Hurley Palmer Flatt

Energy Statement

Pope's Road

Brixton, London

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Prepared by:	James Viet Do	**Date:**	12th December 2019
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APPENDICES

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1 Executive Summary

HDR | Hurley Palmer Flatt has been instructed to provide an Energy Statement for the proposed Pope's Road development, located within the London Borough of Lambeth. The approach taken for the energy assessment is in line with GLA London Plan planning policies for energy, applicable for referable development where building energy statement is submitted post 1st January 2019.

Demolition of the existing building and erection of a part G + 19, part G + 8 storey building comprising flexible A1/A3/B1/D1/D2 uses at basement, ground and first floor, with restaurant (A3) use on floor 8 and B1 accommodation on floors 2 to 19, with plant enclosures at roof level, and associated cycle parking, servicing and all necessary enabling works.

The London Borough of Lambeth requires all developments to demonstrate energy efficiency through design by following the GLA Hierarchy – 'Be Lean', 'Be Clean', and 'Be Green'. The proposed development will aspire to meet the intent of policy by delivering a minimum on-site carbon dioxide emissions reduction of 35% over Part L2A 2013 (and a 15% reduction at the 'Be Lean' stage), based on the approach, information, analysis and contents reported in this document.

In line with the new guidance from GLA, the energy statement for the development will assess carbon savings using the new carbon emission factors (SAP10). Cooling mitigation strategies will be evaluated to avoid overheating risk within building spaces.

Figure 1 below shows the carbon savings for each step in the GLAs suggested hierarchy for carbon savings. The site total regulated energy savings have been modelled at number%

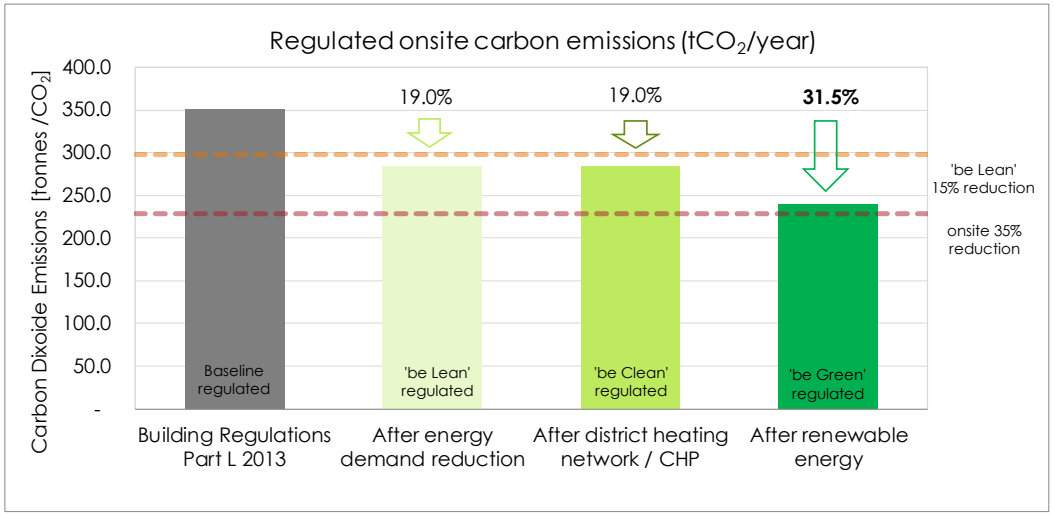


Figure 1: Carbon emission reduction following GLA energy hierarchy (Regulated energy).

Table 1: Summary of total carbon dioxide emissions for each stage of the hierarchy

	Carbon Dioxide Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Building Regulations Part L 2013 (TER)	350.7	286.6	637.3
Be Lean - Local Gas Boilers	284.0	286.6	570.6
Be Clean	284.0	286.6	570.6
Be Green – Heat Pumps	240.2	286.6	526.8

Table 2: Summary of carbon dioxide emissions savings for each stage of the hierarchy

Savings from:	Regulated carbon dioxide savings	
	Tonnes CO_2 per annum	(%)
Be Lean - Local Gas Boilers	66.7	19.0%
Be Clean	0.0	0.0%
Be Green – Heat Pumps	43.8	12.5%
Total cumulative savings	**110.5**	**31.5%**

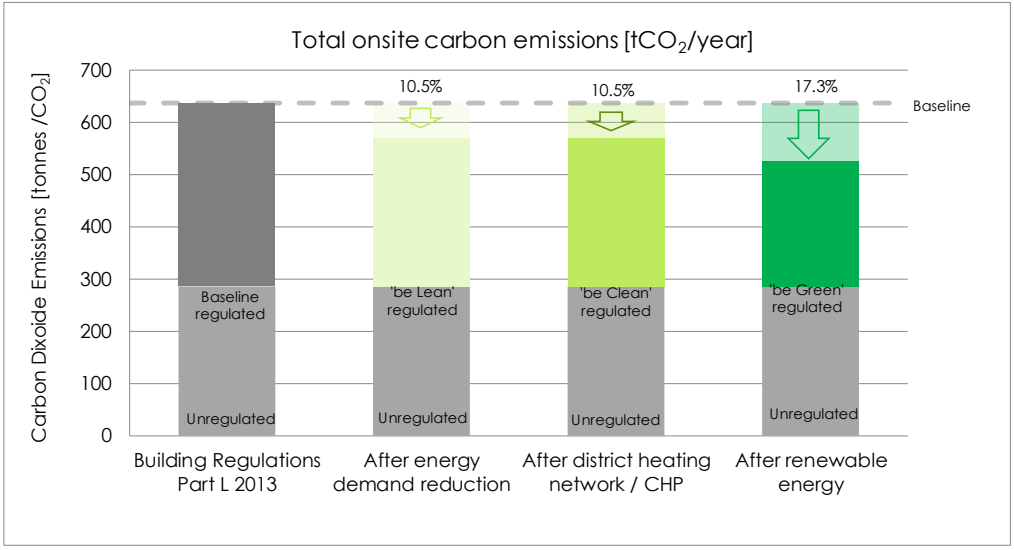


Figure 2: Overall site carbon emission reduction following GLA energy hierarchy (Regulated and unregulated energy).

2 Introduction

HDR | Hurley Palmer Flatt has been instructed to provide an Energy Statement for the proposed Pope's Road development, located within the London Borough of Lambeth. The report details the assessment process and the estimated CO_2 savings achieved through integration of passive design, energy efficiency measures and Low and Zero Carbon (LZC) technology. It also sets out how the Greater London Authority (GLA) London Plan and Lambeth Council policies on energy and CO_2 emissions have been addressed.

The approach taken for the energy assessment is in line with GLA London Plan planning policies for energy as follows:

- Calculate baseline CO_2 emissions;
- Integrate measures to reduce energy demand and ensure efficient use of energy;
- Connect to a heat distribution network where possible
- Integrate renewable energy technology; and
- Calculate total CO_2 savings and final development CO_2 emissions.

2.1 Project Background

Demolition of the existing building and erection of a part G + 19, part G + 8 storey building comprising flexible A1/A3/B1/D1/D2 uses at basement, ground and first floor, with restaurant (A3) use on floor 8 and B1 accommodation on floors 2 to 19, with plant enclosures at roof level, and associated cycle parking, servicing and all necessary enabling works.

Figure 3: CGI photo of the proposed development in Pope's Road

Figure 4: Pope's Road Development Site Location

The calculations in this Energy Statement are based on the drawings from Adjaye Associates Architects dated 25th February 2020.

Table 3: Schedule of areas based on GIA

Zone	Net Internal Area (GIA) m^2
Retail (A1)/Restaurant (A3)	2,373
Office (B1)	25,980
Gym (D1/D2)	647
Total	**29,300**

*The figures reported above have been taken from the Popes Road crib sheet dated 10th March 2020.

3 Planning Policy and Building Regulation Targets

The development has been designed to meet sustainability and energy targets which are driven through:

1. UK Building Regulations:

   Part L2A – Conservation of fuel and power in new buildings other than dwellings;

2. Greater London Authority (GLA): London Plan (March 2016) with reference to London Plan 2019 intend to publish version (Policy SI2), GLA Energy Assessment Guidance (October 2018); and

3. The London Borough of Lambeth: Local Plan 2015, Policy EN4 and the draft revised Lambeth Local Plan 2020

3.1 Building Regulation Part L Summary

The development will comply with building regulation Part L 2013 (Conservation of fuel and power in buildings).

a. Part L2A – Conservation of fuel and power in new buildings other than dwellings

Criterion 1 – Achieving the TER
Criterion 1 of L2A 2013 requires the calculated CO_2 Building Emission Rate (BER) to not exceed the Target CO_2 Emission Rate (TER) of the notional building, which is determined by Part L and NCM guidelines.

Criterion 2 – Limits on Design Flexibility
The performance of the individual fabric elements and fixed building services of the building should achieve reasonable overall standards of efficiency as per the requirements of Part L.

Criterion 3 – Limiting the Effects of Solar Gains in Summer
The purpose of Criterion 3 is to demonstrate the building has appropriate control measures to limit solar gain so as to reduce the need for, or capacity of, installed air conditioning systems.

Criterion 4 - Building performance consistent with the BER
This criterion is the responsibility of the Contractor

Criterion 5 - Provisions for energy efficient operation of the building
This criterion is the responsibility of the Contractor

3.2 Greater London Authority (GLA) London Plan

The Greater London Authority (GLA) has set out guidance relating to sustainable design within the London Plan (Spatial Development Strategy for Greater London). The current adopted London plan is dated March 2016, however in January 2019 policy 5.2 has been updated.

Policy 5.2 Minimising carbon dioxide emissions

Current Planning decisions

A. Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

   1) Be Lean: use less energy

   2) Be Clean: supply energy efficiently

   3) Be Green: use renewable energy

B. The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum

improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

Non-Domestic Buildings: - Year Improvement on 2013 Building Regulations

- 2010 – 2013 | 25 per cent
- 2013 – 2016 | 35 per cent
- 2016 – 2019 | As per building regulations requirements
- 2019 – 2031 | Zero carbon

C. Major development proposals should include a detailed energy assessment to demonstrate how the targets for carbon dioxide emissions reduction outlined above are to be met within the framework of the energy hierarchy.

D. As a minimum, energy assessments should include the following details:

1) calculation of the energy demand and carbon dioxide emissions covered by the Building Regulations and, separately, the energy demand and carbon dioxide emissions from any other part of the development, including plant or equipment, that are not covered by the Building Regulations (see paragraph 5.22) at each stage of the energy hierarchy

2) proposals to reduce carbon dioxide emissions through the energy efficient design of the site, buildings and services

3) proposals to further reduce carbon dioxide emissions through the use of decentralised energy where feasible, such as district heating and cooling and combined heat and power (CHP)

4) proposals to further reduce carbon dioxide emissions through the use of on-site renewable energy technologies.

E. The carbon dioxide reduction targets should be met on-site. Where it is clearly demonstrated that the specific targets cannot be fully achieved on-site, any shortfall may be provided off-site or through a cash in lieu contribution to the relevant borough to be ring fenced to secure delivery of carbon dioxide savings elsewhere.

UPDATES January 2019.
The latest version of the guidance contains a number of updates, including:

- From January 2019, planning applicants are encouraged to use updated (SAP 10) carbon emission factors to assess the expected carbon performance of a new development. Applicants should continue to use the current Building Regulations methodology for estimating energy performance against Part L 2013 requirements (as outlined in Section 6) but with the outputs manually converted for the SAP 10 emission factors. A spreadsheet (version 1.1) has been developed for this purpose which should be submitted alongside an energy assessment. It should be noted that the use of the SAP 10 emission factors in this context is for demonstrating performance against planning policy targets and, as such, is separate to Building Regulation compliance. Applications should therefore ensure that compliance with Building Regulations is maintained.
- Reference is made to the latest CIBSE TM59 overheating guidance which should be used for all residential planning applications
- Updated information requirements for applicants proposing to install heat pumps and CHP, including clarification on when CHP is appropriate.
- An appendix containing the existing emission limits for heating and energy plant has been added.

Targets to be achieved:

- 15% beyond Part L 2013 at 'be lean' level of the hierarchy
- 35% carbon emissions beyond Part L 2013 onsite savings
- Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided through a cash-in-lieu contribution to the relevant borough's carbon offset fund, and/or through off-site contribution where an alternative proposal is identified and delivery is certain.

Policy 5.6 Decentralised energy in development proposals
Planning decisions

A. Development proposals should evaluate the feasibility of Combined Heat and Power (CHP) systems, and where a new CHP system is appropriate also examine opportunities to extend the system beyond the site boundary to adjacent sites.

B. Major development proposals should select energy systems in accordance with the following hierarchy:

1) Connection to existing heating or cooling networks
2) Site wide CHP network
3) Communal heating and cooling

C. Potential opportunities to meet the first priority in this hierarchy are outlined in the London Heat Map tool. Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 Renewable energy
Strategic

A. The Mayor seeks to increase the proportion of energy generated from renewable sources and expects that the projections for installed renewable energy capacity outlined in the Climate Change Mitigation and Energy Strategy and in supplementary planning guidance will be achieved in London.

Planning decisions

B. Within the framework of the energy hierarchy (see Policy 5.2), major development proposals should provide a reduction in expected carbon dioxide emissions through the use of on-site renewable energy generation, where feasible.

Policy 5.9 Overheating and cooling
Strategic

A. The Mayor seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change and the urban heat island effect on an area wide basis.

Planning decisions

B. Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

1) Minimise internal heat generation through energy efficient design

2) Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls

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

4) Passive ventilation

5) Mechanical ventilation

6) Active cooling systems (ensuring they are the lowest carbon options).

C. Major development proposals should demonstrate how the design, materials, construction and operation of the development would minimise overheating and also meet its cooling needs. New development in London should also be designed to avoid the need for energy intensive air conditioning systems as much as possible. Further details and guidance regarding overheating and cooling are outlined in the London Climate Change Adaptation Strategy.

London Plan 2019 intend to publish version policies

Policy SI3 Energy infrastructure

A. Boroughs and developers should engage at an early stage with relevant energy companies and bodies to establish the future energy requirements and infrastructure arising from large-scale development proposals such as Opportunity Areas, Town Centres, other growth areas or clusters of significant new development.

B. Energy masterplans should be developed for large-scale development locations which establish the most effective energy supply options. Energy masterplans should identify:

1) major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)

2) heat loads from existing buildings that can be connected to future phases of a heat network

3) major heat supply plant

4) possible opportunities to utilise energy from waste

5) secondary heat sources

6) opportunities for low temperature heat networks

7) possible land for energy centres and/or energy storage

8) possible heating and cooling network routes

9) opportunities for futureproofing utility infrastructure networks to minimise the impact from road works

10) infrastructure and land requirements for electricity and gas supplies

11) implementation options for delivering feasible projects, considering issues of procurement, funding and risk, and the role of the public sector

C. Development Plans should:

1) identify the need for, and suitable sites for, any necessary energy infrastructure requirements including upgrades to existing infrastructure

2) identify existing heating and cooling networks and opportunities for expanding existing networks and establishing new networks.

D. Major development proposals within Heat Network Priority Areas should have a communal heating system

1) the heat source for the communal heating system should be selected in accordance with the following heating hierarchy:

a. connect to local existing or planned heat networks

b. use available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)

c. generate clean heat and/or power from zero-emission sources

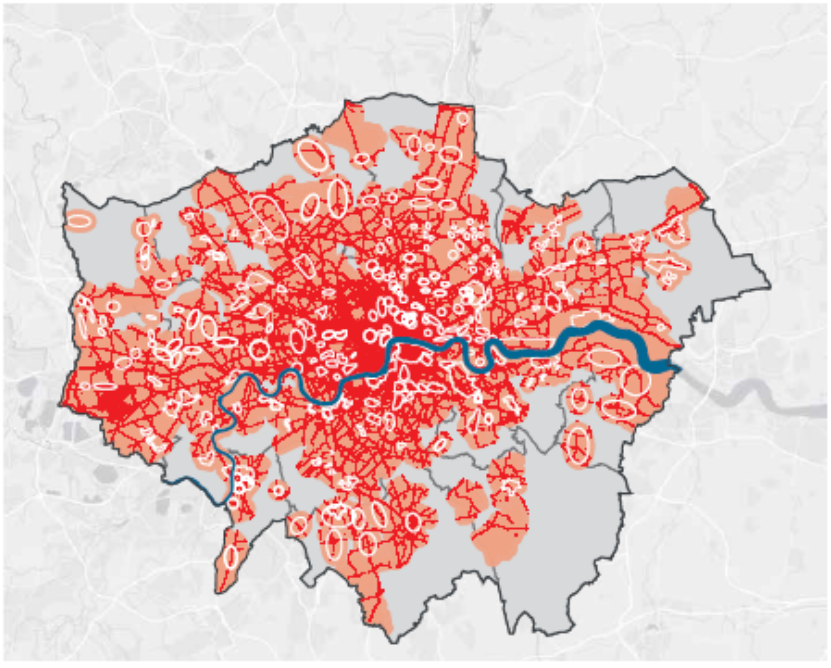
d. use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)

e. use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)

f. use ultra-low NOx gas boilers.

2) CHP and ultra-low NOx gas boiler communal or district heating systems should be designed to ensure that there is no significant impact on local air quality.

3) Where a heat network is planned but not yet in existence the development should be designed for connection at a later date.



Heat Network Priority Areas and Heat Density in London

Relative heat demand based on fuel use kWh/m²/year

Heat Network Priority Areas

Areas where legal air quality limits are exceeded

Local Authority Heat Network Studies

Source: GLA Environment

[1]

[1] Note: Existing district heating and cooling networks can be found here: https://www.london.gov.uk/what-we-do/environment/energy/london-heat-map/view-london-heat-map

Policy SI4 Managing heat risk

A. Development proposals should minimise internal heat gain and the impacts of the urban heat island through design, layout, orientation and materials.

B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:

   1) minimise internal heat generation through energy efficient design

   2) reduce the amount of heat entering a building through orientation, shading, albedo, fenestration, insulation and the provision of green roofs and walls

   3) manage the heat within the building through exposed internal thermal mass and high ceilings

   4) provide passive ventilation

   5) provide mechanical ventilation

   6) provide active cooling systems.

3.3 London Borough of Lambeth Policies

This section sets the strategic policies to be adopted by developments seeking planning permission. The borough requires all developments to demonstrate energy efficiency through design by following the GLA hierarchy – 'Be Lean', 'Be Clean' and 'Be Green'.

The core strategy sets out policies in Lambeth's Local Plan 2015 Policy EN4 which provides details on how the borough plans to address climate change through efficient building design and the use of low carbon/renewable technologies as well as the updated draft revised Lambeth Local Plan 2020.

Policy EN3 Decentralised energy

All major developments will be expected to connect to, and where appropriate extend, existing decentralised heating, ~~cooling or power~~ networks in the vicinity of the site, unless a feasibility assessment demonstrates that connection is not reasonably possible. Minor new-build developments should be designed to be able to connect wherever reasonably possible. Where networks do not currently exist, developments should make provision to connect to any planned future decentralised energy network in the vicinity of the site, having regard to opportunities identified ~~through~~ in Heat Network Priority Areas of the London Heat Map and area specific energy plans. Major development proposals that cannot immediately connect to an existing heating ~~or cooling~~ network should follow the heating and cooling hierarchies set out in London Plan policies SI3 (D) and SI4 (B) ~~evaluate the feasibility of combined heat and power (CHP) systems and, where appropriate, examine the feasibility of extending the system beyond the site boundary~~.

Policy EN4 Sustainable design and construction

a) Lambeth will follow the approach set out in London Plan policies SI1 Improving air quality, SI2 Minimising greenhouse gas emissions, SI4 Managing heat risk, SI5 C and E Water infrastructure.

b) All development, including construction of the public realm, highways and other physical infrastructure, will be required to meet high standards of sustainable design and construction feasible, relating to the scale, nature and form of the proposal.

c) ~~Proposals should demonstrate in a supporting statement that sustainable design standards are integral to the design, construction and operation of the development. Non-residential developments should also be accompanied by a pre-assessment, demonstrating how the following BREEAM standards, or any future replacement standards, will be met:~~

~~i) All new non-residential development and non-self-contained residential accommodation, should meet at least BREEAM 'Excellent' unless it is demonstrated that it is not technically feasible or viable to do so, in which case proposals should demonstrate a 'Very Good' rating with a minimum score of 63 per cent.~~

~~ii) All major non-residential refurbishment of existing buildings and conversions over 500m2 floorspace (gross) should meet at least BREEAM Non-Domestic Refurbishment 'Excellent' unless it is demonstrated that it is not technically feasible or viable to do so, in which case proposals should demonstrate a 'Very Good' rating with a minimum score of 63 per cent.~~

d) In addition to the requirements for zero-carbon in major new developments in London Plan policy SI2:

(i) All new non-residential development and non-self-contained residential accommodation, must meet at least BREEAM 'Excellent'.

(ii) All major non-residential refurbishment of existing buildings and conversions over 500m² floorspace (gross) must meet at least BREEAM Non-Domestic Refurbishment 'Excellent'.

(iii) Minor new-build residential developments of between one and nine units, including proposals that involve extensions or change of use to provide dwellings, must achieve a minimum on-site reduction in regulated carbon emissions of at least 19 per cent beyond Part L of the Building Regulations, unless it can be demonstrated that such provision is not feasible.

e) Proposals should demonstrate in a supporting statement that sustainable design standards are integral to the design, construction and operation of the development. New build residential development are encouraged to use the Home Quality Mark and Passivhaus design standards. Planning applications for non-residential developments should be accompanied by a pre-assessment, demonstrating how the BREEAM standards, or any future replacement standards, will be met.

f) ~~All non-residential development proposals should incorporate living roofs and walls where feasible and appropriate to the character and context of the development. Proposals should include a maintenance plan for the lifetime of the development.~~

g) ~~Non-residential development~~ Development will be required to be resilient to climate change by including appropriate climate change adaptation measures.

h) Adequate remedial treatment of any contaminated land will be required before development can commence.

4 Energy Hierarchy and Overheating

4.1 Carbon emission factors

The development is targeting a 35% on-site carbon emissions reduction over Part L2A 2013 (as well as a 15% reduction at the 'Be Lean' stage of the energy hierarchy). In line with the new guidance from GLA, the energy statement for the development will assess carbon savings using the new carbon emission factors (SAP10).

Table 4 below summarises the carbon emission factors published in Part L2A 2013 and the new carbon emissions factors (SAP10) used in GLA carbon emission reporting spreadsheet.

Table 4: Carbon Emissions Factors

Carbon Emissions Factors	Part L 2013	SAP10	Unit
Gas	0.216	0.210	$kgCO_2/kWh$
Grid Supplied Electricity	0.519	0.233	$kgCO_2/kWh$
Grid Displaced Electricity	0.519	0.233	$kgCO_2/kWh$

4.2 Establishing CO_2 Emissions

Table 5 Regulated carbon dioxide savings from each stage of the energy hierarchy for non-domestic buildings

Regulated non-domestic carbon dioxide savings	(Tonnes CO_2 per annum)	(%)
Be lean: Savings from energy demand reduction	66.7	19.0%
Be clean: Savings from heat network	0.0	0.0%
Be green: Savings from renewable energy	43.8	12.5%
Cumulative on-site savings	**110.5**	**31.5%**

The development achieves a 31.5% cumulative on-site savings on regulated carbon dioxide emissions, falling short of the 35% onsite target

4.3 Calculating Regulated CO_2 Emissions

The strategy considers a baseline, which has been defined for the commercial (non-residential) building on the site, as follows:

Commercial (non-residential) areas within the development have been modelled using Integrated Environmental Solutions (IES), Virtual Environment software 2018. This software creates a dynamic thermal model of the building, using ApacheSIM to calculate the building's loads, energy consumption and resulting CO_2 emissions. This software calculates the Building Emissions Rate (BER) and Target Emission Rate (TER) using the Building Regulations 2013 methodology based on the National Calculation Methodology (NCM).

4.3.1 Energy Models

IES calculates regulated energy consumption i.e. energy end-uses considered under Part L 2013, including heating, cooling, domestic hot water (DHW), and electricity for lighting, pumps and fans. Unregulated energy consumption includes all energy not covered by

Part L 2013 (e.g. gas for catering, small power, lifts and external lighting). An IES model was created for all non-residential spaces to dynamically simulate these areas and estimate the energy consumption and associated carbon emissions. An estimation of energy consumption has been calculated using the results from IES to provide a total development carbon footprint.

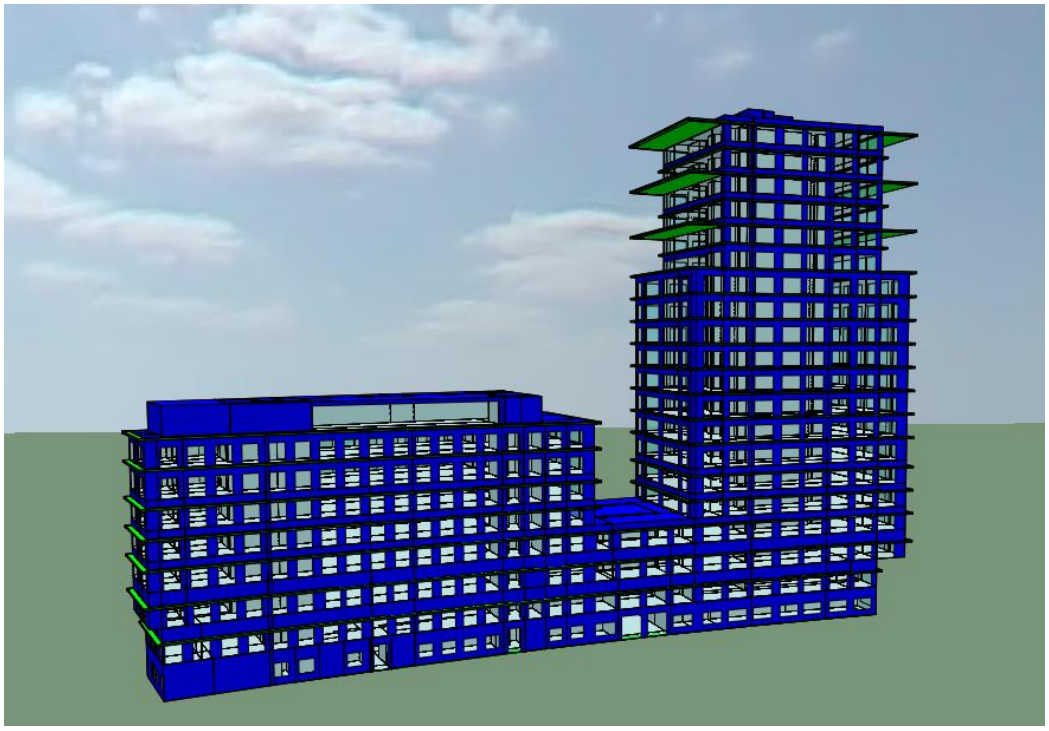


Figure 5: The IES thermal model of Pope's Road development

4.4 Baseline Energy Consumption and CO_2 Emissions

The tables below demonstrate the CO_2 emissions for Pope's Road

Table 6: CO_2 Emissions for the Baseline Scheme Overall Non-Domestic

BASELINE Pope's Road – Overall	Carbon dioxide emissions [tCO_2/yr]		Carbon dioxide emissions [% of total]	
	Regulated	Unregulated	Regulated	Unregulated
Baseline	350.7	287	55%	45%

The baseline CO_2 emissions are 350.7 **tCO_2** (regulated energy uses).

4.5 Demand Reduction (BE LEAN)

A key element of the energy strategy has been to maximise the energy efficiency of the building through passive design and efficient servicing. The measures included within the design are described in detail below.

4.5.1 Form and Façade

The form of Pope's Road development was optimised to utilise the site footprint and enhance accessibility to natural ventilation and passive solar gain. Glazing ratio and glazing types were considered so that passive solar gain was maximised on the south-facing façade in the winter. Building form consisting two blocks and recessed windows

were proposed creating shading and overshadowing which help minimise overheating risks.

4.5.2 Optimise Criteria

The design team has looked for opportunities within the design to reduce the heating and cooling loads within the building. Examples of where this has had an impact on the design include the following:

- Construction of high-performance insulated fabric and low air permeability. That includes the use of glazing with low thermal transfer parameter (U-value), high light transmittance maximising daylight potential, and adequate solar heat gain coefficient (g-value).
- Provision of high-efficacy lamps/luminaires and efficient lighting controls, maximising daylight usage and reducing loads on electrical lighting and cooling.

4.5.3 Building Fabric and Passive Design

The following table shows the U-values and air permeability of the proposed development.

Table 7: Target Fabric and Glazing Specifications

Element		Target and proposed Fabric Targets	
		Notional Building Values	Proposed Building u-value Targets
External Wall	U-value	0.26 W/m^2.K	0.18 W/m^2.K
Basement Wall	U-value	0.26 W/m^2.K	0.18 W/m^2.K
Ground Floor	U-value	0.22 W/m^2.K	0.15 W/m^2.K
Roof	U-value	0.18 W/m^2.K	0.12 W/m^2.K
Proposed Windows	U-value	1.60 W/m^2.K	1.40 W/m^2.K
	g-value	0.4	0.4
Air Permeability		10 m^3/m^2/hr @ 50Pa	3.5 m^3/m^2/hr @ 50
Thermal Bridging allowance		10% degradation of U-value	10% degradation of U-value

4.5.4 Energy Efficient Building Services

The following energy efficiency measures within the building services are proposed for the development:

- Lamps / luminaires to be specified with high efficacy of at least 100 lm/cW and above for office areas.
- Lighting to all other areas of the buildings will be highly efficient and incorporate efficient lighting controls (e.g. occupancy sensors) where applicable.

- Provision of efficient air source heat pumps for heating, domestic hot water, and cooling.
- Heat recovery on mechanical ventilation and air handling plant.
- Variable speed drives and sensors on pumps and fans responding to variable building loads.

Whilst these are the design standards currently targeted, their achievability will be reviewed through detailed design stages to ensure the overall CO_2 reduction targets are maintained, and to consider any design changes.

4.5.5 Be Lean Energy Consumption and CO_2 Emissions

The IES models have been run to calculate the resulting energy consumption and CO_2 emissions considering the passive design and energy efficiency measures detailed within the previous section.

Referring to the baseline scheme, the resulting CO_2 savings for the energy efficient scheme are detailed in the table below:

Table 8 CO_2 savings for the Site-wide Be Lean

'Be LEAN' Pope's Road – Overall Site Wide	Carbon Dioxide Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Emissions after demand reduction (tCO_2/yr)	284.0	287	570.6
Savings (tCO_2/yr)	66.7	0	66.7
Savings (%)	19.0%	0.0%	10.5%

The above table demonstrates that there is up to a **19% reduction in regulated CO_2** emissions over Part L2A 2013 for the development, which reduces to a 10.5% reduction when unregulated emissions are considered.

4.6 Cooling and Overheating

Supplementary Planning Guidance encourages developers to undertake dynamic modelling to assess the risk of overheating in their development. Such an assessment is generally an expectation of the GLA regarding Policy 5.9 'Overheating and Cooling' under climate change adaptation, as stated in GLA's energy planning guidance document dated March 2016.

Table 9: Overheating hierarchy

Overheating Hierarchy	
Minimising internal heat generation through energy efficient design:	Minimal infrastructure will be in place in the building
Reducing the amount of heat entering the building in summer	Maximising fabric and windows performance, in combination with shading (e.g. recessed windows) will reduce the solar gains entering the building.

Use of thermal mass and high ceilings to manage the heat within the building:	Optimising thermal mass of the building will allow increased heat in the summer to be absorbed during the warmer parts of the day and subsequently released in the evening. Increased floor-to-ceiling heights allow for warm air to rise to the ceiling and lower spaces which are occupied to remain cool in the summer.
Passive Ventilation	It is understood at this present time that windows are not openable.
Mechanical Ventilation	Localised Air Handling Units (AHUs) and Mechanical Ventilation with Heat Recovery (MVHR) are proposed to provide fresh air to all commercial and Office Space spaces.

Table 10 Reporting template for cooling demand

	Area weighted average non-domestic cooling demand (MJ/m^2)	Total area weighted non-domestic cooling demand (MJ/year)
Actual (Proposed)	475.4	13,377,565
Notional	1119.2	31,493,840

Some perimeter zones of the office areas exceed the solar gain limit (Criterion 3) without using any passive control measures as shown in the BRUKL in appendix A. Passive solar control measures (such as internal blinds) will be considered in those spaces as the design progresses.

An overheating risk analysis following CIBSE TM52 and TM49 guidance on overheating and future weather files study has been undertaken for this development. The results and recommendations of this study are summarised in Appendix B.

4.6.1 Connection to an area wide heat network

The district heating network in Lambeth does not currently reach this building and so connection to a district heat network was not included in the design.

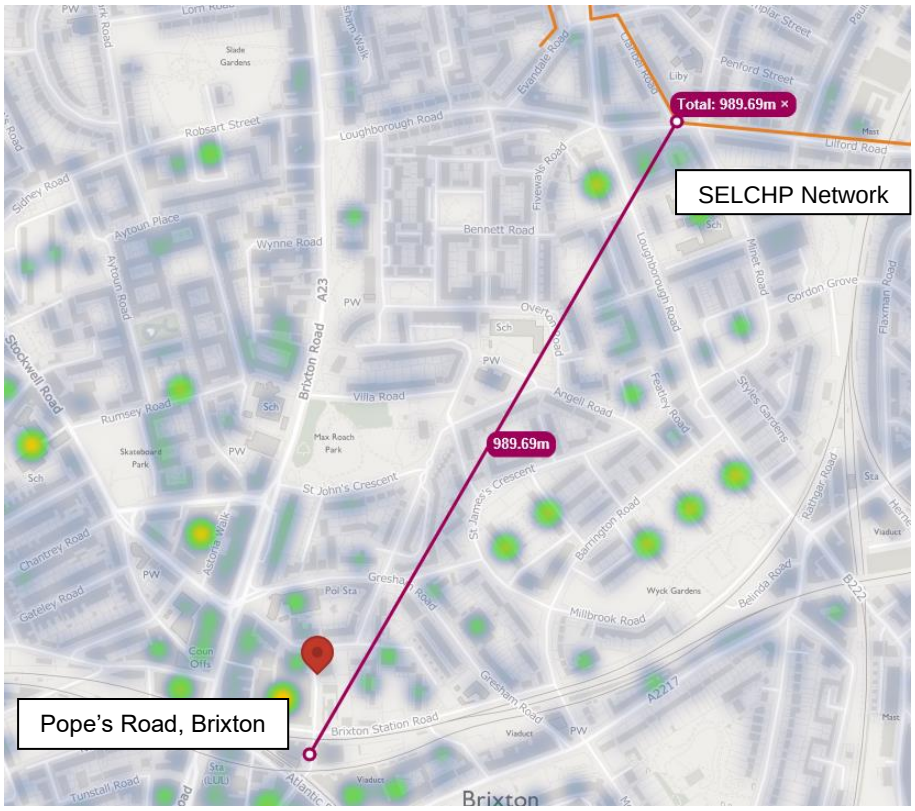


Figure 6: District Heat Network (DHN) Map showing potential network (SELCHP) within an approximate 990m to the proposed site

Table 11: District Heat Network Hierarchy

District Heat network Hierarchy	
Connect to local existing or planned heat networks	Unable to as closest existing network is approximately 1km away
Use available local secondary heat sources (in conjunction with heat pump, if required, and a lower temperature heating system)	There are no local secondary heat sources within the vicinity of the development to utilise
Generate clean heat and/or power from zero-emission sources	Most of the heat generated on site will be from electric heat pumps, the rest instantaneous hot water
Use fuel cells (if using natural gas in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)	Fuel cells are not included in this design.
Use low emission combined heat and power (CHP) (in areas where legal air quality limits are exceeded all development proposals must provide evidence to show that any emissions related to energy generation will be equivalent or lower than those of an ultra-low NOx gas boiler)	Combined heat and power is not currently proposed to be used in this development
Use ultra-low NOx gas boilers.	No boilers are included in the design

4.6.2 Communal Heating System

The proposed development is a single development and so it will not be possible to connect to a site wide communal heating system. It is proposed that the development will use a shared domestic hot water system with heating source from an air to water heat pumps.

4.6.3 Individual Space Heating System

The development is proposed to use efficient air to water heat pumps in office and Office Space blocks. This takes advantage of the lower carbon emissions of the electric grid as well as the efficiency of the heat pumps coefficient of performance (COP).

4.6.4 'Be Clean' Energy Consumption and CO_2 Emissions

There are no carbon savings associated with the 'Be Clean' level of the hierarchy because there is no connection to any potential district heating network. The savings from the heat pumps will be captured under the GREEN energy savings.

4.7 Renewable Energy (BE GREEN)

All Low or Zero Carbon (LZC) technologies identified within both the London Plan and BREEAM credit guidance have been assessed. Where technologies are not considered appropriate to the site and energy demand of the development, justification for their exclusion has been provided.

The following low or zero carbon technology (LZC) has been considered as viable for the site:

- Heat pumps

The following localised green technologies have been considered as non-viable for the site:

- Bio-fuel combined heat and power (CHP) local in the building
- Biomass (CHP) local in the building
- Fuel Cells
- Biofuel community heating scheme local in the building
- Wind turbines
- Photovoltaics (PV)

4.7.1 Feasibility of Renewable Technologies

An initial assessment has been carried out to determine which technologies are technically feasible on the site. For technologies which are identified as feasible, the following factors have been considered to determine which technologies are appropriate in terms of economic and local planning feasibility:

- Energy generated from each LZC energy source per year
- Payback
- Land Use
- Local Planning Criteria
- Noise

- Life cycle cost/lifecycle impact of the potential specification in terms of carbon emissions
- Any available grants

4.7.2 Solar PV Panels

Roof space is limited on this development. Most of the space facing south and west where there is no overshadowing will be reserved for plantroom. Therefore, solar PV panels have been deemed not viable for this development.

The table below summarises the desktop study undertaken to determine the feasibility of solar photovoltaic panels at the site:

Table 18: Key considerations of solar technology

Technology	Criteria	Requirement Met?
Photovoltaic panels		
Roof orientation	Are available roofs facing south-west to south-east (through south), or flat?	✓
Roof space	Is there enough un-shaded roof area?	X
Electrical demand	Is there electrical demand on site?	✓

4.7.3 Solar Thermal Panels

For the same reason stated in 4.7.2, solar thermal panels are discounted in this development. Roof space is limited and the possible benefit gaining from a solar thermal system will be minimal compared to the proposed heat pumps for domestic hot water.

Technology	Criteria	Requirement Met?
Solar Thermal		
Roof orientation	Are available roofs facing south-west to south-east (through south), or flat?	✓
Roof space	Is there enough un-shaded roof area?	X
Hot water demand	Is there year-round hot water demand?	✓
Heating system	Would a solar thermal collector be compatible with the proposed heating system?	X
Hot water storage	Is there space for a hot water storage vessel?	✓
Conflicts with other systems?	Will solar thermal conflict with other systems (e.g. PV) which are higher up the energy hierarchy?	X

4.7.4 Heat Pumps

The table below summarises the desktop study undertaken to determine the feasibility of heat pumps at the site. Air source heat pumps are proposed in the development for heating, cooling and domestic hot water. Other heat pump technologies are discounted as detailed in the table below.

Table 19: Key considerations of heat pump technology

Air Source Heat Pump		
Roof space	Is there available roof space for air-source heat pumps?	✓
Electrical Capacity	Is there enough electrical capacity for air-sourced heat pumps	✓

Technology	Criteria	Requirement Met?
Heat distribution system	Is it possible to have a low-grade distribution system e.g. under floor heating?	✓
Heat distribution system	Is it compatible with the proposed cooling system?	✓
Ground-source Heat Pump		
Ground conditions	Has a basic ground study concluded that the site is suitable for GSHP?	-
Horizontal piping	Is there a large area of open land where horizontal piping could be installed?	X
Vertical piping	Is the ground suitable for vertical piping? Can underground obstacles be avoided?	X
Plant room	Is there space allowed for a GSHP and associated auxiliary equipment?	X
Water-source Heat Pump (River or Lake)		
Resource	Is there an available water source close to the site?	X
Access	Can the available water source be accessed?	X

4.7.5 Wind Turbines

The table below summarises the desktop study undertaken to determine the feasibility of either roof mounted or standalone wind turbines at the site:

Table 12: Key considerations of wind technology

Technology	Criteria	Requirement Met?
Stand-alone Wind Turbine		
Wind speed	Is average wind speed greater than 6m/s at hub height?	-
Clear air flow to turbine	Is the area free from obstructions that could cause turbulence?	X
Open land around proposed site	Is there sufficient open land for a turbine to be installed?	X
Distance to nearest property	Are surrounding properties far away enough to avoid noise disturbance?	X

4.7.6 Biofuel Community Heating Scheme

Wood chips / pellets would require many deliveries and storage, not compatible with a city centre location. Liquid biofuel requires less storage space and has been considered in further detail by the design team.

The biodiesel is typically tested against EN14214 and supplied as pure Biodiesel at B100. Certain suppliers have plans to supply liquid biodiesel to sites around London via tanker. The tanker is anticipated to be sized to hold between 3,000 and 5,000 litres per delivery. Once delivered, the fuel would be pumped to a holding tank onsite, so the location of this tank would need to be accommodated which is not possible within this concentrated site.

The table below summarises the desktop study undertaken to determine the feasibility of a biofuel heating scheme at the site:

Table 13: Key considerations of biofuel technology

Technology	Criteria	Requirement Met?
Woody Biomass		
Heat demand	Is there a year-round heat demand?	X
Supply chain	Is there an established supply chain in the local area?	-
Delivery logistics	Is the site accessible for deliveries? Is there enough space for a supply vehicle to access a biomass storage tank?	X
Storage	Is there enough space for fuel storage to allow a reasonable number of deliveries?	X
Plant room	Is there enough space for a biofuel boiler and associated auxiliary equipment?	X
Flue	Can the flue be designed to meet planning authority requirements?	-
Liquid Biofuel		
Heat demand	Is there a year-round heat demand?	X
Supply chain	Is there an established supply chain in the local area? And can the required quantities of biofuel be guaranteed?	-
Security of supply	Is the future supply of biofuel guaranteed?	-
Delivery logistics	Is the site accessible for deliveries? Is there enough space for a supply vehicle to access a biofuel storage tank?	X
Storage	Is there enough space for fuel storage to allow a reasonable number of deliveries?	X
Running costs	Are the high running costs acceptable?	-

4.7.7 Biofuel Combined Heat and Power (CHP)

A CHP system has been analysed and is not recommended for the site as there is no constant hot water baseload demand.

The inclusion of a centralised heating plant will ensure that biofuel technology could be implemented in the future, if viability improves.

4.7.8 Fuel Cells

The primary fuel source for fuel cells is hydrogen. This can be obtained (using a reformer) from a wide range of fuel supplies including natural gas, coal gas, methanol, landfill gas and other fuels containing hydrogen.

Fuel cells produce zero emissions (at the point of use) when running on pure hydrogen. However most building applications to date have involved the use of carbon-based fuels

(primarily natural gas) requiring the use of a reformer. A consequence of the reforming process is the emission of carbon dioxide, although emissions are still lower than conventional combustion processes due to the higher operating efficiency of the fuel cell. The efficiencies of fuel-cell plants are in the range of 40 to 55% (electrical power generation) and waste heat is generated making it a co-generation energy source.

There is not currently a hydrogen network in London, although there is a very good natural gas infrastructure hence most fuel cells operate using natural gas. Analysis has shown that the carbon savings realised from gas fired CHP outweigh those from a hydrogen fuel cell that is powered by natural gas due to the conversion process from gas to hydrogen. The table below summarises the desktop study undertaken to determine the feasibility of fuel cell technology at the site:

Table 14: Key considerations of fuel cell technology

Technology	Criteria	Requirement Met?
Fuel Cells		
Fuel Supply	Is there a source of hydrogen available?	X
Fuel Supply	Is there an alternate fuel source available?	X
Plant room	Is there space allowed for a fuel cell and associated auxiliary equipment?	X

4.7.9 'Be Green' Energy Consumption and CO_2 Emissions

Table 15 CO_2 savings for the Site-wide Be GREEN

'Be GREEN' Pope's Road – Overall Site Wide	Carbon dioxide emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Emissions after demand reduction (tCO_2/yr)	240.2	287	526.8
Savings (tCO_2/yr)	110.5	0	110.5
Savings (%)	31.5%	0.0%	17.3%

The above table demonstrates that there is up to a **31.5% reduction in regulated CO_2** emissions over Part L2A 2013 for the development, which provides a combined 17.3% reduction when unregulated emissions are considered.

4.8 Total Carbon Emission Savings

The total CO_2 savings achieved by the energy strategy are predicted as up to **110.5 tCO_2** when compared against the Part L 2013 baseline scenario. The tables below show the breakdown in predicted savings for each stage of the energy hierarchy. The combined savings equate to up to a predicted **31.5%** reduction in regulated CO_2 emissions over the baseline Part L 2013 compliant scheme.

Table 16: Summary of SITE WIDE regulated and unregulated CO_2 emissions savings

Overall	Carbon Dioxide Emissions (tCO_2/yr)		
	Regulated	Unregulated	Total
Building Regulations Part L 2013 Compliant Development (TER)	350.7	286.6	637.3
Be Lean - Local Gas Boilers	284.0	286.6	570.6
Be Clean	284.0	286.6	570.6
Be Green - Heat Pumps	240.2	286.6	526.8

Table 17: Summary of SITE WIDE CO_2 emissions savings for each stage of the hierarchy

SITE WIDE Savings from:	Regulated carbon dioxide savings		Regulated & Unregulated carbon savings	
	Tonnes CO_2 per annum	(%)	Tonnes CO_2 per annum	(%)
Be Lean - Local Gas Boilers	66.7	19.0%	67	10.5%
Be Clean	0.0	0.0%	0	0.0%
Be Green - Heat Pumps	43.8	12.5%	44	6.9%
Total cumulative savings	**110.5**	**31.5%**	**111**	**17.3%**

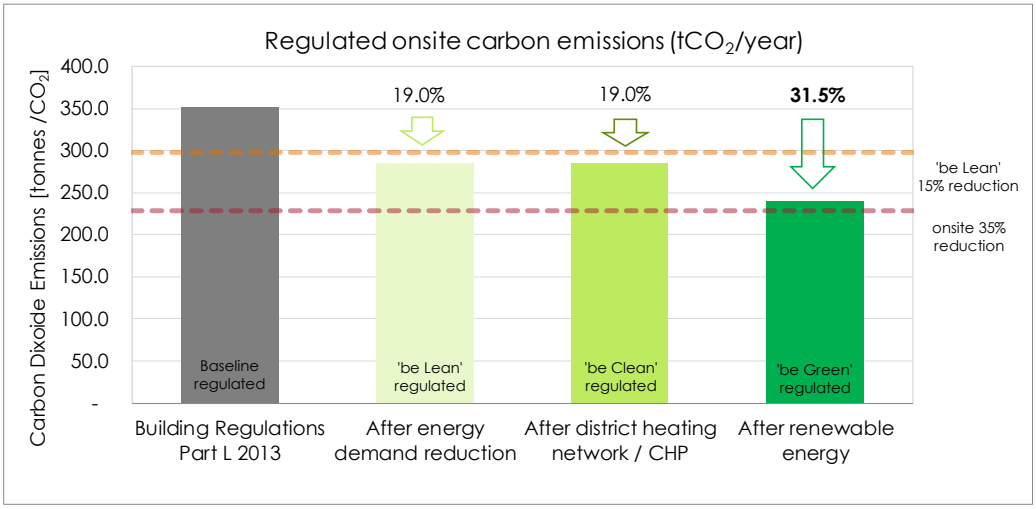


Figure 7: Summary of total carbon dioxide emissions for each stage of the hierarchy SITE WIDE

5 Conclusion

The following table details the carbon savings for the overall site as well as the carbon savings of the proposed development.

	Regulated Carbon Dioxide Emissions Savings		Regulated and Unregulated Carbon Dioxide Emissions Savings	
	(tCO_2/yr)	(%)	(tCO_2/yr)	(%)
Site wide	**110.5**	**31.5%**	**111**	**17.3%**

The proposed development will aspire to meet the intent of policy by delivering a minimum on-site carbon dioxide emissions reduction of 31.5% over a baseline building (NCM baseline and conditions), based on the approach, information, analysis and contents reported in this document.

Figure 8 below shows the carbon savings for each step in the GLAs suggested hierarchy for carbon savings. The site total regulated energy savings have been modelled at 31.5%.

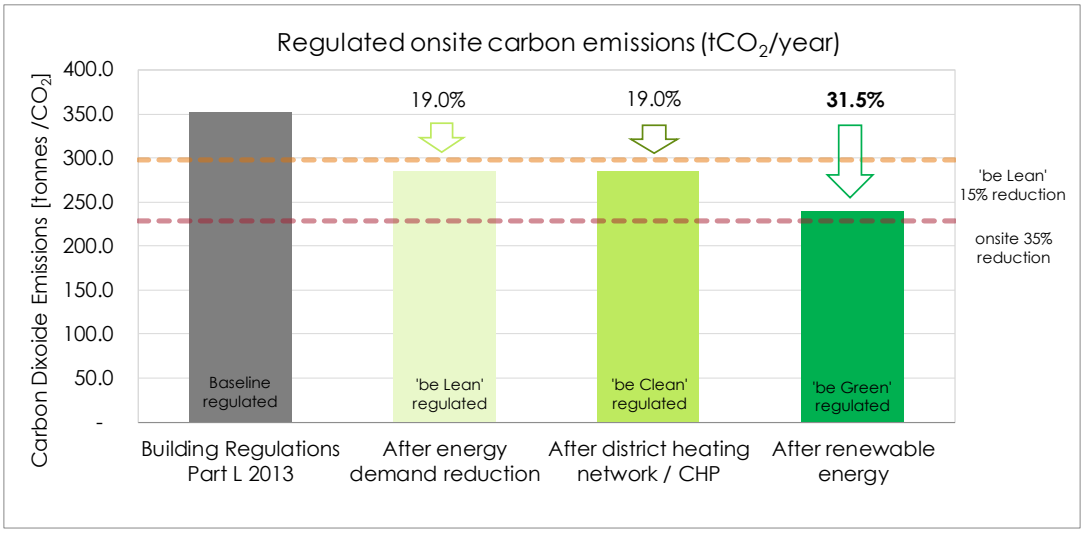


Figure 8: Carbon emission reduction following GLA energy hierarchy (Regulated energy)

APPENDIX A
MODELLING INPUTS

MODELLING APPROACH

A dynamic thermal model has been created from architectural drawings dated 8th November 2019, using the IES-VE software tool (version 2018.2.0.0) to represent the development and enable an evaluation of external and internal conditions for all spaces within the basement and grounds floors as well as the yard building.

Climate Conditions and Weather File

Pope's Road is in the London Borough of Lambeth. London has a moderate climate with the maximum temperature rarely rising above 26°C (Figure 9).

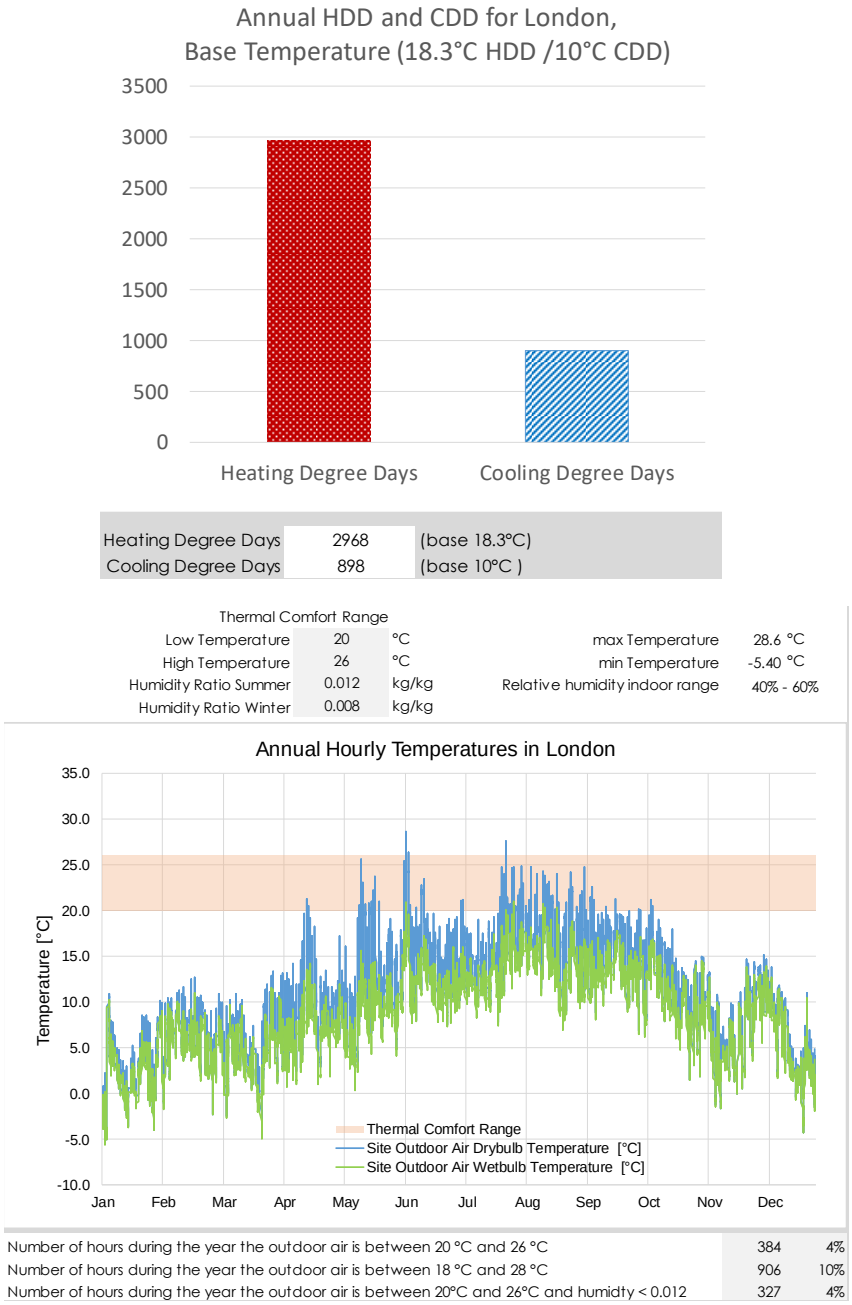
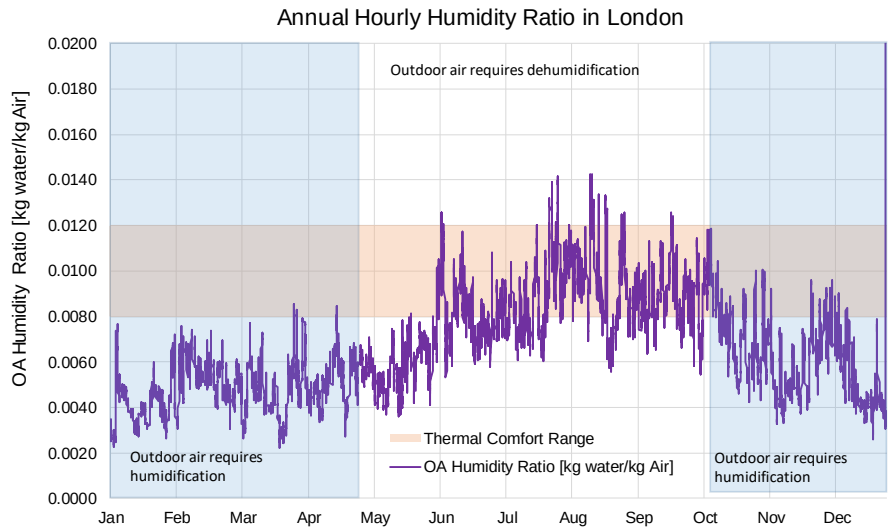


Figure 9: Annual Dry bulb and wet bulb outdoor air temperatures for London

It is an ideal climate for passive cooling through window opening in the summer months when the temperature outside is low enough, with dehumidification rarely required.



Occupied Hours between Jan - April and Nov - Dec (WINTER) dehumidification is required	0	0%
Occupied Hours between May - Oct (SUMMER) dehumidification is required	94	4%
Occupied Hours between Jan - April and Nov - Dec (WINTER) Humidification is required	2235	95%
Occupied Hours between May - Oct (SUMMER) Humidification is required	1161	49%

Figure 10: Annual outdoor humidity levels for London

Geometry

The IES-VE model includes all spaces and adjacent spaces have been modelled to capture their thermal and shading effects.

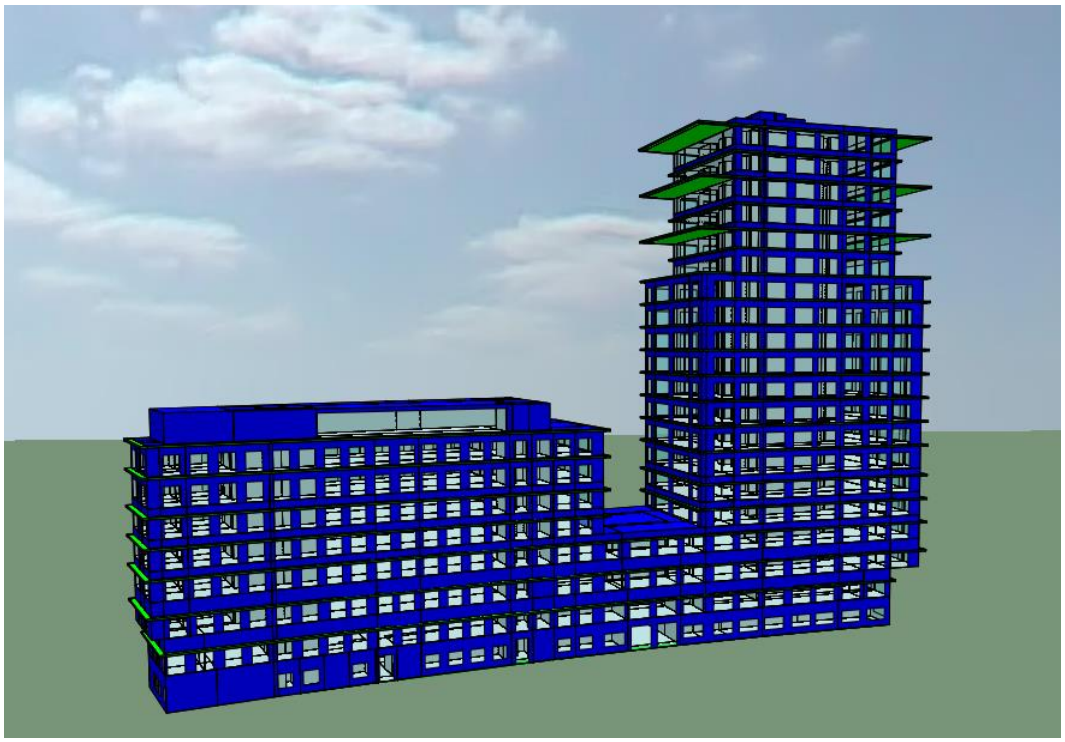


Figure 11: IES thermal model of Pope's Road development

Constructions

The following constructions have been applied to the model. All proposed constructions meet with Part L2A requirements.

Element		Target and proposed Fabric Targets			
		Notional Building Values		Proposed Building u-value Targets	
External Wall	U-value	0.26	W/m^2.K	0.18	W/m^2.K
Basement Wall	U-value	0.26	W/m^2.K	0.18	W/m^2.K
Ground Floor	U-value	0.22	W/m^2.K	0.15	W/m^2.K
Roof	U-value	0.18	W/m^2.K	0.12	W/m^2.K
Proposed Windows	U-value	1.60	W/m^2.K	1.40	W/m^2.K
	g-value	0.4		0.4	
Air Permeability		10 m^3/m^2/hr @ 50Pa		3.5	m^3/m^2/hr @ 50
Thermal Bridging allowance		10% degradation of U-value		10% degradation of U-value	

Internal gains

Internal gains were set using NCM templates, in the proposed building the following lighting has been applied:

Usage Type	Averaged lighting power density lm/W	Local Manual Switching	Constant illuminance control* [Y/N]	Occupancy Sensor Type / Controls	Automatic Daylighting Control [Y/N]	Daylight Control Type (Switching / Dimming)	Daylight Sensor Type (Standalone / Addressable)
Gym - Changing Facilities	100	N	N	Auto-On-Off (0.9)	N		
Gym - Circulation area	100	N	N	Auto-On-Off (0.9)	N		
Gym	120	N	N	Auto-On-Off (0.9)	N		
Gym - Plant Rooms	125	Y	N	None (0.1)	N		
Office - Changing Facilities	100	N	N	Auto-On-Off (0.9)	N		
Office - Circulation	100	N	N	Auto-On-Off (0.9)	N		
Office - Plant Room	125	Y	N	None (0.1)	N		
Office - Open Office	120	N	Y	Auto-On-Off (0.9)	Y	Dimming	Addressable
Office - WC	100	N	N	Auto-On-Off (0.9)	N		
Office - Store (Bike)	125	N	N	Auto-On-Off (0.9)	N		
Office - Reception	100	N	N	Auto-On-Off (0.9)	N		
Restaurant	70	N	N	Auto-On-Dimmed (0.95)	N		
Kitchen	125	Y	N	None (0.1)	N		
Retail - Circulation	90	N	N	Auto-On-Off (0.9)	N		
Retail - Sales Area	100	Y	N	None (0.1)	N		

Heating and cooling strategy

The office and Office Space areas will be served by air to water heat pumps for heating, cooling, and domestic hot water. Full details are as below.

Description Name in IES	Units	East Office Open Office Office - OpenOffices (East)	West Office Open Office Office - OpenOffices (West)	Office Shower/Locker Office - Showers/Lockers	Office WC Office - Circulation WC	Office Circulation Lobby Corridor Stair Office - Circulation/Stairs/Lobby	Office Bike Store Office - Stores	Office Plant Room Office/Retail - Plant Areas	Office Reception Office - Reception	Retail Retail units Speculative Retail A1/A3/D2	Retail Circulation Retail - Circulation
System Description											
Outdoor air delivery (Ventilation)		Office AHUw/Hex	Office AHUw/Hex	Office Showers AHU w/Hex	Extract Fan	Air transfer from office	Basement AHU w/Hex	Basement AHU w/Hex	Basement AHU w/Hex	MVHR	Air transfer
Central Plant		air source heat pump	air source heat pump	none	none	none	none	none	none	none	none
Room Conditioning Heating		hydronic fan coil	hydronic fan coil	dx fan coil	panel heater	panel heater	panel heater	none	dx fan coil	air source heat pump	panel heaters
Room Conditioning Cooling		hyrdronic fan coil	hyrdronic fan coil	dx fan coil	none	none	none	none	dx fan coil	air source heat pump	No
Plant Heating Details											
Heating system type (assumed system in model)	Description	air source heat pump	air source heat pump	air source heat pump	panel heater	panel heater	panel heater		air source heat pump	air source heat pump	panel heater
Heat Fuel Type	Elec/gas	Electricity	Electricity	Electricity	Electricity	Electricity	Electricity		Electricity	Electricity	Electricity
Heat generator seasonal efficiency	SCOP/%	3.36	3.23	2	n/a	n/a	n/a	n/a	3.3	2.5	n/a
Boiler installed on or after 1998?	Yes/No	No	No	No	No	No	No	No	No	n/a	n/a
Central Time Control?	Yes/No	Yes	Yes	no	No	No	No	No	Yes	Yes	No
Optimum start/stop control?	Yes/No	Yes	Yes	no	No	No	No	No	Yes	Yes	No
Local Time Control?	Yes/No	Yes	Yes	Yes	No	No	No	No	Yes	Yes	No
Local Temperature Control?	Yes/No	Yes	Yes	no	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Weather Compensation Control?	Yes/No	Yes	Yes	no	No	No	No	No	Yes	No	No
Is there provision for metering?	Yes/No	Yes	Yes	no	No	No	No	No	Yes	Yes	No
Does the metering warn "out of range" values?	Yes/No	Yes	Yes	no	No	No	No	No	Yes	Yes	No
Pump	List	Variable Speed Multiple Pressure Sensors	Variable Speed Multiple Pressure Sensors	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Plant Cooling Details											
Cooling system type (assumed system in model)	Description	E series mitsubishi HP	air source heat pump	air source heat pump	none	none	none	none	air source heat pump	air source heat pump	none
Nominal EER	EER	3.19	2.90	3.20	n/a	n/a	n/a	n/a	3.19	3.2	n/a
Seasonal EER	SEER	4.62	4.45	n/a	n/a	n/a	n/a	n/a	4.62	3.2	n/a
Power	kW	186	615	n/a	n/a	n/a	n/a	n/a	7	72	n/a
Does it Qualify for ECA? (tax credits)	Yes/No	?	?	?	?	?	?	?	?	?	?
Mixed mode? (CMM)	Description	No	No	No	No	No	No	No	No	No	n/a
Ventilation / AHU											
Specific Fan power for AHU	W/l/s	AHU 2 / FCU 0.2	AHU 2 / FCU 0.2	included in COP		n/a	AHU 2 / FCU 0.2	AHU 2 / FCU 0.2	AHU 2 / FCU 0.2	AHU 2 / FCU 0.2	n/a
Demand controlled ventilation?	List	No	No	No	n/a	n/a	No	No	No	No	n/a
Ductwork Leakage Classification	Type	A	A	A	A	A	A	A	A	n/a	n/a
AHU Leakage Classification	Type	A	A	A	A	A	A	A	A	n/a	n/a
Heat recovery	Type	Plate Recuperator	Plate Recuperator	Plate Recuperator	n/a	n/a	Plate Recuperator	Plate Recuperator	Plate recuperator	Plate recuperator	n/a
	% efficiency	73%	73%	73%	n/a	n/a	73%	73%	73%	73%	n/a
8. DHW											
DHW system type	Description	Local storage heaters	Local storage heaters	Heat Pumps	Local storage heaters	none	none	none		Local storage heaters	
Heat generator seasonal efficiency	SCOP/%	100%	100%	3.25	100%	n/a	n/a	n/a	n/a		n/a
DHW system delivery efficiency	%	95%	95%	95%	95%	-	-	-	-		-
DHW Fuel Type	Elec/gas	Electricity	Electricity	Electricity	Electricity	n/a	n/a	n/a	n/a	Electricity	n/a
Is the system a storage system?	Yes/No	Yes	Yes	Yes	Yes	n/a	n/a	n/a	n/a	Yes	n/a
Storage Volume	litres	?	?	?	?	n/a	n/a	n/a	n/a		n/a
Insulation	Type	?	?	?	?	n/a	n/a	n/a	n/a		n/a
Does the system have secondary circulation?	Yes/No	?	?	?	?	n/a	n/a	n/a	n/a		n/a
10. Building Management											
Electric Power Factor of the building	Power Factor Control									Yes	
Lighting systems have provision for metering?	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	
Lighting systems metering warns of 'out of range' values?	Yes/No	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	
11. LZC technologies											
Low carbon technologies	Description	air source heat pump	air source heat pump	none	none	none	none	none	none	air source heat pump	none
Renewable technologies	Description	none	none	none	none	none	none	none	none	none	none

APPENDIX B
COMPLIANCE RESULTS BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Pope's Road - Planning GREEN

As designed

Date: Fri Mar 20 17:06:00 2020

Administrative information

Building Details

Address: Brixton, London, SW9

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: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Hurley Palmer Flatt

Telephone number: 02074293333

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, $kgCO_2/m^2.annum$	24.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	18.8
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	GB000034:Surf[0]
Floor	0.25	1.07	1.47	GB000009:Surf[0]
Roof	0.25	0.12	0.12	02000022:Surf[6]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0000002C:Surf[0]
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/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

Building services

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

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

1- Office - Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.3	3.2	0	2	0.73
Standard value	2.5*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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- Speculative Retail A1/A3/D2

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2.5	3.2	0	1.9	0.73
Standard value	2.5*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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- Office - Circulation/Stairs/Lobby

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0	0	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Office - OpenOffices (West)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.23	3.2	0	1.9	0.73
Standard value	2.5*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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- Office - OpenOffices (East)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.36	3.2	0	1.9	0.73
Standard value	2.5*	3.2	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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- Office - Circulation WC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0	0	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

7- Office - Showers/Lockers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	2	3.2	0	0	0.73
Standard value	2.5*	3.2	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					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.					

"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
00 Lobby Office 1	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Lobby Office 2	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 1	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 10	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 2	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 3	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 4	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 5	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 6	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 7	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 8	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 9	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 1 I	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 1 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 2 I	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 2 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 3 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 4 P	-	-	-	-	-	-	-	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
01 Leisure 6 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 7 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 8 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 1	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 14	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 15 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 16 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 17	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 18 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 19 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 2	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 20 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 3	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 4	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 5	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 6	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 6	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 5	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 5	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
02 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
03 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 3	-	-	-	-	-	-	-	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
03 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 6	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
03 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
04 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 6	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter South 3	-	-	-	-	-	-	-	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
04 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
04 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
05 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
05 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
06 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 7	-	-	-	-	-	-	-	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
06 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
06 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
07 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
07 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
08 A3 Restaurant 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 A3 Restaurant 2	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office General	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter 2	-	-	-	-	-	-	-	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
08 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
08 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
09 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
10 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
11 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
12 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Open 2	-	-	-	-	-	-	-	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
12 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
13 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
14 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
15 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
16 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter East 1	-	-	-	-	-	-	-	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
16 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
17 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
18 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
19 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
UG B1 Showers 1	-	-	-	2	-	-	-	-	-	-	N/A
UG B1 Showers 2	-	-	-	2	-	-	-	-	-	-	N/A
UG B1 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
UG B1 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
UG B1 WC 3	0.5	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00 Circulation 1	-	90	-	541
00 Circulation 2	-	90	-	112
00 Circulation 3	-	90	-	62
00 Circulation 4	-	90	-	895

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00 Circulation 5	-	90	-	60
00 Circulation 6	-	90	-	89
00 Circulation 7	-	90	-	53
00 Lobby Office 1	-	100	22	159
00 Lobby Office 2	-	100	22	146
00 Plant 1	125	-	-	248
00 Retail 1	-	100	22	2046
00 Retail 10	-	100	22	889
00 Retail 2	-	100	22	1981
00 Retail 3	-	100	22	270
00 Retail 4	-	100	22	278
00 Retail 5	-	100	22	685
00 Retail 6	-	100	22	656
00 Retail 7	-	100	22	515
00 Retail 8	-	100	22	622
00 Retail 9	-	100	22	867
00 Stairs 1	-	90	-	51
00 Stairs 2	-	90	-	52
00 Stairs 3	-	90	-	45
00 Stairs 4	-	90	-	49
00 Store 1	125	-	-	51
01 Circulation 1	-	90	-	62
01 Circulation 2	-	90	-	53
01 Circulation 3	-	90	-	89
01 Circulation 4	-	90	-	25
01 Circulation 5	-	90	-	341
01 Circulation 6	-	90	-	304
01 Circulation 7	-	90	-	26
01 Leisure 1 I	-	125	-	348
01 Leisure 1 P	-	125	-	272
01 Leisure 2 I	-	125	-	96
01 Leisure 2 P	-	125	-	55
01 Leisure 3 P	-	125	-	33
01 Leisure 4 P	-	125	-	46
01 Leisure 6 P	-	125	-	31
01 Leisure 7 P	-	125	-	50
01 Leisure 8 P	-	125	-	265
01 Retail 1	-	100	22	296
01 Retail 14	-	100	22	1386
01 Retail 15 (P)	-	100	22	1086
01 Retail 16 (P)	-	100	22	213
01 Retail 17	-	100	22	1419
01 Retail 18 (P)	-	100	22	763

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01 Retail 19 (P)	-	100	22	1236
01 Retail 2	-	100	22	311
01 Retail 20 (P)	-	100	22	226
01 Retail 3	-	100	22	486
01 Retail 4	-	100	22	463
01 Retail 5	-	100	22	685
01 Retail 6	-	100	22	656
01 Stairs 1	-	90	-	51
01 Stairs 2	-	90	-	52
01 Stairs 3	-	90	-	45
01 Stairs 4	-	90	-	49
02 Circulation 1	-	100	-	56
02 Circulation 2	-	100	-	48
02 Circulation 3	-	100	-	80
02 Circulation 4	-	100	-	22
02 Circulation 5	-	100	-	23
02 Circulation 6	-	100	-	155
02 Office Open 1	120	-	-	746
02 Office Open 2	120	-	-	1049
02 Office Open 3	120	-	-	779
02 Office Open 4	120	-	-	358
02 Office Open 5	120	-	-	964
02 Office Open 6	120	-	-	116
02 Office Perimeter 1	120	-	-	127
02 Office Perimeter 2	120	-	-	133
02 Office Perimeter 3	120	-	-	109
02 Office Perimeter 4	120	-	-	112
02 Office Perimeter East 1	120	-	-	67
02 Office Perimeter North 1	120	-	-	389
02 Office Perimeter North 2	120	-	-	308
02 Office Perimeter North 3	120	-	-	703
02 Office Perimeter North 4	120	-	-	213
02 Office Perimeter North 5	120	-	-	757
02 Office Perimeter South 1	120	-	-	293
02 Office Perimeter South 2	120	-	-	369
02 Office Perimeter South 3	120	-	-	794
02 Office Perimeter South 4	120	-	-	735
02 Office Perimeter South 5	120	-	-	211
02 Office Perimeter West 1	120	-	-	461
02 Stairs 1	-	100	-	46
02 Stairs 2	-	100	-	47
02 Stairs 3	-	100	-	40
02 Stairs 4	-	100	-	44

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
02 WC 1	-	100	-	123
02 WC 2	-	100	-	119
03 Circulation 1	-	100	-	48
03 Circulation 2	-	100	-	39
03 Circulation 3	-	100	-	67
03 Circulation 4	-	100	-	21
03 Circulation 5	-	100	-	150
03 Circulation 6	-	100	-	22
03 Office Open 1	120	-	-	744
03 Office Open 2	120	-	-	1037
03 Office Open 3	120	-	-	773
03 Office Open 4	120	-	-	332
03 Office Open 5	120	-	-	964
03 Office Open 6	120	-	-	115
03 Office Perimeter 3	120	-	-	123
03 Office Perimeter 4	120	-	-	128
03 Office Perimeter 5	120	-	-	104
03 Office Perimeter 6	120	-	-	107
03 Office Perimeter East 1	120	-	-	67
03 Office Perimeter North 1	120	-	-	388
03 Office Perimeter North 2	120	-	-	304
03 Office Perimeter North 3	120	-	-	695
03 Office Perimeter North 4	120	-	-	207
03 Office Perimeter North 5	120	-	-	741
03 Office Perimeter South 1	120	-	-	288
03 Office Perimeter South 2	120	-	-	366
03 Office Perimeter South 3	120	-	-	786
03 Office Perimeter South 4	120	-	-	718
03 Office Perimeter South 5	120	-	-	204
03 Office Perimeter West 1	120	-	-	457
03 Stairs 1	-	100	-	39
03 Stairs 2	-	100	-	40
03 Stairs 3	-	100	-	35
03 Stairs 4	-	100	-	38
03 WC 1	-	100	-	110
03 WC 2	-	100	-	108
04 Circulation 1	-	100	-	48
04 Circulation 2	-	100	-	39
04 Circulation 3	-	100	-	67
04 Circulation 4	-	100	-	21
04 Circulation 5	-	100	-	22
04 Office East 1	120	-	-	380
04 Office Open 1	120	-	-	416

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
04 Office Open 2	120	-	-	998
04 Office Open 3	120	-	-	278
04 Office Open 4	120	-	-	351
04 Office Open 5	120	-	-	964
04 Office Open 6	120	-	-	115
04 Office Perimeter 1	120	-	-	123
04 Office Perimeter 2	120	-	-	126
04 Office Perimeter 2	120	-	-	128
04 Office Perimeter 3	120	-	-	131
04 Office Perimeter 3	120	-	-	104
04 Office Perimeter 4	120	-	-	107
04 Office Perimeter 5	120	-	-	233
04 Office Perimeter 6	120	-	-	217
04 Office Perimeter East 1	120	-	-	67
04 Office Perimeter North 1	120	-	-	593
04 Office Perimeter North 2	120	-	-	207
04 Office Perimeter North 3	120	-	-	741
04 Office Perimeter South 1	120	-	-	672
04 Office Perimeter South 2	120	-	-	718
04 Office Perimeter South 3	120	-	-	204
04 Office Perimeter West 1	120	-	-	457
04 Stairs 1	-	100	-	39
04 Stairs 2	-	100	-	40
04 Stairs 3	-	100	-	35
04 Stairs 4	-	100	-	38
04 WC 1	-	100	-	104
04 WC 2	-	100	-	108
05 Circulation 1	-	100	-	48
05 Circulation 2	-	100	-	39
05 Circulation 3	-	100	-	67
05 Circulation 4	-	100	-	21
05 Circulation 5	-	100	-	22
05 Office East 1	120	-	-	380
05 Office Open 1	120	-	-	416
05 Office Open 2	120	-	-	998
05 Office Open 3	120	-	-	351
05 Office Open 3	120	-	-	278
05 Office Open 4	120	-	-	964
05 Office Open 5	120	-	-	115
05 Office Perimeter 1	120	-	-	123
05 Office Perimeter 2	120	-	-	128
05 Office Perimeter 2	120	-	-	126
05 Office Perimeter 3	120	-	-	104

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
05 Office Perimeter 3	120	-	-	131
05 Office Perimeter 4	120	-	-	107
05 Office Perimeter 5	120	-	-	233
05 Office Perimeter 6	120	-	-	217
05 Office Perimeter East 1	120	-	-	67
05 Office Perimeter North 1	120	-	-	593
05 Office Perimeter North 2	120	-	-	207
05 Office Perimeter North 3	120	-	-	741
05 Office Perimeter South 1	120	-	-	672
05 Office Perimeter South 2	120	-	-	718
05 Office Perimeter South 3	120	-	-	204
05 Office Perimeter West 1	120	-	-	457
05 Stairs 1	-	100	-	39
05 Stairs 2	-	100	-	40
05 Stairs 3	-	100	-	35
05 Stairs 4	-	100	-	38
05 WC 1	-	100	-	104
05 WC 2	-	100	-	108
06 Circulation 1	-	100	-	48
06 Circulation 2	-	100	-	39
06 Circulation 3	-	100	-	67
06 Circulation 4	-	100	-	21
06 Circulation 5	-	100	-	22
06 Office East 1	120	-	-	380
06 Office Open 1	120	-	-	416
06 Office Open 2	120	-	-	998
06 Office Open 3	120	-	-	351
06 Office Open 3	120	-	-	278
06 Office Open 4	120	-	-	964
06 Office Open 5	120	-	-	115
06 Office Perimeter 1	120	-	-	123
06 Office Perimeter 2	120	-	-	128
06 Office Perimeter 2	120	-	-	126
06 Office Perimeter 3	120	-	-	131
06 Office Perimeter 4	120	-	-	104
06 Office Perimeter 5	120	-	-	107
06 Office Perimeter 6	120	-	-	233
06 Office Perimeter 7	120	-	-	217
06 Office Perimeter East 1	120	-	-	67
06 Office Perimeter North 1	120	-	-	593
06 Office Perimeter North 2	120	-	-	207
06 Office Perimeter North 3	120	-	-	741
06 Office Perimeter South 1	120	-	-	672

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
06 Office Perimeter South 2	120	-	-	718
06 Office Perimeter South 3	120	-	-	204
06 Office Perimeter West 1	120	-	-	457
06 Stairs 1	-	100	-	39
06 Stairs 2	-	100	-	40
06 Stairs 3	-	100	-	35
06 Stairs 4	-	100	-	38
06 WC 1	-	100	-	104
06 WC 2	-	100	-	108
07 Circulation 1	-	100	-	48
07 Circulation 2	-	100	-	39
07 Circulation 3	-	100	-	67
07 Circulation 4	-	100	-	21
07 Circulation 5	-	100	-	22
07 Office East 1	120	-	-	380
07 Office Open 1	120	-	-	416
07 Office Open 2	120	-	-	998
07 Office Open 3	120	-	-	351
07 Office Open 3	120	-	-	278
07 Office Open 4	120	-	-	964
07 Office Open 5	120	-	-	115
07 Office Perimeter 1	120	-	-	123
07 Office Perimeter 2	120	-	-	128
07 Office Perimeter 2	120	-	-	126
07 Office Perimeter 3	120	-	-	131
07 Office Perimeter 3	120	-	-	104
07 Office Perimeter 4	120	-	-	107
07 Office Perimeter 5	120	-	-	233
07 Office Perimeter 6	120	-	-	217
07 Office Perimeter East 1	120	-	-	67
07 Office Perimeter North 1	120	-	-	593
07 Office Perimeter North 2	120	-	-	207
07 Office Perimeter North 3	120	-	-	741
07 Office Perimeter South 1	120	-	-	672
07 Office Perimeter South 2	120	-	-	718
07 Office Perimeter South 3	120	-	-	204
07 Office Perimeter West 1	120	-	-	457
07 Stairs 1	-	100	-	39
07 Stairs 2	-	100	-	40
07 Stairs 3	-	100	-	35
07 Stairs 4	-	100	-	38
07 WC 1	-	100	-	104
07 WC 2	-	100	-	108

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
08 A3 Restaurant 1	-	70	22	1011
08 A3 Restaurant 2	-	70	22	357
08 Circulation 1	-	100	-	48
08 Circulation 2	-	100	-	31
08 Circulation 3	-	100	-	59
08 Circulation 4	-	100	-	21
08 Circulation 5	-	100	-	22
08 Office East 1	120	-	-	380
08 Office General	120	-	-	432
08 Office Open 1	120	-	-	416
08 Office Open 2	120	-	-	998
08 Office Perimeter 1	120	-	-	123
08 Office Perimeter 2	120	-	-	128
08 Office Perimeter 2	120	-	-	126
08 Office Perimeter 3	120	-	-	131
08 Office Perimeter North 1	120	-	-	593
08 Office Perimeter South 1	120	-	-	672
08 Office Perimeter West 1	120	-	-	457
08 Plant 1	125	-	-	71
08 Plant 2	125	-	-	226
08 Stairs 1	-	100	-	39
08 Stairs 2	-	100	-	40
08 Stairs 3	-	100	-	35
08 Stairs 4	-	100	-	32
08 WC 1	-	100	-	104
08 WC 2	-	100	-	108
09 Circulation 1	-	100	-	48
09 Circulation 5	-	100	-	22
09 Office East 1	120	-	-	380
09 Office Open 1	120	-	-	416
09 Office Open 2	120	-	-	998
09 Office Perimeter 1	120	-	-	123
09 Office Perimeter 2	120	-	-	128
09 Office Perimeter 2	120	-	-	126
09 Office Perimeter 3	120	-	-	131
09 Office Perimeter North 1	120	-	-	593
09 Office Perimeter South 1	120	-	-	672
09 Office Perimeter West 1	120	-	-	457
09 Stairs 1	-	100	-	39
09 Stairs 2	-	100	-	40
09 WC 1	-	100	-	104
10 Circulation 1	-	100	-	48
10 Circulation 5	-	100	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
10 Office East 1	120	-	-	380
10 Office Open 1	120	-	-	416
10 Office Open 2	120	-	-	998
10 Office Perimeter 1	120	-	-	123
10 Office Perimeter 2	120	-	-	128
10 Office Perimeter 2	120	-	-	126
10 Office Perimeter 3	120	-	-	131
10 Office Perimeter North 1	120	-	-	593
10 Office Perimeter South 1	120	-	-	672
10 Office Perimeter West 1	120	-	-	457
10 Stairs 1	-	100	-	39
10 Stairs 2	-	100	-	40
10 WC 1	-	100	-	104
11 Circulation 1	-	100	-	48
11 Circulation 5	-	100	-	22
11 Office East 1	120	-	-	380
11 Office Open 1	120	-	-	416
11 Office Open 2	120	-	-	998
11 Office Perimeter 1	120	-	-	123
11 Office Perimeter 2	120	-	-	126
11 Office Perimeter 2	120	-	-	128
11 Office Perimeter 3	120	-	-	131
11 Office Perimeter North 1	120	-	-	593
11 Office Perimeter South 1	120	-	-	672
11 Office Perimeter West 1	120	-	-	457
11 Stairs 1	-	100	-	39
11 Stairs 2	-	100	-	40
11 WC 1	-	100	-	104
12 Circulation 1	-	100	-	48
12 Circulation 5	-	100	-	22
12 Office East 1	120	-	-	380
12 Office Open 1	120	-	-	416
12 Office Open 2	120	-	-	998
12 Office Perimeter 1	120	-	-	123
12 Office Perimeter 2	120	-	-	126
12 Office Perimeter 2	120	-	-	128
12 Office Perimeter 3	120	-	-	131
12 Office Perimeter North 1	120	-	-	593
12 Office Perimeter South 1	120	-	-	672
12 Office Perimeter West 1	120	-	-	457
12 Stairs 1	-	100	-	39
12 Stairs 2	-	100	-	40
12 WC 1	-	100	-	104

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
13 Circulation 1	-	100	-	48
13 Circulation 5	-	100	-	22
13 Office East 1	120	-	-	381
13 Office Open 1	120	-	-	417
13 Office Open 2	120	-	-	999
13 Office Perimeter 1	120	-	-	123
13 Office Perimeter 2	120	-	-	128
13 Office Perimeter 2	120	-	-	127
13 Office Perimeter 3	120	-	-	131
13 Office Perimeter North 1	120	-	-	593
13 Office Perimeter South 1	120	-	-	672
13 Office Perimeter West 1	120	-	-	458
13 Stairs 1	-	100	-	39
13 Stairs 2	-	100	-	40
13 WC 1	-	100	-	104
14 Circulation 1	-	100	-	48
14 Circulation 2	-	100	-	22
14 Office Open 1	120	-	-	1010
14 Office Perimeter 1	120	-	-	107
14 Office Perimeter 2	120	-	-	109
14 Office Perimeter 3	120	-	-	120
14 Office Perimeter 4	120	-	-	109
14 Office Perimeter East 1	120	-	-	435
14 Office Perimeter North 1	120	-	-	391
14 Office Perimeter South 1	120	-	-	458
14 Stairs 1	-	100	-	39
14 Stairs 2	-	100	-	40
14 WC 1	-	100	-	104
15 Circulation 1	-	100	-	48
15 Circulation 2	-	100	-	22
15 Office Open 1	120	-	-	1010
15 Office Perimeter 1	120	-	-	107
15 Office Perimeter 2	120	-	-	109
15 Office Perimeter 3	120	-	-	120
15 Office Perimeter 4	120	-	-	109
15 Office Perimeter East 1	120	-	-	435
15 Office Perimeter North 1	120	-	-	391
15 Office Perimeter South 1	120	-	-	458
15 Stairs 1	-	100	-	39
15 Stairs 2	-	100	-	40
15 WC 1	-	100	-	104
16 Circulation 1	-	100	-	48
16 Circulation 2	-	100	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
16 Office Open 1	120	-	-	1010
16 Office Perimeter 1	120	-	-	107
16 Office Perimeter 2	120	-	-	109
16 Office Perimeter 3	120	-	-	120
16 Office Perimeter 4	120	-	-	109
16 Office Perimeter East 1	120	-	-	435
16 Office Perimeter North 1	120	-	-	391
16 Office Perimeter South 1	120	-	-	458
16 Stairs 1	-	100	-	39
16 Stairs 2	-	100	-	40
16 WC 1	-	100	-	104
17 Circulation 1	-	100	-	48
17 Circulation 2	-	100	-	22
17 Office Open 1	120	-	-	1010
17 Office Perimeter 1	120	-	-	107
17 Office Perimeter 2	120	-	-	109
17 Office Perimeter 3	120	-	-	120
17 Office Perimeter 4	120	-	-	109
17 Office Perimeter East 1	120	-	-	435
17 Office Perimeter North 1	120	-	-	391
17 Office Perimeter South 1	120	-	-	458
17 Stairs 1	-	100	-	39
17 Stairs 2	-	100	-	40
17 WC 1	-	100	-	104
18 Circulation 1	-	100	-	48
18 Circulation 2	-	100	-	22
18 Office Open 1	120	-	-	1010
18 Office Perimeter 1	120	-	-	107
18 Office Perimeter 2	120	-	-	109
18 Office Perimeter 3	120	-	-	120
18 Office Perimeter 4	120	-	-	109
18 Office Perimeter East 1	120	-	-	435
18 Office Perimeter North 1	120	-	-	391
18 Office Perimeter South 1	120	-	-	458
18 Stairs 1	-	100	-	39
18 Stairs 2	-	100	-	40
18 WC 1	-	100	-	104
19 Circulation 1	-	100	-	48
19 Circulation 2	-	100	-	22
19 Office Open 1	120	-	-	1010
19 Office Perimeter 1	120	-	-	107
19 Office Perimeter 2	120	-	-	109
19 Office Perimeter 3	120	-	-	120

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
19 Office Perimeter 4	120	-	-	109
19 Office Perimeter East 1	120	-	-	435
19 Office Perimeter North 1	120	-	-	391
19 Office Perimeter South 1	120	-	-	458
19 Stairs 1	-	100	-	39
19 Stairs 2	-	100	-	40
19 WC 1	-	100	-	104
20 Circulation 1	-	100	-	32
20 Stairs 1	-	100	-	39
UG B1 Circulation	-	90	-	61
UG B1 Circulation 1	-	90	-	88
UG B1 Circulation 2	-	90	-	57
UG B1 Circulation 3	-	90	-	62
UG B1 Circulation 4	-	90	-	337
UG B1 Circulation 5	-	90	-	25
UG B1 Circulation 6	-	90	-	20
UG B1 Lockers 1	-	90	-	58
UG B1 Lockers 2	-	90	-	58
UG B1 Plant Room 1	125	-	-	68
UG B1 Plant Room 2	125	-	-	0
UG B1 Plant Room 3	125	-	-	0
UG B1 Plant Room 4	125	-	-	0
UG B1 Plant Room 5	125	-	-	0
UG B1 Plant Room 6	125	-	-	335
UG B1 Showers 1	-	100	-	58
UG B1 Showers 2	-	100	-	57
UG B1 Stairs 1	-	90	-	51
UG B1 Stairs 2	-	90	-	52
UG B1 Stairs 3	-	90	-	50
UG B1 Store Bike 1	125	-	-	106
UG B1 Store Bike 2	125	-	-	96
UG B1 WC 1	-	100	-	41
UG B1 WC 2	-	100	-	40
UG B1 WC 3	-	100	-	226
UG B2 Circulation 1	-	90	-	62
UG B2 Circulation 2	-	90	-	305
UG B2 Circulation 3	-	90	-	61
UG B2 Circulation 4	-	90	-	25
UG B2 Circulation 5	-	90	-	20
UG B2 Circulation 6	-	90	-	427
UG B2 Plant Room 1	125	-	-	323
UG B2 Plant Room 2	125	-	-	787
UG B2 Plant Room 3	125	-	-	461

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
UG B2 Plant Room 4	125	-	-	194
UG B2 Plant Room 5	125	-	-	335
UG B2 Plant Room 6	125	-	-	755
UG B2 Stairs 1	-	90	-	51
UG B2 Stairs 2	-	90	-	52
UG B2 Stairs 3	-	90	-	50

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Lobby Office 1	N/A	N/A
00 Lobby Office 2	N/A	N/A
00 Retail 1	NO (-59.1%)	NO
00 Retail 10	NO (-64%)	NO
00 Retail 2	NO (-45.5%)	NO
00 Retail 3	NO (-50.3%)	NO
00 Retail 4	NO (-51.1%)	NO
00 Retail 5	NO (-64%)	NO
00 Retail 6	NO (-48.8%)	NO
00 Retail 7	NO (-64.1%)	NO
00 Retail 8	NO (-49.4%)	NO
00 Retail 9	NO (-49.8%)	NO
01 Leisure 1 I	NO (-75.9%)	NO
01 Leisure 1 P	NO (-60.5%)	NO
01 Leisure 2 I	NO (-60%)	NO
01 Leisure 2 P	NO (-61.1%)	NO
01 Leisure 3 P	NO (-63.2%)	NO
01 Leisure 4 P	NO (-39.2%)	NO
01 Leisure 6 P	NO (-55.7%)	NO
01 Leisure 7 P	NO (-48.3%)	NO
01 Leisure 8 P	NO (-44.6%)	NO
01 Retail 1	NO (-19.9%)	NO
01 Retail 14	NO (-80.9%)	NO
01 Retail 15 (P)	NO (-59.8%)	NO
01 Retail 16 (P)	NO (-57.5%)	NO
01 Retail 17	NO (-64.9%)	NO
01 Retail 18 (P)	NO (-52.5%)	NO
01 Retail 19 (P)	NO (-42.3%)	NO
01 Retail 2	NO (-41.1%)	NO
01 Retail 20 (P)	NO (-45.1%)	NO
01 Retail 3	NO (-55.1%)	NO
01 Retail 4	NO (-38%)	NO
01 Retail 5	NO (-52.5%)	NO
01 Retail 6	NO (-33.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 Office Open 1	NO (-79.9%)	NO
02 Office Open 2	NO (-66.4%)	NO
02 Office Open 3	NO (-85.4%)	NO
02 Office Open 4	NO (-58.7%)	NO
02 Office Open 5	NO (-77.9%)	NO
02 Office Open 6	NO (-51.6%)	NO
02 Office Perimeter 1	NO (-47.6%)	NO
02 Office Perimeter 2	NO (-35.6%)	NO
02 Office Perimeter 3	NO (-64.9%)	NO
02 Office Perimeter 4	NO (-61.5%)	NO
02 Office Perimeter East 1	NO (-46.5%)	NO
02 Office Perimeter North 1	NO (-56.8%)	NO
02 Office Perimeter North 2	NO (-59.2%)	NO
02 Office Perimeter North 3	NO (-60.4%)	NO
02 Office Perimeter North 4	NO (-55%)	NO
02 Office Perimeter North 5	NO (-60.6%)	NO
02 Office Perimeter South 1	NO (-43.2%)	NO
02 Office Perimeter South 2	NO (-40.6%)	NO
02 Office Perimeter South 3	NO (-42.5%)	NO
02 Office Perimeter South 4	NO (-44.8%)	NO
02 Office Perimeter South 5	NO (-40.2%)	NO
02 Office Perimeter West 1	NO (-28.7%)	NO
03 Office Open 1	NO (-81.2%)	NO
03 Office Open 2	NO (-68.3%)	NO
03 Office Open 3	NO (-86.9%)	NO
03 Office Open 4	NO (-64.1%)	NO
03 Office Open 5	NO (-78.4%)	NO
03 Office Open 6	NO (-50.2%)	NO
03 Office Perimeter 3	NO (-47.8%)	NO
03 Office Perimeter 4	NO (-35.6%)	NO
03 Office Perimeter 5	NO (-57.9%)	NO
03 Office Perimeter 6	NO (-54.4%)	NO
03 Office Perimeter East 1	NO (-41.9%)	NO
03 Office Perimeter North 1	NO (-57.2%)	NO
03 Office Perimeter North 2	NO (-62.7%)	NO
03 Office Perimeter North 3	NO (-59.6%)	NO
03 Office Perimeter North 4	NO (-53.1%)	NO
03 Office Perimeter North 5	NO (-60%)	NO
03 Office Perimeter South 1	NO (-43.6%)	NO
03 Office Perimeter South 2	NO (-41.1%)	NO
03 Office Perimeter South 3	NO (-41.6%)	NO
03 Office Perimeter South 4	NO (-43.8%)	NO
03 Office Perimeter South 5	NO (-38.2%)	NO
03 Office Perimeter West 1	NO (-28.3%)	NO
04 Office East 1	NO (-48.8%)	NO
04 Office Open 1	NO (-70.2%)	NO
04 Office Open 2	NO (-66.5%)	NO
04 Office Open 3	NO (-81.5%)	NO
04 Office Open 4	NO (-55.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04 Office Open 5	NO (-78.4%)	NO
04 Office Open 6	NO (-50.2%)	NO
04 Office Perimeter 1	NO (-47.6%)	NO
04 Office Perimeter 2	NO (-65.2%)	NO
04 Office Perimeter 2	NO (-35.4%)	NO
04 Office Perimeter 3	NO (-50.7%)	NO
04 Office Perimeter 3	NO (-57.9%)	NO
04 Office Perimeter 4	NO (-54.4%)	NO
04 Office Perimeter 5	NO (-63.4%)	NO
04 Office Perimeter 6	NO (-53.4%)	NO
04 Office Perimeter East 1	NO (-41.9%)	NO
04 Office Perimeter North 1	NO (-58.2%)	NO
04 Office Perimeter North 2	NO (-53.1%)	NO
04 Office Perimeter North 3	NO (-59.9%)	NO
04 Office Perimeter South 1	NO (-39.5%)	NO
04 Office Perimeter South 2	NO (-43.8%)	NO
04 Office Perimeter South 3	NO (-38.2%)	NO
04 Office Perimeter West 1	NO (-27.3%)	NO
05 Office East 1	NO (-44.7%)	NO
05 Office Open 1	NO (-69.4%)	NO
05 Office Open 2	NO (-66.4%)	NO
05 Office Open 3	NO (-55.4%)	NO
05 Office Open 3	NO (-81.5%)	NO
05 Office Open 4	NO (-78.4%)	NO
05 Office Open 5	NO (-50.1%)	NO
05 Office Perimeter 1	NO (-47.6%)	NO
05 Office Perimeter 2	NO (-35.4%)	NO
05 Office Perimeter 2	NO (-63.4%)	NO
05 Office Perimeter 3	NO (-57.9%)	NO
05 Office Perimeter 3	NO (-49.9%)	NO
05 Office Perimeter 4	NO (-54.4%)	NO
05 Office Perimeter 5	NO (-63.5%)	NO
05 Office Perimeter 6	NO (-53.4%)	NO
05 Office Perimeter East 1	NO (-41.9%)	NO
05 Office Perimeter North 1	NO (-58.1%)	NO
05 Office Perimeter North 2	NO (-53.1%)	NO
05 Office Perimeter North 3	NO (-59.9%)	NO
05 Office Perimeter South 1	NO (-39.4%)	NO
05 Office Perimeter South 2	NO (-43.8%)	NO
05 Office Perimeter South 3	NO (-38.2%)	NO
05 Office Perimeter West 1	NO (-27.3%)	NO
06 Office East 1	NO (-31.1%)	NO
06 Office Open 1	NO (-65.7%)	NO
06 Office Open 2	NO (-65.3%)	NO
06 Office Open 3	NO (-50.8%)	NO
06 Office Open 3	NO (-80.2%)	NO
06 Office Open 4	NO (-77.9%)	NO
06 Office Open 5	NO (-48.9%)	NO
06 Office Perimeter 1	NO (-46.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
06 Office Perimeter 2	NO (-33.4%)	NO
06 Office Perimeter 2	NO (-57.4%)	NO
06 Office Perimeter 3	NO (-45.9%)	NO
06 Office Perimeter 4	NO (-57.8%)	NO
06 Office Perimeter 5	NO (-54%)	NO
06 Office Perimeter 6	NO (-60.8%)	NO
06 Office Perimeter 7	NO (-49.9%)	NO
06 Office Perimeter East 1	NO (-41.2%)	NO
06 Office Perimeter North 1	NO (-57.5%)	NO
06 Office Perimeter North 2	NO (-52.6%)	NO
06 Office Perimeter North 3	NO (-59.4%)	NO
06 Office Perimeter South 1	NO (-36.3%)	NO
06 Office Perimeter South 2	NO (-41.7%)	NO
06 Office Perimeter South 3	NO (-35.9%)	NO
06 Office Perimeter West 1	NO (-25.5%)	NO
07 Office East 1	NO (-25.3%)	NO
07 Office Open 1	NO (-61.9%)	NO
07 Office Open 2	NO (-64.9%)	NO
07 Office Open 3	NO (-50.8%)	NO
07 Office Open 3	NO (-80.2%)	NO
07 Office Open 4	NO (-77.9%)	NO
07 Office Open 5	NO (-48.9%)	NO
07 Office Perimeter 1	NO (-46.4%)	NO
07 Office Perimeter 2	NO (-33.2%)	NO
07 Office Perimeter 2	NO (-55.5%)	NO
07 Office Perimeter 3	NO (-45.1%)	NO
07 Office Perimeter 3	NO (-57.8%)	NO
07 Office Perimeter 4	NO (-54%)	NO
07 Office Perimeter 5	NO (-60.8%)	NO
07 Office Perimeter 6	NO (-49.8%)	NO
07 Office Perimeter East 1	NO (-41.2%)	NO
07 Office Perimeter North 1	NO (-57%)	NO
07 Office Perimeter North 2	NO (-52.6%)	NO
07 Office Perimeter North 3	NO (-59.4%)	NO
07 Office Perimeter South 1	NO (-36.1%)	NO
07 Office Perimeter South 2	NO (-41.7%)	NO
07 Office Perimeter South 3	NO (-35.9%)	NO
07 Office Perimeter West 1	NO (-26%)	NO
08 A3 Restaurant 1	NO (-41.3%)	NO
08 A3 Restaurant 2	N/A	N/A
08 Office East 1	NO (-22.1%)	NO
08 Office General	N/A	N/A
08 Office Open 1	NO (-59.8%)	NO
08 Office Open 2	NO (-64.6%)	NO
08 Office Perimeter 1	NO (-46.4%)	NO
08 Office Perimeter 2	NO (-33.2%)	NO
08 Office Perimeter 2	NO (-54.4%)	NO
08 Office Perimeter 3	NO (-44.6%)	NO
08 Office Perimeter North 1	NO (-56.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
08 Office Perimeter South 1	NO (-35.7%)	NO
08 Office Perimeter West 1	NO (-26%)	NO
09 Office East 1	NO (-21.3%)	NO
09 Office Open 1	NO (-59.3%)	NO
09 Office Open 2	NO (-64.6%)	NO
09 Office Perimeter 1	NO (-46.4%)	NO
09 Office Perimeter 2	NO (-33.1%)	NO
09 Office Perimeter 2	NO (-54.3%)	NO
09 Office Perimeter 3	NO (-44.4%)	NO
09 Office Perimeter North 1	NO (-56.7%)	NO
09 Office Perimeter South 1	NO (-35.7%)	NO
09 Office Perimeter West 1	NO (-25.9%)	NO
10 Office East 1	NO (-21.3%)	NO
10 Office Open 1	NO (-59.3%)	NO
10 Office Open 2	NO (-64.6%)	NO
10 Office Perimeter 1	NO (-46.4%)	NO
10 Office Perimeter 2	NO (-33.1%)	NO
10 Office Perimeter 2	NO (-54.3%)	NO
10 Office Perimeter 3	NO (-44.4%)	NO
10 Office Perimeter North 1	NO (-56.7%)	NO
10 Office Perimeter South 1	NO (-35.7%)	NO
10 Office Perimeter West 1	NO (-25.9%)	NO
11 Office East 1	NO (-21.4%)	NO
11 Office Open 1	NO (-59.3%)	NO
11 Office Open 2	NO (-64.6%)	NO
11 Office Perimeter 1	NO (-46.4%)	NO
11 Office Perimeter 2	NO (-54.3%)	NO
11 Office Perimeter 2	NO (-33.2%)	NO
11 Office Perimeter 3	NO (-44.4%)	NO
11 Office Perimeter North 1	NO (-56.7%)	NO
11 Office Perimeter South 1	NO (-35.7%)	NO
11 Office Perimeter West 1	NO (-25.9%)	NO
12 Office East 1	NO (-21.4%)	NO
12 Office Open 1	NO (-59.3%)	NO
12 Office Open 2	NO (-64.6%)	NO
12 Office Perimeter 1	NO (-46.4%)	NO
12 Office Perimeter 2	NO (-54.3%)	NO
12 Office Perimeter 2	NO (-33.2%)	NO
12 Office Perimeter 3	NO (-44.4%)	NO
12 Office Perimeter North 1	NO (-56.8%)	NO
12 Office Perimeter South 1	NO (-35.7%)	NO
12 Office Perimeter West 1	NO (-25.8%)	NO
13 Office East 1	NO (-20.6%)	NO
13 Office Open 1	NO (-60%)	NO
13 Office Open 2	NO (-64.9%)	NO
13 Office Perimeter 1	NO (-46.5%)	NO
13 Office Perimeter 2	NO (-33.2%)	NO
13 Office Perimeter 2	NO (-54.1%)	NO
13 Office Perimeter 3	NO (-44.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
13 Office Perimeter North 1	NO (-56.9%)	NO
13 Office Perimeter South 1	NO (-35.9%)	NO
13 Office Perimeter West 1	NO (-25.1%)	NO
14 Office Open 1	YES (+29.2%)	NO
14 Office Perimeter 1	NO (-47.8%)	NO
14 Office Perimeter 2	NO (-46.2%)	NO
14 Office Perimeter 3	NO (-33%)	NO
14 Office Perimeter 4	NO (-31.3%)	NO
14 Office Perimeter East 1	YES (+0.2%)	NO
14 Office Perimeter North 1	NO (-48.7%)	NO
14 Office Perimeter South 1	NO (-27.2%)	NO
15 Office Open 1	NO (-24.7%)	NO
15 Office Perimeter 1	NO (-64.2%)	NO
15 Office Perimeter 2	NO (-62.9%)	NO
15 Office Perimeter 3	NO (-52.1%)	NO
15 Office Perimeter 4	NO (-53.2%)	NO
15 Office Perimeter East 1	NO (-46%)	NO
15 Office Perimeter North 1	NO (-55.8%)	NO
15 Office Perimeter South 1	NO (-37.9%)	NO
16 Office Open 1	YES (+25.4%)	NO
16 Office Perimeter 1	NO (-48.8%)	NO
16 Office Perimeter 2	NO (-47.3%)	NO
16 Office Perimeter 3	NO (-35.6%)	NO
16 Office Perimeter 4	NO (-34.2%)	NO
16 Office Perimeter East 1	NO (-2.6%)	NO
16 Office Perimeter North 1	NO (-49.5%)	NO
16 Office Perimeter South 1	NO (-30.6%)	NO
17 Office Open 1	NO (-24.7%)	NO
17 Office Perimeter 1	NO (-64.2%)	NO
17 Office Perimeter 2	NO (-62.8%)	NO
17 Office Perimeter 3	NO (-52.1%)	NO
17 Office Perimeter 4	NO (-53.1%)	NO
17 Office Perimeter East 1	NO (-46%)	NO
17 Office Perimeter North 1	NO (-55.8%)	NO
17 Office Perimeter South 1	NO (-37.9%)	NO
18 Office Open 1	YES (+27%)	NO
18 Office Perimeter 1	NO (-48.2%)	NO
18 Office Perimeter 2	NO (-47.8%)	NO
18 Office Perimeter 3	NO (-36.2%)	NO
18 Office Perimeter 4	NO (-33.6%)	NO
18 Office Perimeter East 1	NO (-4.1%)	NO
18 Office Perimeter North 1	NO (-49.5%)	NO
18 Office Perimeter South 1	NO (-30.5%)	NO
19 Office Open 1	NO (-24.2%)	NO
19 Office Perimeter 1	NO (-64.1%)	NO
19 Office Perimeter 2	NO (-62.1%)	NO
19 Office Perimeter 3	NO (-51.5%)	NO
19 Office Perimeter 4	NO (-53%)	NO
19 Office Perimeter East 1	NO (-44.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
19 Office Perimeter North 1	NO (-55.7%)	NO
19 Office Perimeter South 1	NO (-37.9%)	NO
UG B1 Showers 1	N/A	N/A
UG B1 Showers 2	N/A	N/A

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 [m²]	28139.6	28139.6
External area [m²]	21870	21870
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	4	3
Average conductance [W/K]	13671.3	12154.1
Average U-value [W/m²K]	0.63	0.56
Alpha value* [%]	10.09	10

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

Building Use

% Area	Building Type
17	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
83	**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
	D2 General Assembly and Leisure, Night Clubs, and Theatres
	Others: Passenger terminals
	Others: Emergency services
	Others: Miscellaneous 24hr activities
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	2.79	1.87
Cooling	6.03	9.01
Auxiliary	12.82	12.4
Lighting	10.23	22.08
Hot water	4.76	5.8
Equipment*	43.72	43.72
TOTAL**	**36.63**	**51.15**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	96.61	136.68
Primary energy* [kWh/m²]	118.04	147.11
Total emissions [kg/m²]	18.8	24.5

* 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	24.3	86.9	2.2	6.8	14	3.07	3.55	3.36	4.62
	Notional	18.4	151.7	2	11.1	14.4	2.56	3.79	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	13.4	132.4	1.6	12	24.3	2.29	3.07	2.5	4
	Notional	3.2	205	0.3	15	19.3	2.56	3.79	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	29.7	90.7	2.8	7.4	14.6	2.95	3.42	3.23	4.45
	Notional	17.5	152	1.9	11.1	14.4	2.56	3.79	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	206.5	53.3	29.2	6.2	8.2	1.96	2.39	2	3.2
	Notional	1.7	305.5	0.2	22.4	2.3	2.56	3.79	----	----
[ST] Unflued radiant heater, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	31.7	0	9	0	19.1	0.98	0	1	0
	Notional	7.2	0	2.3	0	22.9	0.86	0	----	----
[ST] Unflued radiant heater, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	33.2	0	9.4	0	0	0.98	0	1	0
	Notional	24.4	0	7.8	0	0	0.86	0	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	9.4	112.2	0.9	8.8	15.2	3.04	3.52	3.3	4.62
	Notional	0	305	0	22.4	11.7	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	0000002C:Surf[1]
Floor	0.2	0.18	0000002C:Surf[4]
Roof	0.15	0.12	02000022:Surf[6]
Windows, roof windows, and rooflights	1.5	1.4	0000002C: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	4

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Pope's Road - Planning LEAN

As designed

Date: Fri Mar 20 18:17:18 2020

Administrative information

Building Details

Address: Brixton, London, SW9

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: Name

Telephone number: Phone

Address: Street Address, City, Postcode

Certifier details

Name: Hurley Palmer Flatt

Telephone number: 02074293333

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, $kgCO_2/m^2.annum$	24.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	24.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	19.6
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	GB000034:Surf[0]
Floor	0.25	1.07	1.47	GB000009:Surf[0]
Roof	0.25	0.12	0.12	02000022:Surf[6]
Windows***, roof windows, and rooflights	2.2	1.4	1.4	0000002C:Surf[0]
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/(m²K)]

$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [W/(m²K)]

$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [W/(m²K)]

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

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

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

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

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	4

Building services

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

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

1- Office - Reception

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	2	0.73
Standard value	0.91*	3.2	N/A	1.6^	0.5
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- Speculative Retail A1/A3/D2

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	1.9	0.73
Standard value	0.91*	3.2	N/A	1.6^	0.5
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- Office - Circulation/Stairs/Lobby

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0	0	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

4- Office - OpenOffices (West)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	1.9	0.73
Standard value	0.91*	3.2	N/A	1.6^	0.5
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- Office - OpenOffices (East)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	1.9	0.73
Standard value	0.91*	3.2	N/A	1.6^	0.5
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- Office - Circulation WC

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0	0	-
Standard value	0.86	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

7- Office - Showers/Lockers

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.2	0	0	0.73
Standard value	0.91*	3.2	N/A	N/A	0.5
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.

"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
00 Lobby Office 1	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Lobby Office 2	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 1	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 10	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 2	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 3	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 4	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 5	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 6	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 7	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 8	-	-	-	-	-	-	-	0.2	-	-	N/A
00 Retail 9	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 1 I	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 1 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 2 I	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 2 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 3 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 4 P	-	-	-	-	-	-	-	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
01 Leisure 6 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 7 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Leisure 8 P	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 1	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 14	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 15 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 16 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 17	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 18 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 19 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 2	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 20 (P)	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 3	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 4	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 5	-	-	-	-	-	-	-	0.2	-	-	N/A
01 Retail 6	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Open 6	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter North 5	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 4	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter South 5	-	-	-	-	-	-	-	0.2	-	-	N/A
02 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
02 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
02 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
03 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 3	-	-	-	-	-	-	-	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
03 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Open 6	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter North 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 4	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter South 5	-	-	-	-	-	-	-	0.2	-	-	N/A
03 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
03 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
03 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
04 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Open 6	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
04 Office Perimeter South 3	-	-	-	-	-	-	-	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
04 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
04 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
04 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
05 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
05 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
05 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
05 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
06 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter 7	-	-	-	-	-	-	-	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
06 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
06 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
06 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
06 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
07 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 4	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Open 5	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 5	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter 6	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter North 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter North 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter South 2	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter South 3	-	-	-	-	-	-	-	0.2	-	-	N/A
07 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
07 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
07 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
08 A3 Restaurant 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 A3 Restaurant 2	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office General	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter 2	-	-	-	-	-	-	-	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
08 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
08 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
08 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
09 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
09 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
10 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
10 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
11 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
11 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
12 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Open 2	-	-	-	-	-	-	-	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
12 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
12 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
13 Office East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Open 2	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 Office Perimeter West 1	-	-	-	-	-	-	-	0.2	-	-	N/A
13 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
14 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
14 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
15 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
15 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
16 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter East 1	-	-	-	-	-	-	-	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
16 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
16 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
17 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
17 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
18 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
18 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
19 Office Open 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 2	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 3	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter 4	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter East 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter North 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 Office Perimeter South 1	-	-	-	-	-	-	-	0.2	-	-	N/A
19 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
UG B1 Showers 1	-	-	-	2	-	-	-	-	-	-	N/A
UG B1 Showers 2	-	-	-	2	-	-	-	-	-	-	N/A
UG B1 WC 1	0.5	-	-	-	-	-	-	-	-	-	N/A
UG B1 WC 2	0.5	-	-	-	-	-	-	-	-	-	N/A
UG B1 WC 3	0.5	-	-	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00 Circulation 1	-	90	-	541
00 Circulation 2	-	90	-	112
00 Circulation 3	-	90	-	62
00 Circulation 4	-	90	-	895

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
00 Circulation 5	-	90	-	60
00 Circulation 6	-	90	-	89
00 Circulation 7	-	90	-	53
00 Lobby Office 1	-	100	22	159
00 Lobby Office 2	-	100	22	146
00 Plant 1	125	-	-	248
00 Retail 1	-	100	22	2046
00 Retail 10	-	100	22	889
00 Retail 2	-	100	22	1981
00 Retail 3	-	100	22	270
00 Retail 4	-	100	22	278
00 Retail 5	-	100	22	685
00 Retail 6	-	100	22	656
00 Retail 7	-	100	22	515
00 Retail 8	-	100	22	622
00 Retail 9	-	100	22	867
00 Stairs 1	-	90	-	51
00 Stairs 2	-	90	-	52
00 Stairs 3	-	90	-	45
00 Stairs 4	-	90	-	49
00 Store 1	125	-	-	51
01 Circulation 1	-	90	-	62
01 Circulation 2	-	90	-	53
01 Circulation 3	-	90	-	89
01 Circulation 4	-	90	-	25
01 Circulation 5	-	90	-	341
01 Circulation 6	-	90	-	304
01 Circulation 7	-	90	-	26
01 Leisure 1 I	-	125	-	348
01 Leisure 1 P	-	125	-	272
01 Leisure 2 I	-	125	-	96
01 Leisure 2 P	-	125	-	55
01 Leisure 3 P	-	125	-	33
01 Leisure 4 P	-	125	-	46
01 Leisure 6 P	-	125	-	31
01 Leisure 7 P	-	125	-	50
01 Leisure 8 P	-	125	-	265
01 Retail 1	-	100	22	296
01 Retail 14	-	100	22	1386
01 Retail 15 (P)	-	100	22	1086
01 Retail 16 (P)	-	100	22	213
01 Retail 17	-	100	22	1419
01 Retail 18 (P)	-	100	22	763

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
01 Retail 19 (P)	-	100	22	1236
01 Retail 2	-	100	22	311
01 Retail 20 (P)	-	100	22	226
01 Retail 3	-	100	22	486
01 Retail 4	-	100	22	463
01 Retail 5	-	100	22	685
01 Retail 6	-	100	22	656
01 Stairs 1	-	90	-	51
01 Stairs 2	-	90	-	52
01 Stairs 3	-	90	-	45
01 Stairs 4	-	90	-	49
02 Circulation 1	-	100	-	56
02 Circulation 2	-	100	-	48
02 Circulation 3	-	100	-	80
02 Circulation 4	-	100	-	22
02 Circulation 5	-	100	-	23
02 Circulation 6	-	100	-	155
02 Office Open 1	120	-	-	746
02 Office Open 2	120	-	-	1049
02 Office Open 3	120	-	-	779
02 Office Open 4	120	-	-	358
02 Office Open 5	120	-	-	964
02 Office Open 6	120	-	-	116
02 Office Perimeter 1	120	-	-	127
02 Office Perimeter 2	120	-	-	133
02 Office Perimeter 3	120	-	-	109
02 Office Perimeter 4	120	-	-	112
02 Office Perimeter East 1	120	-	-	67
02 Office Perimeter North 1	120	-	-	389
02 Office Perimeter North 2	120	-	-	308
02 Office Perimeter North 3	120	-	-	703
02 Office Perimeter North 4	120	-	-	213
02 Office Perimeter North 5	120	-	-	757
02 Office Perimeter South 1	120	-	-	293
02 Office Perimeter South 2	120	-	-	369
02 Office Perimeter South 3	120	-	-	794
02 Office Perimeter South 4	120	-	-	735
02 Office Perimeter South 5	120	-	-	211
02 Office Perimeter West 1	120	-	-	461
02 Stairs 1	-	100	-	46
02 Stairs 2	-	100	-	47
02 Stairs 3	-	100	-	40
02 Stairs 4	-	100	-	44

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
02 WC 1	-	100	-	123
02 WC 2	-	100	-	119
03 Circulation 1	-	100	-	48
03 Circulation 2	-	100	-	39
03 Circulation 3	-	100	-	67
03 Circulation 4	-	100	-	21
03 Circulation 5	-	100	-	150
03 Circulation 6	-	100	-	22
03 Office Open 1	120	-	-	744
03 Office Open 2	120	-	-	1037
03 Office Open 3	120	-	-	773
03 Office Open 4	120	-	-	332
03 Office Open 5	120	-	-	964
03 Office Open 6	120	-	-	115
03 Office Perimeter 3	120	-	-	123
03 Office Perimeter 4	120	-	-	128
03 Office Perimeter 5	120	-	-	104
03 Office Perimeter 6	120	-	-	107
03 Office Perimeter East 1	120	-	-	67
03 Office Perimeter North 1	120	-	-	388
03 Office Perimeter North 2	120	-	-	304
03 Office Perimeter North 3	120	-	-	695
03 Office Perimeter North 4	120	-	-	207
03 Office Perimeter North 5	120	-	-	741
03 Office Perimeter South 1	120	-	-	288
03 Office Perimeter South 2	120	-	-	366
03 Office Perimeter South 3	120	-	-	786
03 Office Perimeter South 4	120	-	-	718
03 Office Perimeter South 5	120	-	-	204
03 Office Perimeter West 1	120	-	-	457
03 Stairs 1	-	100	-	39
03 Stairs 2	-	100	-	40
03 Stairs 3	-	100	-	35
03 Stairs 4	-	100	-	38
03 WC 1	-	100	-	110
03 WC 2	-	100	-	108
04 Circulation 1	-	100	-	48
04 Circulation 2	-	100	-	39
04 Circulation 3	-	100	-	67
04 Circulation 4	-	100	-	21
04 Circulation 5	-	100	-	22
04 Office East 1	120	-	-	380
04 Office Open 1	120	-	-	416

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
04 Office Open 2	120	-	-	998
04 Office Open 3	120	-	-	278
04 Office Open 4	120	-	-	351
04 Office Open 5	120	-	-	964
04 Office Open 6	120	-	-	115
04 Office Perimeter 1	120	-	-	123
04 Office Perimeter 2	120	-	-	126
04 Office Perimeter 2	120	-	-	128
04 Office Perimeter 3	120	-	-	131
04 Office Perimeter 3	120	-	-	104
04 Office Perimeter 4	120	-	-	107
04 Office Perimeter 5	120	-	-	233
04 Office Perimeter 6	120	-	-	217
04 Office Perimeter East 1	120	-	-	67
04 Office Perimeter North 1	120	-	-	593
04 Office Perimeter North 2	120	-	-	207
04 Office Perimeter North 3	120	-	-	741
04 Office Perimeter South 1	120	-	-	672
04 Office Perimeter South 2	120	-	-	718
04 Office Perimeter South 3	120	-	-	204
04 Office Perimeter West 1	120	-	-	457
04 Stairs 1	-	100	-	39
04 Stairs 2	-	100	-	40
04 Stairs 3	-	100	-	35
04 Stairs 4	-	100	-	38
04 WC 1	-	100	-	104
04 WC 2	-	100	-	108
05 Circulation 1	-	100	-	48
05 Circulation 2	-	100	-	39
05 Circulation 3	-	100	-	67
05 Circulation 4	-	100	-	21
05 Circulation 5	-	100	-	22
05 Office East 1	120	-	-	380
05 Office Open 1	120	-	-	416
05 Office Open 2	120	-	-	998
05 Office Open 3	120	-	-	351
05 Office Open 3	120	-	-	278
05 Office Open 4	120	-	-	964
05 Office Open 5	120	-	-	115
05 Office Perimeter 1	120	-	-	123
05 Office Perimeter 2	120	-	-	128
05 Office Perimeter 2	120	-	-	126
05 Office Perimeter 3	120	-	-	104

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
05 Office Perimeter 3	120	-	-	131
05 Office Perimeter 4	120	-	-	107
05 Office Perimeter 5	120	-	-	233
05 Office Perimeter 6	120	-	-	217
05 Office Perimeter East 1	120	-	-	67
05 Office Perimeter North 1	120	-	-	593
05 Office Perimeter North 2	120	-	-	207
05 Office Perimeter North 3	120	-	-	741
05 Office Perimeter South 1	120	-	-	672
05 Office Perimeter South 2	120	-	-	718
05 Office Perimeter South 3	120	-	-	204
05 Office Perimeter West 1	120	-	-	457
05 Stairs 1	-	100	-	39
05 Stairs 2	-	100	-	40
05 Stairs 3	-	100	-	35
05 Stairs 4	-	100	-	38
05 WC 1	-	100	-	104
05 WC 2	-	100	-	108
06 Circulation 1	-	100	-	48
06 Circulation 2	-	100	-	39
06 Circulation 3	-	100	-	67
06 Circulation 4	-	100	-	21
06 Circulation 5	-	100	-	22
06 Office East 1	120	-	-	380
06 Office Open 1	120	-	-	416
06 Office Open 2	120	-	-	998
06 Office Open 3	120	-	-	351
06 Office Open 3	120	-	-	278
06 Office Open 4	120	-	-	964
06 Office Open 5	120	-	-	115
06 Office Perimeter 1	120	-	-	123
06 Office Perimeter 2	120	-	-	128
06 Office Perimeter 2	120	-	-	126
06 Office Perimeter 3	120	-	-	131
06 Office Perimeter 4	120	-	-	104
06 Office Perimeter 5	120	-	-	107
06 Office Perimeter 6	120	-	-	233
06 Office Perimeter 7	120	-	-	217
06 Office Perimeter East 1	120	-	-	67
06 Office Perimeter North 1	120	-	-	593
06 Office Perimeter North 2	120	-	-	207
06 Office Perimeter North 3	120	-	-	741
06 Office Perimeter South 1	120	-	-	672

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
06 Office Perimeter South 2	120	-	-	718
06 Office Perimeter South 3	120	-	-	204
06 Office Perimeter West 1	120	-	-	457
06 Stairs 1	-	100	-	39
06 Stairs 2	-	100	-	40
06 Stairs 3	-	100	-	35
06 Stairs 4	-	100	-	38
06 WC 1	-	100	-	104
06 WC 2	-	100	-	108
07 Circulation 1	-	100	-	48
07 Circulation 2	-	100	-	39
07 Circulation 3	-	100	-	67
07 Circulation 4	-	100	-	21
07 Circulation 5	-	100	-	22
07 Office East 1	120	-	-	380
07 Office Open 1	120	-	-	416
07 Office Open 2	120	-	-	998
07 Office Open 3	120	-	-	351
07 Office Open 3	120	-	-	278
07 Office Open 4	120	-	-	964
07 Office Open 5	120	-	-	115
07 Office Perimeter 1	120	-	-	123
07 Office Perimeter 2	120	-	-	128
07 Office Perimeter 2	120	-	-	126
07 Office Perimeter 3	120	-	-	131
07 Office Perimeter 3	120	-	-	104
07 Office Perimeter 4	120	-	-	107
07 Office Perimeter 5	120	-	-	233
07 Office Perimeter 6	120	-	-	217
07 Office Perimeter East 1	120	-	-	67
07 Office Perimeter North 1	120	-	-	593
07 Office Perimeter North 2	120	-	-	207
07 Office Perimeter North 3	120	-	-	741
07 Office Perimeter South 1	120	-	-	672
07 Office Perimeter South 2	120	-	-	718
07 Office Perimeter South 3	120	-	-	204
07 Office Perimeter West 1	120	-	-	457
07 Stairs 1	-	100	-	39
07 Stairs 2	-	100	-	40
07 Stairs 3	-	100	-	35
07 Stairs 4	-	100	-	38
07 WC 1	-	100	-	104
07 WC 2	-	100	-	108

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
08 A3 Restaurant 1	-	70	22	1011
08 A3 Restaurant 2	-	70	22	357
08 Circulation 1	-	100	-	48
08 Circulation 2	-	100	-	31
08 Circulation 3	-	100	-	59
08 Circulation 4	-	100	-	21
08 Circulation 5	-	100	-	22
08 Office East 1	120	-	-	380
08 Office General	120	-	-	432
08 Office Open 1	120	-	-	416
08 Office Open 2	120	-	-	998
08 Office Perimeter 1	120	-	-	123
08 Office Perimeter 2	120	-	-	128
08 Office Perimeter 2	120	-	-	126
08 Office Perimeter 3	120	-	-	131
08 Office Perimeter North 1	120	-	-	593
08 Office Perimeter South 1	120	-	-	672
08 Office Perimeter West 1	120	-	-	457
08 Plant 1	125	-	-	71
08 Plant 2	125	-	-	226
08 Stairs 1	-	100	-	39
08 Stairs 2	-	100	-	40
08 Stairs 3	-	100	-	35
08 Stairs 4	-	100	-	32
08 WC 1	-	100	-	104
08 WC 2	-	100	-	108
09 Circulation 1	-	100	-	48
09 Circulation 5	-	100	-	22
09 Office East 1	120	-	-	380
09 Office Open 1	120	-	-	416
09 Office Open 2	120	-	-	998
09 Office Perimeter 1	120	-	-	123
09 Office Perimeter 2	120	-	-	128
09 Office Perimeter 2	120	-	-	126
09 Office Perimeter 3	120	-	-	131
09 Office Perimeter North 1	120	-	-	593
09 Office Perimeter South 1	120	-	-	672
09 Office Perimeter West 1	120	-	-	457
09 Stairs 1	-	100	-	39
09 Stairs 2	-	100	-	40
09 WC 1	-	100	-	104
10 Circulation 1	-	100	-	48
10 Circulation 5	-	100	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
10 Office East 1	120	-	-	380
10 Office Open 1	120	-	-	416
10 Office Open 2	120	-	-	998
10 Office Perimeter 1	120	-	-	123
10 Office Perimeter 2	120	-	-	128
10 Office Perimeter 2	120	-	-	126
10 Office Perimeter 3	120	-	-	131
10 Office Perimeter North 1	120	-	-	593
10 Office Perimeter South 1	120	-	-	672
10 Office Perimeter West 1	120	-	-	457
10 Stairs 1	-	100	-	39
10 Stairs 2	-	100	-	40
10 WC 1	-	100	-	104
11 Circulation 1	-	100	-	48
11 Circulation 5	-	100	-	22
11 Office East 1	120	-	-	380
11 Office Open 1	120	-	-	416
11 Office Open 2	120	-	-	998
11 Office Perimeter 1	120	-	-	123
11 Office Perimeter 2	120	-	-	126
11 Office Perimeter 2	120	-	-	128
11 Office Perimeter 3	120	-	-	131
11 Office Perimeter North 1	120	-	-	593
11 Office Perimeter South 1	120	-	-	672
11 Office Perimeter West 1	120	-	-	457
11 Stairs 1	-	100	-	39
11 Stairs 2	-	100	-	40
11 WC 1	-	100	-	104
12 Circulation 1	-	100	-	48
12 Circulation 5	-	100	-	22
12 Office East 1	120	-	-	380
12 Office Open 1	120	-	-	416
12 Office Open 2	120	-	-	998
12 Office Perimeter 1	120	-	-	123
12 Office Perimeter 2	120	-	-	126
12 Office Perimeter 2	120	-	-	128
12 Office Perimeter 3	120	-	-	131
12 Office Perimeter North 1	120	-	-	593
12 Office Perimeter South 1	120	-	-	672
12 Office Perimeter West 1	120	-	-	457
12 Stairs 1	-	100	-	39
12 Stairs 2	-	100	-	40
12 WC 1	-	100	-	104

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
13 Circulation 1	-	100	-	48
13 Circulation 5	-	100	-	22
13 Office East 1	120	-	-	381
13 Office Open 1	120	-	-	417
13 Office Open 2	120	-	-	999
13 Office Perimeter 1	120	-	-	123
13 Office Perimeter 2	120	-	-	128
13 Office Perimeter 2	120	-	-	127
13 Office Perimeter 3	120	-	-	131
13 Office Perimeter North 1	120	-	-	593
13 Office Perimeter South 1	120	-	-	672
13 Office Perimeter West 1	120	-	-	458
13 Stairs 1	-	100	-	39
13 Stairs 2	-	100	-	40
13 WC 1	-	100	-	104
14 Circulation 1	-	100	-	48
14 Circulation 2	-	100	-	22
14 Office Open 1	120	-	-	1010
14 Office Perimeter 1	120	-	-	107
14 Office Perimeter 2	120	-	-	109
14 Office Perimeter 3	120	-	-	120
14 Office Perimeter 4	120	-	-	109
14 Office Perimeter East 1	120	-	-	435
14 Office Perimeter North 1	120	-	-	391
14 Office Perimeter South 1	120	-	-	458
14 Stairs 1	-	100	-	39
14 Stairs 2	-	100	-	40
14 WC 1	-	100	-	104
15 Circulation 1	-	100	-	48
15 Circulation 2	-	100	-	22
15 Office Open 1	120	-	-	1010
15 Office Perimeter 1	120	-	-	107
15 Office Perimeter 2	120	-	-	109
15 Office Perimeter 3	120	-	-	120
15 Office Perimeter 4	120	-	-	109
15 Office Perimeter East 1	120	-	-	435
15 Office Perimeter North 1	120	-	-	391
15 Office Perimeter South 1	120	-	-	458
15 Stairs 1	-	100	-	39
15 Stairs 2	-	100	-	40
15 WC 1	-	100	-	104
16 Circulation 1	-	100	-	48
16 Circulation 2	-	100	-	22

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
16 Office Open 1	120	-	-	1010
16 Office Perimeter 1	120	-	-	107
16 Office Perimeter 2	120	-	-	109
16 Office Perimeter 3	120	-	-	120
16 Office Perimeter 4	120	-	-	109
16 Office Perimeter East 1	120	-	-	435
16 Office Perimeter North 1	120	-	-	391
16 Office Perimeter South 1	120	-	-	458
16 Stairs 1	-	100	-	39
16 Stairs 2	-	100	-	40
16 WC 1	-	100	-	104
17 Circulation 1	-	100	-	48
17 Circulation 2	-	100	-	22
17 Office Open 1	120	-	-	1010
17 Office Perimeter 1	120	-	-	107
17 Office Perimeter 2	120	-	-	109
17 Office Perimeter 3	120	-	-	120
17 Office Perimeter 4	120	-	-	109
17 Office Perimeter East 1	120	-	-	435
17 Office Perimeter North 1	120	-	-	391
17 Office Perimeter South 1	120	-	-	458
17 Stairs 1	-	100	-	39
17 Stairs 2	-	100	-	40
17 WC 1	-	100	-	104
18 Circulation 1	-	100	-	48
18 Circulation 2	-	100	-	22
18 Office Open 1	120	-	-	1010
18 Office Perimeter 1	120	-	-	107
18 Office Perimeter 2	120	-	-	109
18 Office Perimeter 3	120	-	-	120
18 Office Perimeter 4	120	-	-	109
18 Office Perimeter East 1	120	-	-	435
18 Office Perimeter North 1	120	-	-	391
18 Office Perimeter South 1	120	-	-	458
18 Stairs 1	-	100	-	39
18 Stairs 2	-	100	-	40
18 WC 1	-	100	-	104
19 Circulation 1	-	100	-	48
19 Circulation 2	-	100	-	22
19 Office Open 1	120	-	-	1010
19 Office Perimeter 1	120	-	-	107
19 Office Perimeter 2	120	-	-	109
19 Office Perimeter 3	120	-	-	120

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
19 Office Perimeter 4	120	-	-	109
19 Office Perimeter East 1	120	-	-	435
19 Office Perimeter North 1	120	-	-	391
19 Office Perimeter South 1	120	-	-	458
19 Stairs 1	-	100	-	39
19 Stairs 2	-	100	-	40
19 WC 1	-	100	-	104
20 Circulation 1	-	100	-	32
20 Stairs 1	-	100	-	39
UG B1 Circulation	-	90	-	61
UG B1 Circulation 1	-	90	-	88
UG B1 Circulation 2	-	90	-	57
UG B1 Circulation 3	-	90	-	62
UG B1 Circulation 4	-	90	-	337
UG B1 Circulation 5	-	90	-	25
UG B1 Circulation 6	-	90	-	20
UG B1 Lockers 1	-	90	-	58
UG B1 Lockers 2	-	90	-	58
UG B1 Plant Room 1	125	-	-	68
UG B1 Plant Room 2	125	-	-	0
UG B1 Plant Room 3	125	-	-	0
UG B1 Plant Room 4	125	-	-	0
UG B1 Plant Room 5	125	-	-	0
UG B1 Plant Room 6	125	-	-	335
UG B1 Showers 1	-	100	-	58
UG B1 Showers 2	-	100	-	57
UG B1 Stairs 1	-	90	-	51
UG B1 Stairs 2	-	90	-	52
UG B1 Stairs 3	-	90	-	50
UG B1 Store Bike 1	125	-	-	106
UG B1 Store Bike 2	125	-	-	96
UG B1 WC 1	-	100	-	41
UG B1 WC 2	-	100	-	40
UG B1 WC 3	-	100	-	226
UG B2 Circulation 1	-	90	-	62
UG B2 Circulation 2	-	90	-	305
UG B2 Circulation 3	-	90	-	61
UG B2 Circulation 4	-	90	-	25
UG B2 Circulation 5	-	90	-	20
UG B2 Circulation 6	-	90	-	427
UG B2 Plant Room 1	125	-	-	323
UG B2 Plant Room 2	125	-	-	787
UG B2 Plant Room 3	125	-	-	461

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
UG B2 Plant Room 4	125	-	-	194
UG B2 Plant Room 5	125	-	-	335
UG B2 Plant Room 6	125	-	-	755
UG B2 Stairs 1	-	90	-	51
UG B2 Stairs 2	-	90	-	52
UG B2 Stairs 3	-	90	-	50

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
00 Lobby Office 1	N/A	N/A
00 Lobby Office 2	N/A	N/A
00 Retail 1	NO (-59.1%)	NO
00 Retail 10	NO (-64%)	NO
00 Retail 2	NO (-45.5%)	NO
00 Retail 3	NO (-50.3%)	NO
00 Retail 4	NO (-51.1%)	NO
00 Retail 5	NO (-64%)	NO
00 Retail 6	NO (-48.8%)	NO
00 Retail 7	NO (-64.1%)	NO
00 Retail 8	NO (-49.4%)	NO
00 Retail 9	NO (-49.8%)	NO
01 Leisure 1 I	NO (-75.9%)	NO
01 Leisure 1 P	NO (-60.5%)	NO
01 Leisure 2 I	NO (-60%)	NO
01 Leisure 2 P	NO (-61.1%)	NO
01 Leisure 3 P	NO (-63.2%)	NO
01 Leisure 4 P	NO (-39.2%)	NO
01 Leisure 6 P	NO (-55.7%)	NO
01 Leisure 7 P	NO (-48.3%)	NO
01 Leisure 8 P	NO (-44.6%)	NO
01 Retail 1	NO (-19.9%)	NO
01 Retail 14	NO (-80.9%)	NO
01 Retail 15 (P)	NO (-59.8%)	NO
01 Retail 16 (P)	NO (-57.5%)	NO
01 Retail 17	NO (-64.9%)	NO
01 Retail 18 (P)	NO (-52.5%)	NO
01 Retail 19 (P)	NO (-42.3%)	NO
01 Retail 2	NO (-41.1%)	NO
01 Retail 20 (P)	NO (-45.1%)	NO
01 Retail 3	NO (-55.1%)	NO
01 Retail 4	NO (-38%)	NO
01 Retail 5	NO (-52.5%)	NO
01 Retail 6	NO (-33.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
02 Office Open 1	NO (-79.9%)	NO
02 Office Open 2	NO (-66.4%)	NO
02 Office Open 3	NO (-85.4%)	NO
02 Office Open 4	NO (-58.7%)	NO
02 Office Open 5	NO (-77.9%)	NO
02 Office Open 6	NO (-51.6%)	NO
02 Office Perimeter 1	NO (-47.6%)	NO
02 Office Perimeter 2	NO (-35.6%)	NO
02 Office Perimeter 3	NO (-64.9%)	NO
02 Office Perimeter 4	NO (-61.5%)	NO
02 Office Perimeter East 1	NO (-46.5%)	NO
02 Office Perimeter North 1	NO (-56.8%)	NO
02 Office Perimeter North 2	NO (-59.2%)	NO
02 Office Perimeter North 3	NO (-60.4%)	NO
02 Office Perimeter North 4	NO (-55%)	NO
02 Office Perimeter North 5	NO (-60.6%)	NO
02 Office Perimeter South 1	NO (-43.2%)	NO
02 Office Perimeter South 2	NO (-40.6%)	NO
02 Office Perimeter South 3	NO (-42.5%)	NO
02 Office Perimeter South 4	NO (-44.8%)	NO
02 Office Perimeter South 5	NO (-40.2%)	NO
02 Office Perimeter West 1	NO (-28.7%)	NO
03 Office Open 1	NO (-81.2%)	NO
03 Office Open 2	NO (-68.3%)	NO
03 Office Open 3	NO (-86.9%)	NO
03 Office Open 4	NO (-64.1%)	NO
03 Office Open 5	NO (-78.4%)	NO
03 Office Open 6	NO (-50.2%)	NO
03 Office Perimeter 3	NO (-47.8%)	NO
03 Office Perimeter 4	NO (-35.6%)	NO
03 Office Perimeter 5	NO (-57.9%)	NO
03 Office Perimeter 6	NO (-54.4%)	NO
03 Office Perimeter East 1	NO (-41.9%)	NO
03 Office Perimeter North 1	NO (-57.2%)	NO
03 Office Perimeter North 2	NO (-62.7%)	NO
03 Office Perimeter North 3	NO (-59.6%)	NO
03 Office Perimeter North 4	NO (-53.1%)	NO
03 Office Perimeter North 5	NO (-60%)	NO
03 Office Perimeter South 1	NO (-43.6%)	NO
03 Office Perimeter South 2	NO (-41.1%)	NO
03 Office Perimeter South 3	NO (-41.6%)	NO
03 Office Perimeter South 4	NO (-43.8%)	NO
03 Office Perimeter South 5	NO (-38.2%)	NO
03 Office Perimeter West 1	NO (-28.3%)	NO
04 Office East 1	NO (-48.8%)	NO
04 Office Open 1	NO (-70.2%)	NO
04 Office Open 2	NO (-66.5%)	NO
04 Office Open 3	NO (-81.5%)	NO
04 Office Open 4	NO (-55.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
04 Office Open 5	NO (-78.4%)	NO
04 Office Open 6	NO (-50.2%)	NO
04 Office Perimeter 1	NO (-47.6%)	NO
04 Office Perimeter 2	NO (-65.2%)	NO
04 Office Perimeter 2	NO (-35.4%)	NO
04 Office Perimeter 3	NO (-50.7%)	NO
04 Office Perimeter 3	NO (-57.9%)	NO
04 Office Perimeter 4	NO (-54.4%)	NO
04 Office Perimeter 5	NO (-63.4%)	NO
04 Office Perimeter 6	NO (-53.4%)	NO
04 Office Perimeter East 1	NO (-41.9%)	NO
04 Office Perimeter North 1	NO (-58.2%)	NO
04 Office Perimeter North 2	NO (-53.1%)	NO
04 Office Perimeter North 3	NO (-59.9%)	NO
04 Office Perimeter South 1	NO (-39.5%)	NO
04 Office Perimeter South 2	NO (-43.8%)	NO
04 Office Perimeter South 3	NO (-38.2%)	NO
04 Office Perimeter West 1	NO (-27.3%)	NO
05 Office East 1	NO (-44.7%)	NO
05 Office Open 1	NO (-69.4%)	NO
05 Office Open 2	NO (-66.4%)	NO
05 Office Open 3	NO (-55.4%)	NO
05 Office Open 3	NO (-81.5%)	NO
05 Office Open 4	NO (-78.4%)	NO
05 Office Open 5	NO (-50.1%)	NO
05 Office Perimeter 1	NO (-47.6%)	NO
05 Office Perimeter 2	NO (-35.4%)	NO
05 Office Perimeter 2	NO (-63.4%)	NO
05 Office Perimeter 3	NO (-57.9%)	NO
05 Office Perimeter 3	NO (-49.9%)	NO
05 Office Perimeter 4	NO (-54.4%)	NO
05 Office Perimeter 5	NO (-63.5%)	NO
05 Office Perimeter 6	NO (-53.4%)	NO
05 Office Perimeter East 1	NO (-41.9%)	NO
05 Office Perimeter North 1	NO (-58.1%)	NO
05 Office Perimeter North 2	NO (-53.1%)	NO
05 Office Perimeter North 3	NO (-59.9%)	NO
05 Office Perimeter South 1	NO (-39.4%)	NO
05 Office Perimeter South 2	NO (-43.8%)	NO
05 Office Perimeter South 3	NO (-38.2%)	NO
05 Office Perimeter West 1	NO (-27.3%)	NO
06 Office East 1	NO (-31.1%)	NO
06 Office Open 1	NO (-65.7%)	NO
06 Office Open 2	NO (-65.3%)	NO
06 Office Open 3	NO (-50.8%)	NO
06 Office Open 3	NO (-80.2%)	NO
06 Office Open 4	NO (-77.9%)	NO
06 Office Open 5	NO (-48.9%)	NO
06 Office Perimeter 1	NO (-46.6%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
06 Office Perimeter 2	NO (-33.4%)	NO
06 Office Perimeter 2	NO (-57.4%)	NO
06 Office Perimeter 3	NO (-45.9%)	NO
06 Office Perimeter 4	NO (-57.8%)	NO
06 Office Perimeter 5	NO (-54%)	NO
06 Office Perimeter 6	NO (-60.8%)	NO
06 Office Perimeter 7	NO (-49.9%)	NO
06 Office Perimeter East 1	NO (-41.2%)	NO
06 Office Perimeter North 1	NO (-57.5%)	NO
06 Office Perimeter North 2	NO (-52.6%)	NO
06 Office Perimeter North 3	NO (-59.4%)	NO
06 Office Perimeter South 1	NO (-36.3%)	NO
06 Office Perimeter South 2	NO (-41.7%)	NO
06 Office Perimeter South 3	NO (-35.9%)	NO
06 Office Perimeter West 1	NO (-25.5%)	NO
07 Office East 1	NO (-25.3%)	NO
07 Office Open 1	NO (-61.9%)	NO
07 Office Open 2	NO (-64.9%)	NO
07 Office Open 3	NO (-50.8%)	NO
07 Office Open 3	NO (-80.2%)	NO
07 Office Open 4	NO (-77.9%)	NO
07 Office Open 5	NO (-48.9%)	NO
07 Office Perimeter 1	NO (-46.4%)	NO
07 Office Perimeter 2	NO (-33.2%)	NO
07 Office Perimeter 2	NO (-55.5%)	NO
07 Office Perimeter 3	NO (-45.1%)	NO
07 Office Perimeter 3	NO (-57.8%)	NO
07 Office Perimeter 4	NO (-54%)	NO
07 Office Perimeter 5	NO (-60.8%)	NO
07 Office Perimeter 6	NO (-49.8%)	NO
07 Office Perimeter East 1	NO (-41.2%)	NO
07 Office Perimeter North 1	NO (-57%)	NO
07 Office Perimeter North 2	NO (-52.6%)	NO
07 Office Perimeter North 3	NO (-59.4%)	NO
07 Office Perimeter South 1	NO (-36.1%)	NO
07 Office Perimeter South 2	NO (-41.7%)	NO
07 Office Perimeter South 3	NO (-35.9%)	NO
07 Office Perimeter West 1	NO (-26%)	NO
08 A3 Restaurant 1	NO (-41.3%)	NO
08 A3 Restaurant 2	N/A	N/A
08 Office East 1	NO (-22.1%)	NO
08 Office General	N/A	N/A
08 Office Open 1	NO (-59.8%)	NO
08 Office Open 2	NO (-64.6%)	NO
08 Office Perimeter 1	NO (-46.4%)	NO
08 Office Perimeter 2	NO (-33.2%)	NO
08 Office Perimeter 2	NO (-54.4%)	NO
08 Office Perimeter 3	NO (-44.6%)	NO
08 Office Perimeter North 1	NO (-56.8%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
08 Office Perimeter South 1	NO (-35.7%)	NO
08 Office Perimeter West 1	NO (-26%)	NO
09 Office East 1	NO (-21.3%)	NO
09 Office Open 1	NO (-59.3%)	NO
09 Office Open 2	NO (-64.6%)	NO
09 Office Perimeter 1	NO (-46.4%)	NO
09 Office Perimeter 2	NO (-33.1%)	NO
09 Office Perimeter 2	NO (-54.3%)	NO
09 Office Perimeter 3	NO (-44.4%)	NO
09 Office Perimeter North 1	NO (-56.7%)	NO
09 Office Perimeter South 1	NO (-35.7%)	NO
09 Office Perimeter West 1	NO (-25.9%)	NO
10 Office East 1	NO (-21.3%)	NO
10 Office Open 1	NO (-59.3%)	NO
10 Office Open 2	NO (-64.6%)	NO
10 Office Perimeter 1	NO (-46.4%)	NO
10 Office Perimeter 2	NO (-33.1%)	NO
10 Office Perimeter 2	NO (-54.3%)	NO
10 Office Perimeter 3	NO (-44.4%)	NO
10 Office Perimeter North 1	NO (-56.7%)	NO
10 Office Perimeter South 1	NO (-35.7%)	NO
10 Office Perimeter West 1	NO (-25.9%)	NO
11 Office East 1	NO (-21.4%)	NO
11 Office Open 1	NO (-59.3%)	NO
11 Office Open 2	NO (-64.6%)	NO
11 Office Perimeter 1	NO (-46.4%)	NO
11 Office Perimeter 2	NO (-54.3%)	NO
11 Office Perimeter 2	NO (-33.2%)	NO
11 Office Perimeter 3	NO (-44.4%)	NO
11 Office Perimeter North 1	NO (-56.7%)	NO
11 Office Perimeter South 1	NO (-35.7%)	NO
11 Office Perimeter West 1	NO (-25.9%)	NO
12 Office East 1	NO (-21.4%)	NO
12 Office Open 1	NO (-59.3%)	NO
12 Office Open 2	NO (-64.6%)	NO
12 Office Perimeter 1	NO (-46.4%)	NO
12 Office Perimeter 2	NO (-54.3%)	NO
12 Office Perimeter 2	NO (-33.2%)	NO
12 Office Perimeter 3	NO (-44.4%)	NO
12 Office Perimeter North 1	NO (-56.8%)	NO
12 Office Perimeter South 1	NO (-35.7%)	NO
12 Office Perimeter West 1	NO (-25.8%)	NO
13 Office East 1	NO (-20.6%)	NO
13 Office Open 1	NO (-60%)	NO
13 Office Open 2	NO (-64.9%)	NO
13 Office Perimeter 1	NO (-46.5%)	NO
13 Office Perimeter 2	NO (-33.2%)	NO
13 Office Perimeter 2	NO (-54.1%)	NO
13 Office Perimeter 3	NO (-44.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
13 Office Perimeter North 1	NO (-56.9%)	NO
13 Office Perimeter South 1	NO (-35.9%)	NO
13 Office Perimeter West 1	NO (-25.1%)	NO
14 Office Open 1	YES (+29.2%)	NO
14 Office Perimeter 1	NO (-47.8%)	NO
14 Office Perimeter 2	NO (-46.2%)	NO
14 Office Perimeter 3	NO (-33%)	NO
14 Office Perimeter 4	NO (-31.3%)	NO
14 Office Perimeter East 1	YES (+0.2%)	NO
14 Office Perimeter North 1	NO (-48.7%)	NO
14 Office Perimeter South 1	NO (-27.2%)	NO
15 Office Open 1	NO (-24.7%)	NO
15 Office Perimeter 1	NO (-64.2%)	NO
15 Office Perimeter 2	NO (-62.9%)	NO
15 Office Perimeter 3	NO (-52.1%)	NO
15 Office Perimeter 4	NO (-53.2%)	NO
15 Office Perimeter East 1	NO (-46%)	NO
15 Office Perimeter North 1	NO (-55.8%)	NO
15 Office Perimeter South 1	NO (-37.9%)	NO
16 Office Open 1	YES (+25.4%)	NO
16 Office Perimeter 1	NO (-48.8%)	NO
16 Office Perimeter 2	NO (-47.3%)	NO
16 Office Perimeter 3	NO (-35.6%)	NO
16 Office Perimeter 4	NO (-34.2%)	NO
16 Office Perimeter East 1	NO (-2.6%)	NO
16 Office Perimeter North 1	NO (-49.5%)	NO
16 Office Perimeter South 1	NO (-30.6%)	NO
17 Office Open 1	NO (-24.7%)	NO
17 Office Perimeter 1	NO (-64.2%)	NO
17 Office Perimeter 2	NO (-62.8%)	NO
17 Office Perimeter 3	NO (-52.1%)	NO
17 Office Perimeter 4	NO (-53.1%)	NO
17 Office Perimeter East 1	NO (-46%)	NO
17 Office Perimeter North 1	NO (-55.8%)	NO
17 Office Perimeter South 1	NO (-37.9%)	NO
18 Office Open 1	YES (+27%)	NO
18 Office Perimeter 1	NO (-48.2%)	NO
18 Office Perimeter 2	NO (-47.8%)	NO
18 Office Perimeter 3	NO (-36.2%)	NO
18 Office Perimeter 4	NO (-33.6%)	NO
18 Office Perimeter East 1	NO (-4.1%)	NO
18 Office Perimeter North 1	NO (-49.5%)	NO
18 Office Perimeter South 1	NO (-30.5%)	NO
19 Office Open 1	NO (-24.2%)	NO
19 Office Perimeter 1	NO (-64.1%)	NO
19 Office Perimeter 2	NO (-62.1%)	NO
19 Office Perimeter 3	NO (-51.5%)	NO
19 Office Perimeter 4	NO (-53%)	NO
19 Office Perimeter East 1	NO (-44.2%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
19 Office Perimeter North 1	NO (-55.7%)	NO
19 Office Perimeter South 1	NO (-37.9%)	NO
UG B1 Showers 1	N/A	N/A
UG B1 Showers 2	N/A	N/A

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]	28139.6	28139.6
External area [m^2]	21870	21870
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	4	3
Average conductance [W/K]	13671.3	12154.1
Average U-value [W/m^2K]	0.63	0.56
Alpha value* [%]	10.09	10

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

Building Use

% Area	Building Type
17	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
83	**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
	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	7.64	4.45
Cooling	6.03	9.01
Auxiliary	12.82	12.4
Lighting	10.23	22.08
Hot water	6.59	6.64
Equipment*	43.72	43.72
TOTAL**	**43.31**	**54.58**

* 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]	96.61	136.68
Primary energy* [kWh/m^2]	115.67	143.12
Total emissions [kg/m^2]	19.6	24.9

* 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	24.3	86.9	8.1	6.8	14	0.83	3.55	0.91	4.62
	Notional	18.4	151.7	5.9	11.1	14.4	0.86	3.79	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	13.4	132.4	4.5	12	24.3	0.83	3.07	0.91	4
	Notional	3.2	205	1	15	19.3	0.86	3.79	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	29.7	90.7	9.9	7.4	14.6	0.83	3.42	0.91	4.45
	Notional	17.5	152	5.6	11.1	14.4	0.86	3.79	----	----
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	206.5	53.3	64.3	6.2	8.2	0.89	2.39	0.91	3.2
	Notional	1.7	305.5	0.5	22.4	2.3	0.86	3.79	----	----
[ST] Unflued radiant heater, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	31.7	0	9	0	19.1	0.98	0	1	0
	Notional	7.2	0	2.3	0	22.9	0.86	0	----	----
[ST] Unflued radiant heater, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	33.2	0	9.4	0	0	0.98	0	1	0
	Notional	24.4	0	7.8	0	0	0.86	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	9.4	112.2	3.1	8.8	15.2	0.84	3.52	0.91	4.62
	Notional	0	305	0	22.4	11.7	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	0000002C:Surf[1]
Floor	0.2	0.18	0000002C:Surf[4]
Roof	0.15	0.12	02000022:Surf[6]
Windows, roof windows, and rooflights	1.5	1.4	0000002C: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	4

APPENDIX C TM52 OVERHEATING RISK ASSESSMENT

Hurley Palmer Flatt

Overheating Risk Assessment

Popes Road

Brixton

London

Date:	20th March 2019	**Issue:**	02
Reference:	WED14106	**Status:**	Issue

Prepared by:	Raphael Amajuoyi	**Date:**	20th March 2020
Edited by:	Annie Marston	**Date:**	20th March 2020
Authorised by:	Annie Marston	**Date:**	27th March 2020
Issuing office:	London Blackfriars		

DOCUMENT CONTROL

Issue	Date	Status	HPF Author	HPF Approval	Notes
01	20/03/20	Issue	20/03/20_RA	20/03/20_AMa	TM52 Overheating Analysis for planning.
02	27/03/20	Issue	20/03/20_RA	27/03/20_AMa	Updated with comments.

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APPENDICES

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1 Executive Summary

In line with GLA requirements, HDR | Hurley Palmer Flatt has been instructed to assess the potential risk of overheating for the commercial office (B1), speculative retail (A1), restaurant (A3) and leisure/gym (D2) areas on the proposed Pope's Road development.

The risk of overheating was assessed in line with CIBSE Guide A, CIBSE TM52 and TM49 methodologies. Sample floors (Office Level 13 and 18 and; Retail units at Levels ground and 01) were selected based on deemed 'worst case' scenarios as such, it is believed that demonstration of compliance with these floors will demonstrate all other floors will pass. The results show that **ALL restaurant and proposed leisure/gym areas PASS** the **overheating criterion for maximum operative temperatures of 26°C**. ALL commercial office areas passed showed no overheating risk by exceeding the maximum operative threshold under the DSY 1 2020 weather file but 2 and 3 perimeter zones marginally exceeded this threshold under the DSY 2 2020 and DSY 3 2020, respectively. These spaces will be assessed further as the design progresses to address possible increases in cooling capacity to minimise any potential risk of overheating. **ALL speculative retail areas PASS the overheating criterion for maximum operative temperatures of 25°C**.

These results are based on limited cooling capacity in the commercial offices and unlimited cooling for speculative areas which are expected to be fitted out by prospective tenants for the retail, restaurant and leisure/gymnasium. It is likely that the assessed spaces will have reduced risk of overheating in weather 2020s scenarios of London Weather Centre DSY1, DSY2 and DSY3 weather files. This approach allows for futureproofing of the mechanical cooling design for the proposed development.

This overheating assessment is based on industry guidance specified herein and associated design data, default values and assumptions, where applicable. As such, variations in gender, percentage of gender, clothing, activity level, etc. may influence the results. Should any variation be proposed we strongly recommend additional overheating and occupancy thermal comfort studies are undertaken and reported on to suit the proposal, prior to any design/operational decisions being finalised.

The above assessments have not considered specific product ranges and possible variations, e.g. manufacturer products, and as such are a design-based study only which may require further review at a later stage, especially during procurement.

2 Introduction

HDR | Hurley Palmer Flatt has been instructed to assess the potential risk of overheating for the proposed Pope's Road mixed-use development, located within the London Borough of Lambeth. As such, it reports on the RIBA Stage 2 design and frozen drawings received from the Adjaye Associates architects issued on the 20th February 2020.

This report documents the assessment of the potential risk of overheating for sample commercial office (B1) spaces and all speculative retail (A1), restaurant (A3) units and leisure/gymnasium (D2) area. This assessment has been carried out for the proposed scheme by way of demonstrating compliance in accordance with CIBSE TM52 'The limits of thermal comfort: avoiding overheating in European buildings', mechanically conditioned buildings.

CIBSE TM52 for mechanically conditioned buildings sets a maximum temperature for different types of indoor spaces. **The guidance states that the operative temperature for the sample commercial office areas should not exceed 26ºC, and not exceed 25ºC in all other spaces (retail, restaurant and leisure/gym) during a typical non-heating season (i.e. 1 May to 30 September).**

Such an assessment is required under 9.4 and detailed in table 11 of the "Energy Assessment Guidance October 2018".

2.1 The Development

The site for the proposed development is located on Pope's Road, approximately 50m north-east of Brixton rail station and 100m from Brixton tube station.

Demolition of the existing building and erection of a part G + 19, part G + 8 storey building comprising flexible A1/A3/B1/D1/D2 uses at basement, ground and first floor, with restaurant (A3) use on floor 8 and B1 accommodation on floors 2 to 19, with plant enclosures at roof level, and associated cycle parking, servicing and all necessary enabling works.

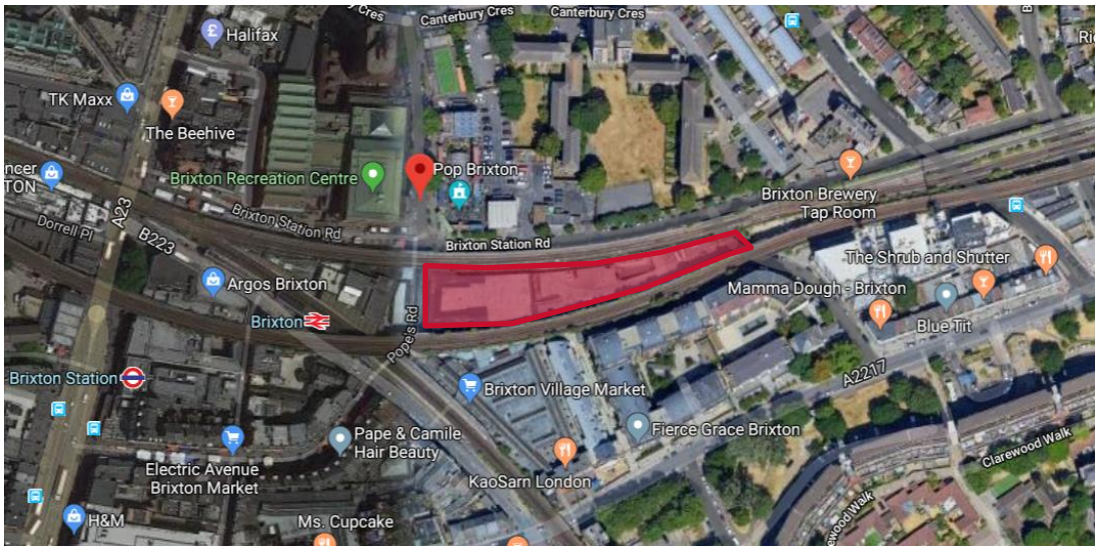

Figure 1: Aerial View of Pope's Road Development site (Source: Google Earth)

3 Assessment Criteria

The risk of overheating and occupancy thermal comfort assessments is based on operative temperatures. Operative temperature is an average of the 'air temperature' and the 'mean radiant temperature'. It expresses the effect of the air temperature, controlled by the HVAC system, and the mean radiant temperature which is largely affected by the building façade design and performance. The target operative temperature necessary to achieve thermal comfort is affected by the following:

- Air temperature
- Air/Wind speed
- Radiant temperature
- Relative humidity
- Clothing level
- Gender and;
- Metabolic rate/Activity level

3.1 Risk of Overheating

This overheating study for the proposed development is assessing sample commercial spaces (i.e. office areas and retail units) against CIBSE TM52 overheating criteria. Guidance within TM52 sets a maximum allowable operative temperature for mechanically conditioned buildings for different space usage types.

The table below is an excerpt from CIBSE TM52 guidance which sets the maximum operative temperature for different types of indoor spaces (Table 4 in section 6.2.2 '*Testing for overheating in mechanically conditioned buildings using operative temperature*') relevant to this study.

Table 1: CIBSE TM52 Maximum temperatures for mechanically conditioned buildings using operative temperature

Type and use of space	Assumed metabolic rate	Summer (Max Temperature ºC)
Residential	1.0	26
Office	1.0	26
Public Spaces (Restaurant)	~1.2	26
Shops (Retail)	1.6	25

These are based on a clothing level of 1.0 in the winter and 0.5 in the summer. Therefore, this has been selected as the limiting design operative temperature to assess for risk of overheating for all assessed spaces.

This assessment is based on industry guidance specified herein and associated design data and assumptions, where applicable. As such variations in gender, percentage of gender, clothing, activity level, etc. will influence the results. Refer to CIBSE TM52 and CIBSE Guide A for further information on assumptions of gender mix and associated heat gains.

Should any variation be proposed we strongly recommend additional overheating studies be undertaken and reported on to suit the proposal, prior to any design or operational decisions being finalised.

4 Modelling Approach and Inputs

The risk of overheating (TM52) has been carried out using 3D dynamic thermal modelling. The simulation tool used for this analysis was Integrated Environmental Solutions (IES) Virtual Environment version 2019.0.0.0, an industry acknowledged software tool providing thermal analysis in accordance the methodologies stated in CIBSE AM11.

The 3D dynamic thermal model was based on Stage 2 architectural drawings for all assessed floors. Sample occupied commercial office areas based on what have been deemed as 'worst case' scenarios alongside all retail, restaurant and leisure/gym areas.

4.1 Climate Analysis

This study uses design summer year (DSY1, DSY2 and DSY3) weather files of the 2020s to assess the risk of overheating with regard to occupancy thermal comfort for all relevant spaces. The 'DSY1' weather file is representative of a moderately warm summer year, 'DSY2' represents a short, intense warm spell and 'DSY3' represents a long, intense warm spell used in line with updated GLA guidance.

The graphs below provide annual hourly temperatures and humidity ratios in London. It should be noted these are reference only as they are based on the London Heathrow dry-bulb and wet-bulb temperatures.

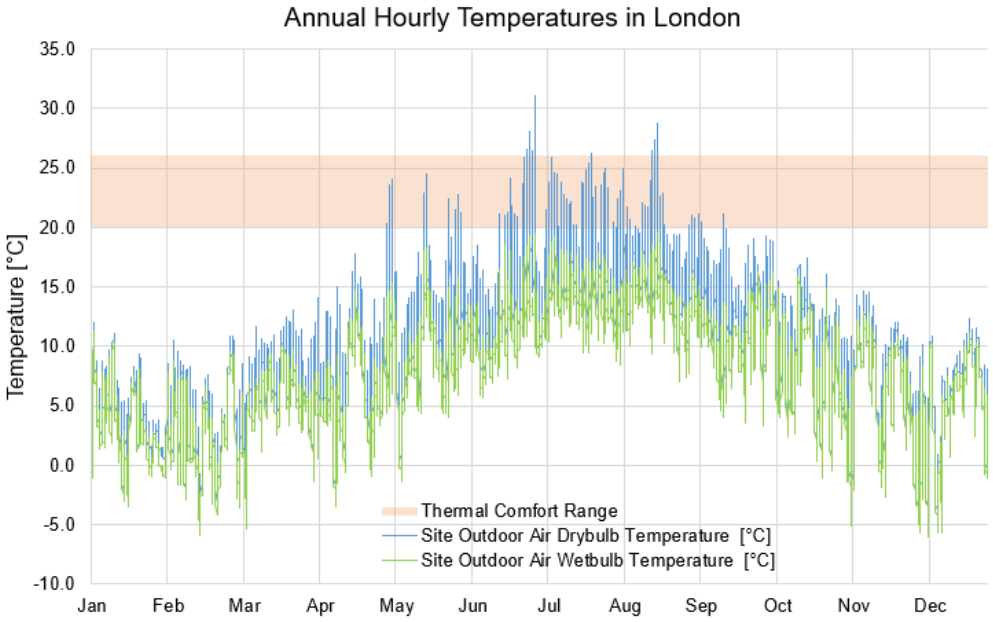

Figure 2: Dry bulb and wet bulb outdoor air temperatures throughout the year

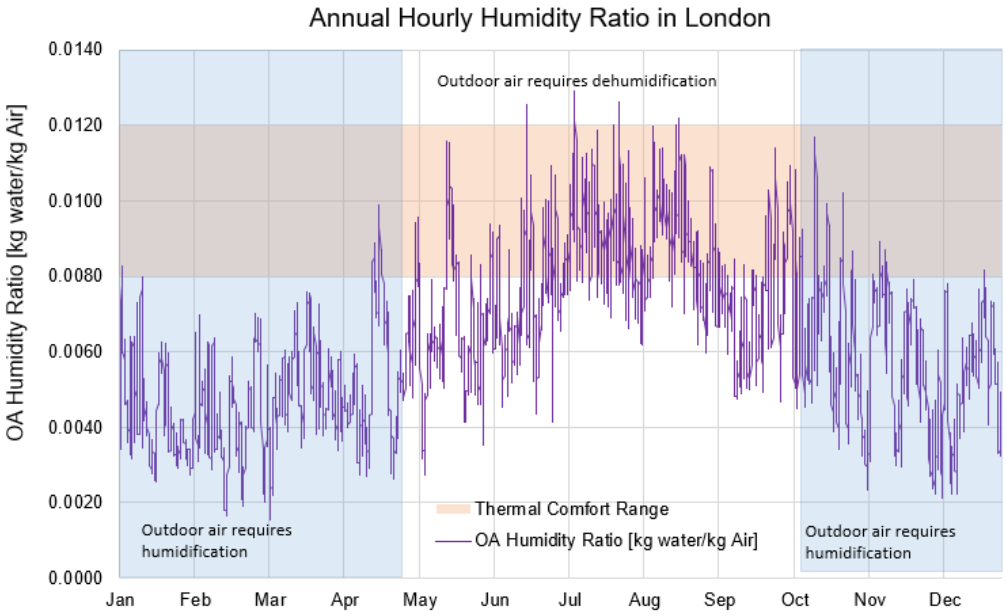

Figure 3: Outdoor air humidity through the year

4.2 Geometry and Constructions (u-values and g-values)

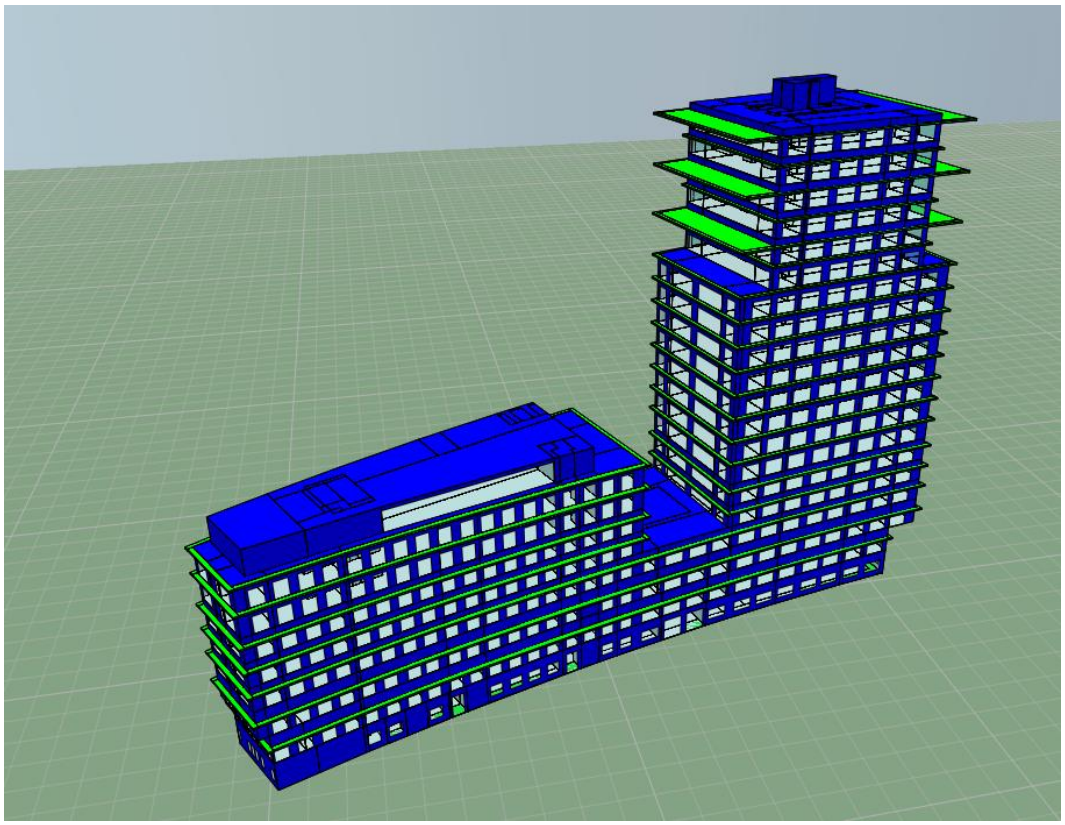

Figure 4: North view in IES model

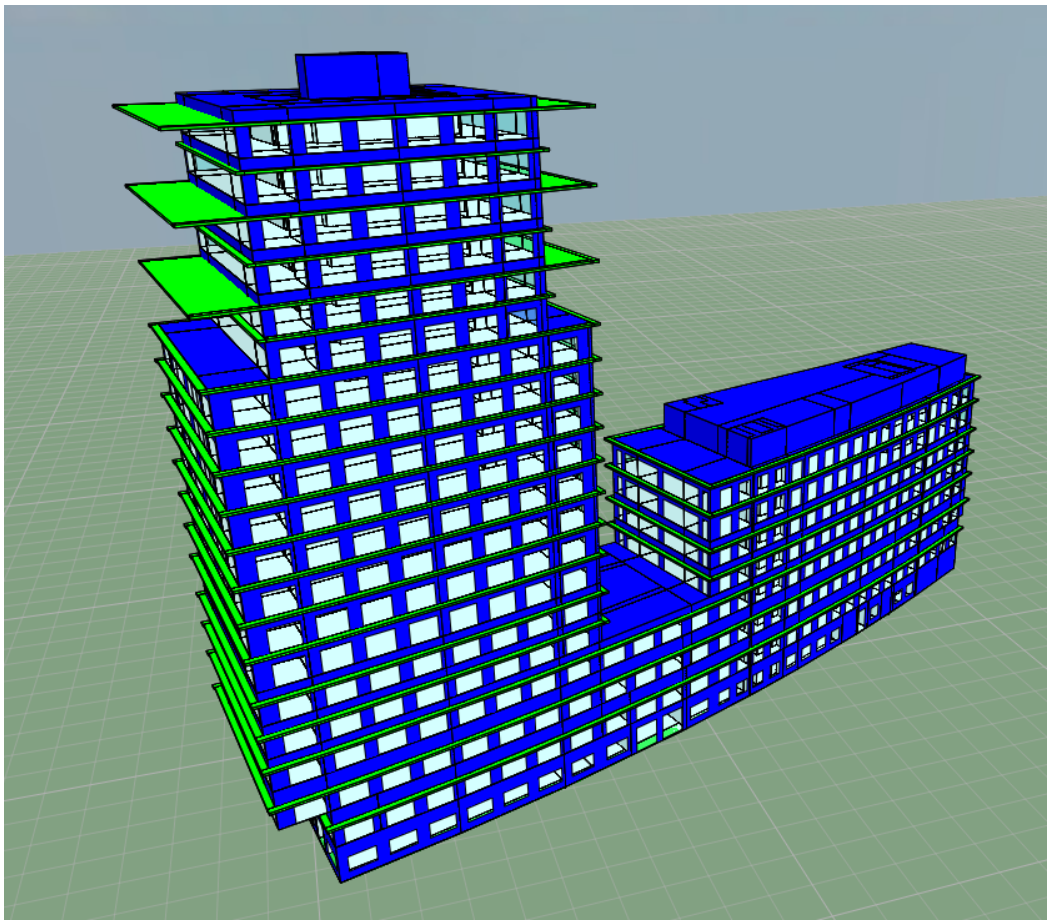

Figure 5: South view in IES model

Table 2: Modelling Details – Construction u-values and g-values

Parameter	Inputs
Exposed (Insulated) Floor	0.15 W/m^2. K
External (Curtain) Wall U-value	0.18 W/m^2. K
Roof U-value	0.12 W/m^2. K
Window	1.4W/m^2. K
Window g-Value	0.40
Air Permeability	3.5 m^3/m^2/hr @ 50Pa
Thermal Bridging allowance	10% degradation of U-value

4.3 Internal Loads

The table below details the occupancy profile, occupancy density, internal gains, lighting power density & radiant fraction assumed for the building (extracted from design MEP services strategy).

Table 3: Modelling Details – Office Occupancy, Lighting and Equipment

Parameter	Inputs
Occupancy:	8m^2/person
Occupancy Gain:	90W/person (sensible) | 50W/person (latent)
Heating Set-point:	20°C

Cooling Set-point	24°C
Lighting Power Density:	8 W/m^2
Lighting Radiant Fraction:	0.45 (NCM data)
Small Power:	25 W/m^2
Schedule:	7am – 7pm
Room Equipment Radiant Fraction:	0.20 (NCM data)
Activity Level (as defined in IES):	90 (Very Light Work)

Table 4: Modelling Details – Retail (A1) Units Occupancy, Lighting and Equipment

Parameter	Inputs
Occupancy:	5m^2/person
Occupancy Gain:	100W/person (sensible) | 60W/person (latent)
Heating Set-point:	20°C
Cooling Set-point	23°C
Lighting Power Density:	25 W/m^2
Lighting Radiant Fraction:	0.45 (NCM data)
Small Power:	5 W/m^2
Schedule:	7am – 7pm
Room Equipment Radiant Fraction:	0.20 (NCM data)
Activity Level (as defined in IES):	90 (Very Light Work)

Table 5: Modelling Details – Restaurant (A3) Units Occupancy, Lighting and Equipment

Parameter	Inputs
Occupancy:	3m^2/person
Occupancy Gain:	90W/person (sensible) | 50W/person (latent)
Heating Set-point:	20°C
Cooling Set-point	23°C
Lighting Power Density:	25 W/m^2
Lighting Radiant Fraction:	0.45 (NCM data)
Small Power:	5 W/m^2
Schedule:	7am – 7pm
Room Equipment Radiant Fraction:	0.20 (NCM data)
Activity Level (as defined in IES):	90 (Very Light Work)

Table 6: Modelling Details – Leisure/Gym (D2) Units Occupancy, Lighting and Equipment

Parameter	Inputs
Occupancy:	3m^2/person
Occupancy Gain:	140W/person (sensible) | 125W/person (latent)
Heating Set-point:	20°C
Cooling Set-point	23°C
Lighting Power Density:	25 W/m^2
Lighting Radiant Fraction:	0.45 (NCM data)
Small Power:	5 W/m^2
Schedule:	7am – 7pm
Room Equipment Radiant Fraction:	0.20 (NCM data)
Activity Level (as defined in IES):	90 (Very Light Work)

4.4 Cooling and HVAC

The cooling capacity is currently being assumed as ‘not limited’ for all assessed commercial office areas, which are deemed to be actively cooled. The proposed allowance at this stage of the design assumes a 30W/m^2 and 74W/m^2 for heating and cooling loads, respectively. As retail (A1), restaurant (A3) and leisure (D2) are being provided for speculative tenants to fit-out, unlimited cooling capacities have been used to assess the potential risk of overheating.

The results presented are therefore based on the cooling equipment being able to achieve the target set-points. Therefore, the specification of cooling equipment to be installed will need to demonstrate the set-points can be achieved as any variation, may alter the validity of the results reported.

5 Results

TM52 criteria were assessed for the three TM49 future weather files DSY1 DSY2 and DSY3 to assess overheating risk.

5.1 TM52 Risk of Overheating – DSY1, DSY2 and DSY3 2020s Weather Files

Using the London Weather Centre (LWC) DSY1 2020 weather files all assessed spaces **PASS** the CIBSE TM52 overheating criterion as no hours are predicted to exceed the maximum allowable operative temperature of 26°C for commercial office, restaurant and leisure/gym spaces or 25°C in retail units as illustrated in Table 6.Almost all spaces demonstrate compliance using the DSY2 2020 and DSY3 2020 weather files with exception to three perimeter commercial office areas, which marginally exceed the maximum operative temperature threshold.

Table 7: Percentage of hours exceeding maximum operative temperature

	DSY1 – 2020s (a moderately warm summer)	DSY2 – 2020s (a more intense single warm spell)	DSY3 – 2020s (a long period of persistent warmth)
13 – Office Open 1	0	0	0
13 – Office Open 2	0	0	0
13 – Office Perimeter North	0	0	0
13 – Office Perimeter South	0	0	0
13 – Office Perimeter West	0	0	0
13 – Office Perimeter East	0	0	0
13 – Office Perimeter 1	0	0	0
13 – Office Perimeter 2	0	0	0
13 – Office Perimeter 3	0	0	0
13 – Office Perimeter 4	0	0	0
18 – Office Open 1	0	0	0
18 – Office Perimeter North	0	0	0
18 – Office Perimeter South	0	0	0
18 – Office Perimeter East	0	0	0.2
18 – Office Perimeter 1	0	0	0
18 – Office Perimeter 2	0	0	0.1
18 – Office Perimeter 3	0	0.1	0.2
18 – Office Perimeter 4	0	0.2	0
00 – Retail-01	0	0	0
00 – Retail-02	0	0	0
00 – Retail-03	0	0	0
00 – Retail-04	0	0	0
00 – Retail-05	0	0	0
00 – Retail-06	0	0	0
00 – Retail-07	0	0	0
00 – Retail-08	0	0	0
00 – Retail-09	0	0	0
00 – Retail-10	0	0	0
00 – Retail-11	0	0	0
00 – Retail-12	0	0	0
00 – Retail-13	0	0	0
00 – Retail-14	0	0	0
00 – Retail-15	0	0	0
00 – Retail-16	0	0	0
00 – Retail-17	0	0	0
00 – Retail-19	0	0	0
00 – Retail-20	0	0	0
00 – Retail-21	0	0	0
00 – Retail-22	0	0	0
00 – Retail-23	0	0	0
00 – Retail-24	0	0	0

00 – Retail-25	0	0	0
00 – Retail-26	0	0	0
00 – Retail-27	0	0	0
00 – Retail-28	0	0	0
00 – Retail-29	0	0	0
00 – Retail-30	0	0	0
00 – Retail-31	0	0	0
00 – Retail-32	0	0	0
00 – Retail-33	0	0	0
00 – Retail-34	0	0	0
00 – Retail Pop-up-01	0	0	0
00 – Retail Pop-up-02	0	0	0
01 – Flex Retail-1 (I)	0	0	0
01 – Flex Retail-2 (I)	0	0	0
01 – Flex Retail-1 (P)	0	0	0
01 – Flex Retail-2 (P)	0	0	0
01 – Flex Retail-3 (P)	0	0	0
01 – Flex Retail-4 (P)	0	0	0
01 – Flex Retail-5 (P)	0	0	0
01 – Retail Pop-up-01	0	0	0
01 – Retail Pop-up-02	0	0	0
01 – Restaurant-01	0	0	0
01 – Restaurant-02	0	0	0
01 – Leisure/Gym-1 (I)	0	0	0
01 – Leisure/Gym-2 (I)	0	0	0
01 – Leisure/Gym-1 (P)	0	0	0
01 – Leisure/Gym-2 (P)	0	0	0
01 – Leisure/Gym-3 (P)	0	0	0
01 – Leisure/Gym-4 (P)	0	0	0
01 – Leisure/Gym-5 (P)	0	0	0
01 – Leisure/Gym-6 (P)	0	0	0
01 – Leisure/Gym-7 (P)	0	0	0
01 – Leisure/Gym-8 (P)	0	0	0

The current set of results show no spaces are deemed to be at risk of overheating in the retail (A1), restaurant (A3) or leisure/gym (D2) areas in accordance with TM52 overheating criterion of mechanically conditioned buildings. Three perimeter zones on the 18th floor suggest a marginal exceedance of the maximum operative temperature, which will be assessed as the design progresses to address possible increases in cooling capacity to minimise any potential risk of overheating.

6.0 Conclusion

The inputs detailed above demonstrate the proposed mixed-use scheme is currently showing a reduced risk of overheating in accordance with TM52 methodology using the 2020s London Weather Centre (LWC) DSY1, DSY2 and DSY3 weather files for almost all assessed spaces.

This approach allows for futureproofing of the mechanical cooling design for the proposed development.

These results are based on limited cooling capacity in the commercial offices and unlimited cooling for speculative areas which are expected to be fitted out by prospective tenants for the retail, restaurant and leisure/gymnasium. It is likely that the assessed spaces will have reduced risk of overheating in weather 2020s scenarios of London Weather Centre DSY1, DSY2 and DSY3 weather files. This approach allows for futureproofing of the mechanical cooling design for the proposed development.

The results based on the current design and inputs modelled suggest a reduced risk of potential overheating across all assessed spaces. As the design progresses these items may need to be reassessed against the criteria to ensure that a reduced risk of overheating remains low.