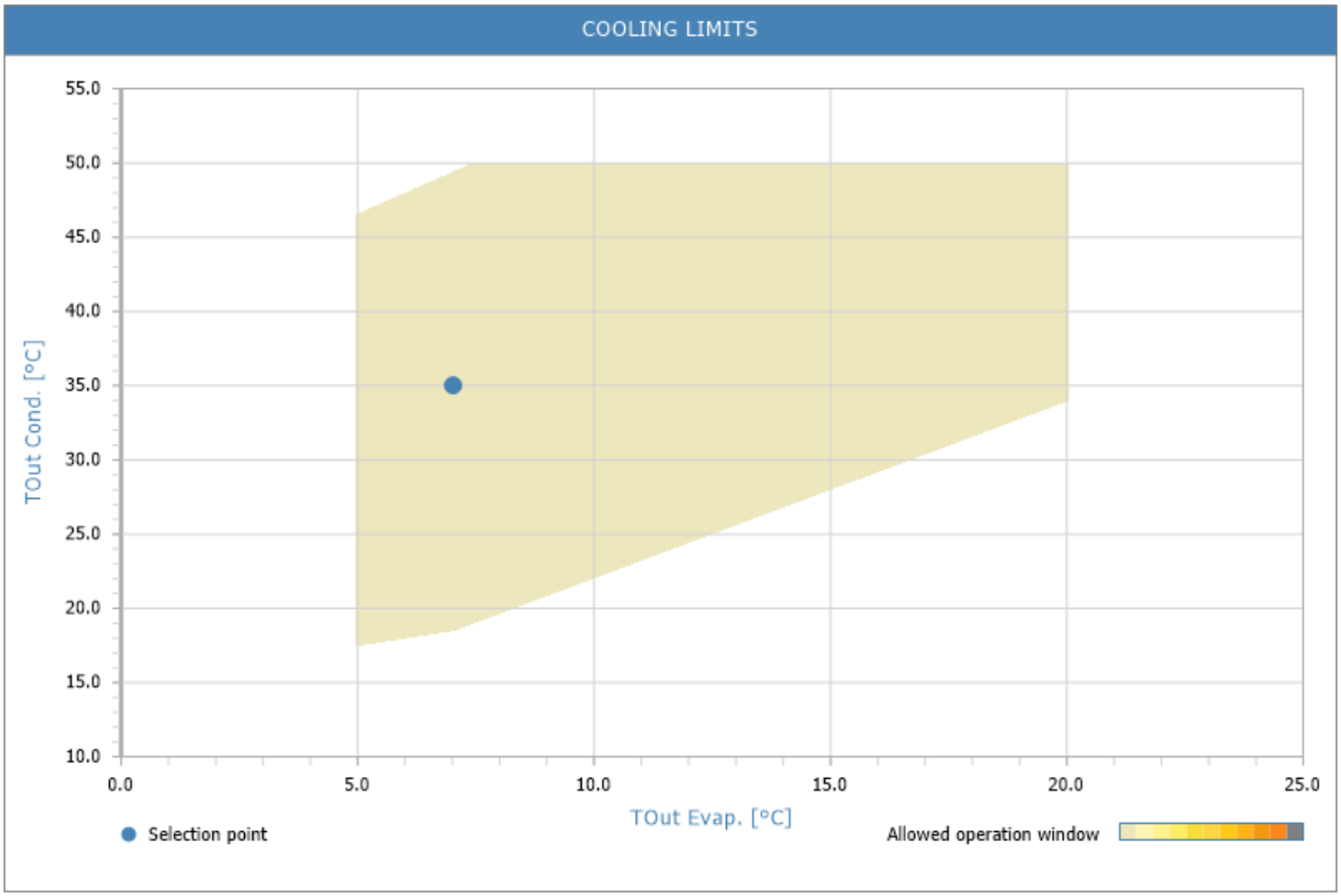
COOLING CENTRIFUGAL R HFC R-134a

Note

Distance	m	1
Note		Average sound pressure level at 1 m distance, unit in a free field on a reflective surface; non-binding value calculated from the sound power level. Sound power on the basis of measurements made in compliance with ISO 9614.

OPERATING LIMITS



ELECTRICAL DATA

Power supply	V/ph/Hz	400/3/50
F.L.I. - Max absorbed power	kW	306.0
F.L.A. - Max absorbed current	A	480
S.A. - Inrush current	A	-

TX-W /3A00

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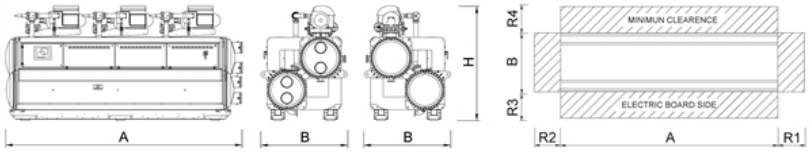
COOLING CENTRIFUGAL R HFC R-134a

WEIGHT & DIMENSIONS

A	mm	3710
B	mm	1710
H	mm	2260
Operating weight	kg	7440
R1	mm	1000
R2	mm	3000
R3	mm	1500
R4	mm	1000



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Rpt.version: 1.0.3.0

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APPENDIX 5 – MONITORING ROLE CORRESPONDENCE

Harry Popplewell

From: Riccardo Zara
Sent: 18 May 2020 10:23
To: Elias, Laura @ London HH; Philip Kite
Cc: Christian Riley; Alex Groot
Subject: RE: Case 4925 5 Kingdom Street Post Stage I Energy comments [Set 4]

Hi Laura,

It seems that all projects in London will require a 3 years post construction monitoring role. We'll be happy to do that, we just need to define the details of the scope with British Land, but I think the GLA will ask for it for all new commercial developments.

Kind regards
Riccardo Zara
Associate Engineer

D +447977514095
riccardo.zara@ramboll.co.uk

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From: Elias, Laura @ London HH <Laura.Elias@cbre.com>
Sent: 18 May 2020 10:18
To: Riccardo Zara <Riccardo.Zara@ramboll.co.uk>; Philip Kite <Philip.Kite@ramboll.co.uk>
Cc: Christian Riley <C.Riley@m3c.co.uk>; Alex Groot <A.Groot@m3c.co.uk>
Subject: FW: Case 4925 5 Kingdom Street Post Stage I Energy comments [Set 4]

Hi both

GLA are just following up on their energy colleague's previous comments – see below.

The district heating point is sorted as WCC confirmed in its committee report. The monitoring I think needs to be considered – can you let me know your thoughts.

Thanks

Laura Elias MRTPI | Associate Director
UK Development - Planning | CBRE Ltd
M +44 7590 485288

From: Ian Yenney <Ian.Yenney@london.gov.uk>
Sent: 24 October 2019 15:18
To: Ben Stroud <Ben.Stroud@london.gov.uk>; Justine Mahanga <Justine.Mahanga@london.gov.uk>
Cc: Ioanna Mytilinaiou <Ioanna.Mytilinaiou@london.gov.uk>; Julian Boss <julian.Boss@london.gov.uk>; Anne-Marie Robinson <Anne-Marie.Robinson@london.gov.uk>; Philip Exton <Philip.Exton@london.gov.uk>
Subject: Case 4925 5 Kingdom Street Post Stage I Energy comments [Set 4]

Hi Justine
Please see the latest set of post stage I energy comments for Case 4925 5 kingdom street below. Our response to the recent submission is in blue text. Minor progress has been made and they are nearly there.
11. The applicant has carried out an investigation and there are no existing or planned district heating networks within the vicinity of the proposed development. However, they should make contact with Westminster City council

APPENDIX 6 - 5KS GLA CARBON EMISSION CALCULATIONS

Refer to attached spreadsheets