Planning Report

Energy and Sustainability Statement

Planning Submission

Vinegar Yard Development

Commercial Development

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1 Executive Summary

This report was prepared in October 2021 on behalf of St Thomas Bermondsey Limited for the planning application of Vinegar Yard development, which is bounded, by St Thomas Street, Fenning Street, Vinegar Yard and Snowfields including Nos. 1-7 Fenning Street and No. 9 Fenning Street, SE1 3QR. The site located in London Bridge area in the London Borough of Southwark. The report has been revised in December 2020 to incorporate GLA recommendation to remove the gas-fired CHP from the scheme and replace it by heat pumps to comply with the emerging policy of the new London plan.

Redevelopment of the site to include the demolition of existing buildings, retention and refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof level and 3 basement levels) comprising of café and community space within the warehouse and flexible retail, affordable workspace and flexible office and medical/research floorspace within the new building, cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

The updated scheme seeks to provide flexible medical and research & development floorspace (Use Classes D1 or B1(b)) designed to allow for occupation by Guys and St Thomas' NHS Foundation Trust, but flexible to ensure long term resilience. Levels one to ten of the building will first be offered to Guys and St Thomas' for use as either D1 medical space or B1(b) research & development. The remainder of the upper floors, levels 11 to 18, comprise a B1(a) office use. This configuration reflects Guys and St Thomas's Adaptable Estates Strategy, where buildings are able to accommodate a range of possible functions both physically and by virtue of permitted uses in the long term.

In the event that Guys and St Thomas' do not wish to occupy levels 1 to 10 of the proposed building, it will default to a B1(b) research and development use and will be made available to R&D occupiers whose work can support the SC1 Life Science & Innovation District. Minor changes to the plant configuration at levels 3 and 8 of the building and the retail floorspace at ground floor level would also change as a result of a research and development use. The remainder of the proposed floorspace within the scheme would not change in the event of a research and development occupier taking the building.

The flexible medical and research & development use will be controlled by a suitably worded planning condition and obligation within the Section 106 agreement.

The energy strategy combines the two separate options for the proposed development: **Class D1 Medial & Class B1b research facilities**. The report contains clear separation and variance for both the options in various sections.

The climate emergency dictates urgent and high-impact action from all stakeholders of the proposed Vinegar Yard development, with the ultimate goal of addressing the aims of the Paris Agreement and supporting the UK Government declaration of Net Zero Carbon by 2050.

The various aspect of 'Sustainable Design' for Vinegar Yard is applied against the relevant United Nations Sustainable Development goals, for buildings. These set project-specific targets with the aim to achieve the lowest possible carbon footprint for the proposed development over the Whole Life Cycle of the building.

Figure 1: UN Sustainability Goals for Buildings

All aspect of proposed developments design is highly influenced by various sustainability measures incorporated at concept design & highest of the class sustainability certification targets set from the very outset.

Following are the key achievements for the proposed development leading to a design which responds to the need to tackle climate change.

- **For use class D1 medical**; regulated carbon dioxide savings of **57 %** relative to a New-Build Part L2A 2013 compliant development, using SAP10 carbon factors.
- **For use class B1b research facilities**; regulated carbon dioxide savings of **55%** relative to a New-Build Part L2A 2013 compliant development, using SAP10 carbon factors.
- 35,500 kWh of electricity generated on-site via façade & roof mounted PVs. Equal to powering 25 energy efficient homes for a year.
- 45% reduction in potable water consumption with the application of low drainage for flushing toilets.
- Green Power Purchase Agreement and on-site Energy Generation providing Net Zero Carbon operations from day one.
- Potential of Natural Ventilation system to provide comfort levels during summer months and night purge in combination with exposed soffits.
- Life Cycle Analysis (LCA) using the RICS published standards to assess the embodied carbon impact and inform the early stage building design. The LCA analysis has resulted in embodied carbon savings in line with the RIBA 2020 Climate Challenge Benchmark of **800 kgCO2e/m².**

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- Fossil fuel-free and all-electric development, allowing the building to respond to the effort of the UK's energy sector to tackle climate change by switching to renewables as the lead source of energy, thereby attaining zero carbon operation.

  Building service design incorporating an innovative centralised Air Source Heat-Pump (ASHP) system utilising heat from the cooling waste heat rejection system to perform at high efficiency. The energy strategy, based on the all-electric apparatus, will have no on-site NOx emissions, and will also tackle the heat island effect by absorbing most of the waste energy from the building's cooling system.

  The urban heat island effect created by building cooling rejection systems are often ignored. The reduction of rejection of waste heat at Vinegar Yard will benefit the wellbeing of the on-site occupants but also directly tackle localised overheating in an urban environment.

- The introduction of an energy use intensity target for energy consumption during the operational phase required an early stage detailed CIBSE TM54 analysis to be carried out to inform the selection of the Building Service Strategy.

  The current predicted energy intensity target complies with the UKGBC published 2030 targets of 70 kWh/m²/annum (GIA), for the base build building energy consumption, equal to UK NABERS 4.5 Stars Rating. (Subjected to class and design development)

- BREEAM New Construction 2018 "Shell and Core" targeting an "Excellent" Rating.
- Well, Standard Ready base build building with an aspiration of "Gold Level" certification.
- Energy metering as per the GLA's published guidelines on "Be Seen" and the Better Building Partnerships (BBP) guide for office energy metering.

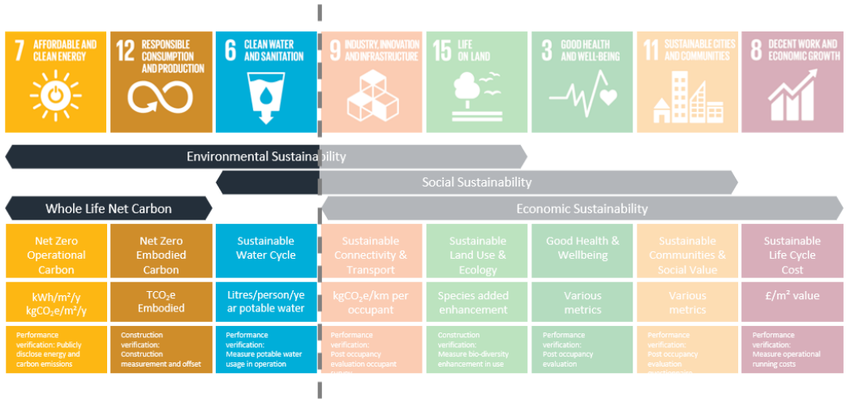

Figure 2: Key UN Sustainable Goals defined for Vinegar Yard Building. Highlighting key goal's for achieving Paris Proof building development.

The energy assessment has been carried out using the adopted methodology outlined in the "Energy Planning: Greater London Authority (GLA) guidance on preparing energy assessments" April 2020 and "The London Plan (2021) adopted in March 2021". The London Plan energy hierarchy is as follows:

1. Be lean: Use less energy.
2. Be clean: Supply energy efficiently.
3. Be green: Use renewable energy.
4. Be Seen: Energy monitoring.

The Proposed Development will need to conform to the requirements set out in Part L 2A (Conservation of Fuel, and Power) of the Building Regulations 2013, and thus submit an energy assessment for the purposes of the planning application. The methodology of carrying out, and reporting predicted energy consumption, and associated carbon emissions are outlined in the Mayor's Energy Hierarchy as detailed in the Energy Assessment Guidance (April -2020).

The concept of applying the Energy Hierarchy in relation to Part L 2013 of the Building Regulations is illustrated in Figure 1 below. Where the dark blue bars drop below the black dotted line, this demonstrates savings in regulated CO_2 emissions compared to a development that complies with Part L 2013 of the Building Regulations.

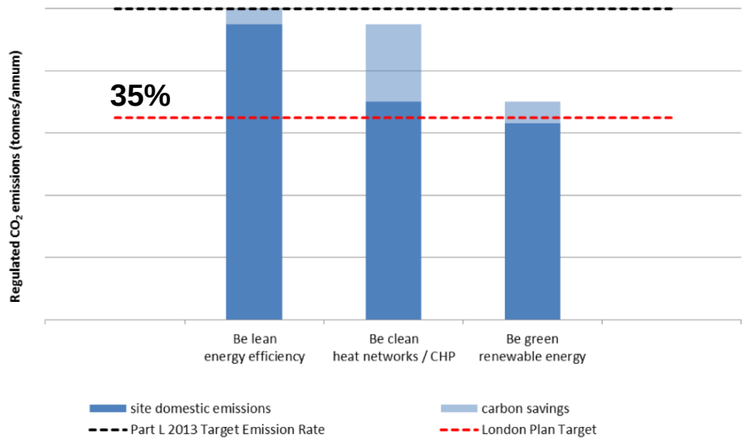

Figure 1 GLA's Non-Domestic Energy Hierarchy

The combination of the optimised passive design measures, energy-efficient plant selection and the low temperature heat pump design, result in an overall annual carbon reduction of **57% (Class D1) and 55% (Class B1b)** relative to the current 2013 Part L2A target emission rate (TER) for the building, using SAP10 carbon numbers.

Grid electricity has significantly decarbonized since the last update of Part L in April 2014, and in July 2018, the Government published updated carbon emission factors

(SAP 10 carbon factors) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations. The Building Regulations Part L uses SAP 2012 carbon factors. Further details can be found in Section 3.

In accordance with the recommendations from the GLA Draft Energy Assessment Guidance issued in April 2020, SAP 10 carbon factors have been reported as well as Building Regulations SAP 2012 carbon factors to consider the decarbonization effect on the grid and provide more realistic carbon emissions estimations.

SAP 10 carbon factors should be used for developments with electricity-driven energy supply, and it is therefore applicable to the Proposed Development. SAP 2012 factors are reported for reference only.

The following tables demonstrate compliance with the energy hierarchy and the carbon targets proposed by the GLA. The commercial areas within the Proposed Development, namely office, retail, leisure spaces, are classified as 'non-domestic areas' as per Building Regulations terminology and will be referred as such throughout the report.

Figure 1-1 – The Proposed Development

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1.1 Non-domestic Operational Carbon Dioxide Emissions

The following tables demonstrate compliance with the energy hierarchy, and the carbon targets proposed by the GLA. The commercial areas within the Proposed Development, namely office, retail, back of the house, are classified as 'non-domestic areas' as per Building Regulations terminology and will be referred as such throughout the report.

1.1.1 SAP 2012 Carbon Factors – Class D1 Medical

Table 1-1 Carbon Dioxide Emissions After Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Energy Planning – Greater London Authority guidance on preparing energy assessment	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	Unregulated Energy
Building Regulations 2013 Part L Compliant Development	600.9	843.3
LEAN - After energy demand reduction	339.2	674.6
CLEAN - Same as Lean	339.2	674.6
GREEN - After Renewable Energy	290.1	674.6

Table 1-2 Regulated Carbon Dioxide Savings from Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Non-domestic areas	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Savings from reduced energy demand	261.7	44%
Savings from Clean Technology	0.0	0.0%
Savings from Renewable Energy	49.2	8%
Total Cumulative Savings	310.9	52%
Total Target Savings - GLA's Target	600.9	100%

1.1.2 SAP 10 Carbon Factors – Class D1 Medical

Table 1-3 Carbon Dioxide Emissions After Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Energy Planning – Greater London Authority guidance on preparing energy assessment	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	Unregulated Energy
Building Regulations 2013 Part L Compliant Development	302.0	378.6
LEAN - After energy demand reduction	199.9	302.9
CLEAN - Same as Lean	199.9	302.9
GREEN - After Renewable Energy	130.0	302.9

Table 1-4 Regulated Carbon Dioxide Savings from Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Non-domestic areas	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Savings from reduced energy demand	102.2	34%
Savings from Clean Technology	0.0	0.0%
Savings from Renewable Energy	69.6	23%
Total Cumulative Savings	171.8	57%
Total Target Savings - GLA's Target	302.0	100%

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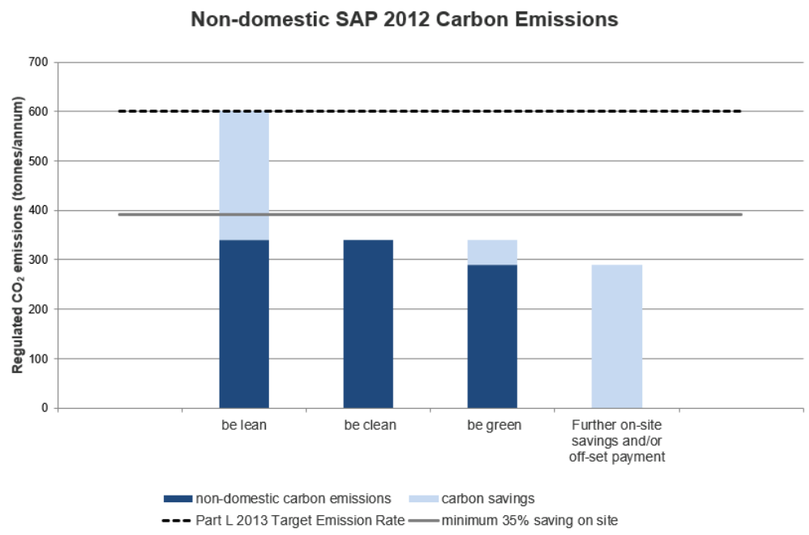

Figure 1-3 GLA's Energy Hierarchy for the Proposed Development as per SAP 2012 Carbon Factors – Class D1

The carbon dioxide emissions savings shown in the bar chart above match the BRUKL outputs enclosed in Appendix A.

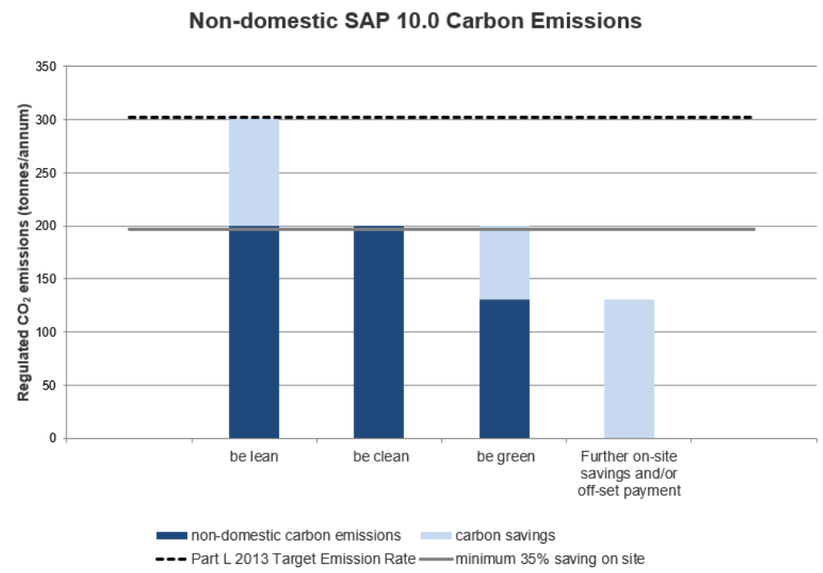

Figure 1-4 GLA's Energy Hierarchy for the Proposed Development as per SAP 10 Carbon Factors – Class D1

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1.1.3 SAP 2012 Carbon Factors – Class B1b Research facility

Table 1-5 Carbon Dioxide Emissions After Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Energy Planning – Greater London Authority guidance on preparing energy assessment	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	Unregulated Energy
Building Regulations 2013 Part L Compliant Development	556.0	846.1
LEAN - After energy demand reduction	329.6	676.9
CLEAN - Same as Lean	329.6	676.9
GREEN - After Renewable Energy	282.1	676.9

Table 1-6 Regulated Carbon Dioxide Savings from Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Non-domestic areas	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Savings from reduced energy demand	226.5	41.0%
Savings from Clean Technology	0.0	0.0%
Savings from Renewable Energy	47.5	9.0%
Total Cumulative Savings	274.0	49.0%
Total Target Savings - GLA's Target	556.0	100%

1.1.4 SAP 10 Carbon Factors – Class B1b Research facility

Table 1-7 Carbon Dioxide Emissions After Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Energy Planning – Greater London Authority guidance on preparing energy assessment	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	Unregulated Energy
Building Regulations 2013 Part L Compliant Development	281.9	379.9
LEAN - After energy demand reduction	193.6	303.9
CLEAN - Same as Lean	193.6	303.9
GREEN - After Renewable Energy	126.6	303.9

Table 1-8 Regulated Carbon Dioxide Savings from Each Stage of The Energy Hierarchy for Non-Domestic Buildings

Non-domestic areas	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Savings from reduced energy demand	88.3	31.0%
Savings from Clean Technology	0.0	0.0%
Savings from Renewable Energy	67.0	24%
Total Cumulative Savings	155.2	55.0%
Total Target Savings - GLA's Target	281.9	100%

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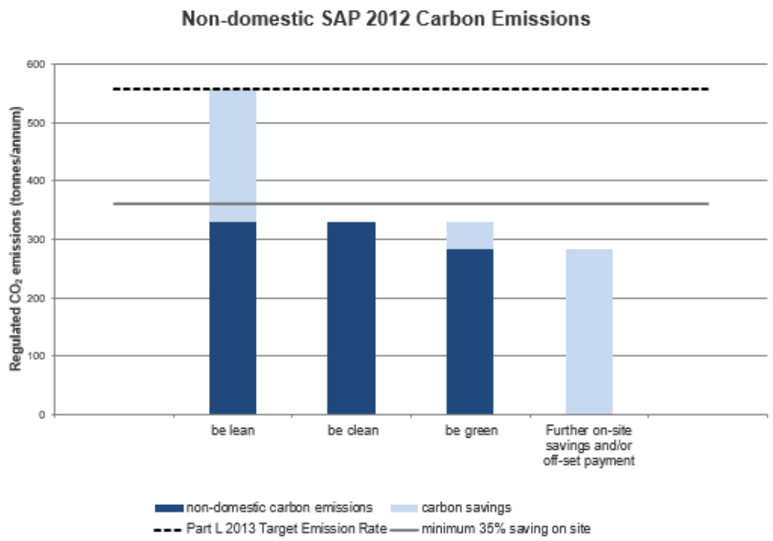

Figure 1-5 GLA's Energy Hierarchy for the Proposed Development as per SAP 2012 Carbon Factors – Class B1b

The carbon dioxide emissions savings shown in the bar chart above match the BRUKL outputs enclosed in Appendix A.

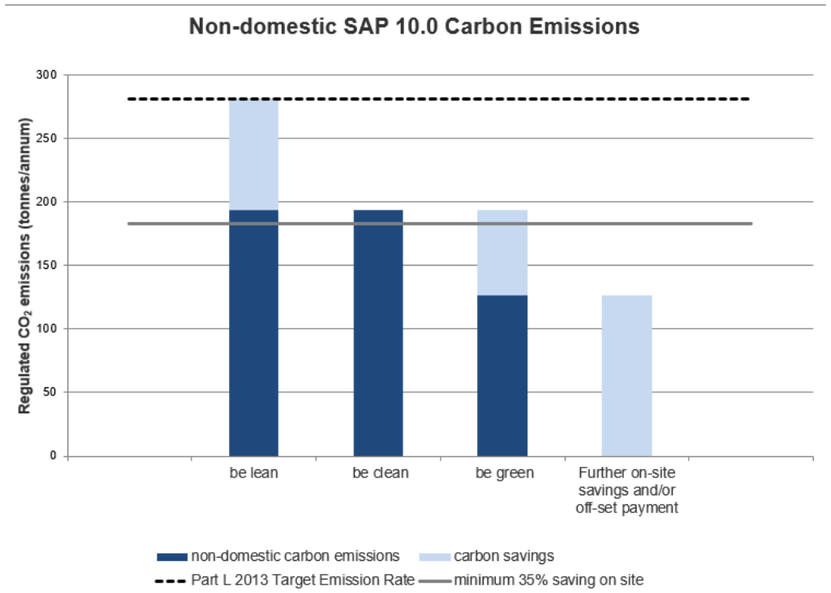

Figure 1-6 GLA's Energy Hierarchy for the Proposed Development as per SAP 10 Carbon Factors – Class B1b

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1.2 Net Zero Operational Carbon

Grid electricity has significantly decarbonised since the last update of Part L in April 2014, and in July 2018, the Government published updated carbon emission factors (SAP 10 carbon factors) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations. The Building Regulations Part L uses SAP 2012 carbon factors.

In accordance with the recommendations from the GLA Draft Energy Assessment Guidance issued in April 2020, SAP 10 carbon factors have been reported as well as Building Regulations SAP 2012 carbon factors to consider the decarbonisation effect on the grid and provide more realistic carbon emissions estimations. As per paragraph 1.7 of the GLA Energy Assessment Guidance (2020), planning applicants are encouraged to use the SAP 10 emission factors for referable applications when estimating CO_2 emission performance against London Plan policies. This will ensure that the assessment of new developments better reflects the actual carbon emissions associated with their expected operation.

SAP 10 carbon factor is therefore **applicable** to the Proposed Development. SAP 2012 factors are reported for reference only. In summary, the proposed development will be net zero carbon for operational energy and construction embodied carbon by:

1. Only purchasing electricity from green energy providers with recognized supply coming from renewable sources from day 1;
2. Committing to a 15-year renewable energy power purchase agreement (PPA);
3. Encouraging tenant's to be adopt "Green Fit-out" and monitor and review landlord performance via Post Occupancy Evaluation;
4. Significantly reducing embodied carbon and mapping performance against a whole life carbon approach using the RICS methodology; and
5. Voluntarily offsetting embodied carbon emissions from construction using recognized standards such as the Gold Standard, or similar.

Therefore, no carbon offset payment will be applied to the Proposed Development.

1.3 Key Policy Documents

During the development of the Project, the planning policies contained within the following key Policy Documents have been considered:

- National Planning Policy Framework (February 2019);
- The new London Plan (March 2021);
- The Adopted Southwark Core Strategy (2011) and Saved Southwark Plan (2007) policies;
- The Draft New Southwark Plan (January 2020) and future updates;
- Other relevant supplementary planning guidance.

LB Southwark is in the process of preparing a new Local Plan that will, upon adoption, replace the saved Southwark Plan policies and Core Strategy. The Examination in Public hearing sessions for the New Southwark Plan ended in April 2021. Most recently the London Borough of Southwark consulted on the Main Modifications to the New Southwark Plan between August and September 2021. It is anticipated the Inspectors Report will be issued in Autumn 2021 and the Cabinet and Council Assembly will consider the Plan for adoption at the end of 2021.

We consider relevant emerging policies in the NSP can be attributed 'significant weight' in the determination of this planning application, given its current state of preparation.

Due to the advanced stages of preparation of the New Southwark Plan, it can be attributed substantial weight in the determination of this planning application.

These documents have informed the clients brief and hence the building design. References to these documents have been made against relevant aspect of design and implementation within the pages below.

2 Introduction

2.1 Purpose of the Report

This report describes the various options for energy and carbon reduction and also contains a sustainability strategy for Vinegar Yard ("Proposed Development").

The figures presented in this report are calculated for the purpose of initial estimates only, using the preliminary information currently available. Hence whilst they can be used to gain an understanding of the benefits of each technology, they must not be taken out of context; establishing the best economic and energy-efficient operation will require more complex analysis of building projected load profiles when these are developed.

2.2 Development Description

Redevelopment of the site to include the demolition of existing buildings, retention and refurbishment of the warehouse and the erection of a ground, mezzanine and 18 storey building (with plant at roof level and 3 basement levels) comprising of café and community space within the warehouse and flexible retail, affordable workspace and flexible office and medical floorspace within the new building, cycle and disabled car parking, servicing, refuse and plant areas, public garden (including soft and hard landscaping), highway improvements and all other associated works.

The updated scheme seeks to provide flexible medical and research & development floorspace (Use Classes D1 or B1(b)) designed to allow for occupation by Guys and St Thomas' NHS Foundation Trust, but flexible to ensure long term resilience. Levels one to ten of the building will first be offered to Guys and St Thomas' for use as either D1 medical space or B1(b) research & development. The remainder of the upper floors, levels 11 to 18, comprise a B1(a) office use. This configuration reflects Guys and St Thomas's Adaptable Estates Strategy, where buildings are able to accommodate a range of possible functions both physically and by virtue of permitted uses in the long term.

In the event that Guys and St Thomas' do not wish to occupy levels 1 to 10 of the proposed building, it will default to a B1(b) research and development use and will be made available to R&D occupiers whose work can support the SC1 Life Science & Innovation District. Minor changes to the plant configuration at levels 3 and 8 of the building and the retail floorspace at ground floor level would also change as a result of a research and development use. The remainder of the proposed floorspace within the scheme would not change in the event of a research and development occupier taking the building.

Table 2-1 Area schedule by planning use based on two options:

Medical Use Scenario – Use Class D1	GIA, m^2
Class B1(a) - Medical use – Levels 11 to 18	**8,207**
Class D1 - Medical Use – Outpatients – Levels 1 to 10	**12,314**
Basement and Mezzanine Affordable Workspace: Flexible use class D1 / B1(b) floorspace	**1,835**
Ground Medical (circulation): Use class	**320**
Ground Affordable Workspace (circulation): Flexible use class D1 / B1(b) floorspace	**117**
Ground Retail: Flexible use classes A1, A2, A3 & A4 floorspace	**408**
Basement Affordable Workspace: Use class B1 floorspace (Southwark Studios)	**1,115**
Plant – Building Service Systems (Mechanical)	**5,827**
Warehouse: First floor Community: Use class D1 floorspace	**180**
Warehouse: Flexible use classes A1, A2, A3 & A4 floorspace	**180**
Total Above Ground	**24,952**
Total Below Ground	**5,551**
TOTAL	**30,503**

Research & Development – Use Class B1(b)	GIA, m^2
Class B1(a) – R&D use – Levels 11 to 18	**8,207**
Class B1(b) – R&D use – Levels 1 to 10	**12,644**
Basement and Mezzanine Affordable Workspace: Flexible use class D1 / B1(b) floorspace	**1,835**
Ground Research & Development (circulation): Use class B1(b)	**320**
Ground Affordable Workspace (circulation): Flexible use class D1 / B1(b) floorspace	**117**
Ground Retail: Flexible use classes A1, A2, A3 & A4 floorspace	**438**
Basement Affordable Workspace: Use class B1 floorspace	**1,115**
Plant – Building Service Systems (Mechanical)	**5,467**
Warehouse: First floor Community: Use class D1 floorspace	**180**
Warehouse: Flexible use classes A1, A2, A3 & A4 floorspace	**180**
Total Above Ground	**24,952**
Total Below Ground	**5,551**
TOTAL	**30,503**

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2.4 Planning Application Boundary

The Vinegar Yard project (which is the redevelopment of St. Thomas, London Bridge car park and adjacent area) bounded by St Thomas Street, Fenning Street, Vinegar Yard and Snowfields including Nos. 1-7 Fenning Street and No. 9 Fenning Street SE1 3QR. The site is located in the London Borough of Southwark.

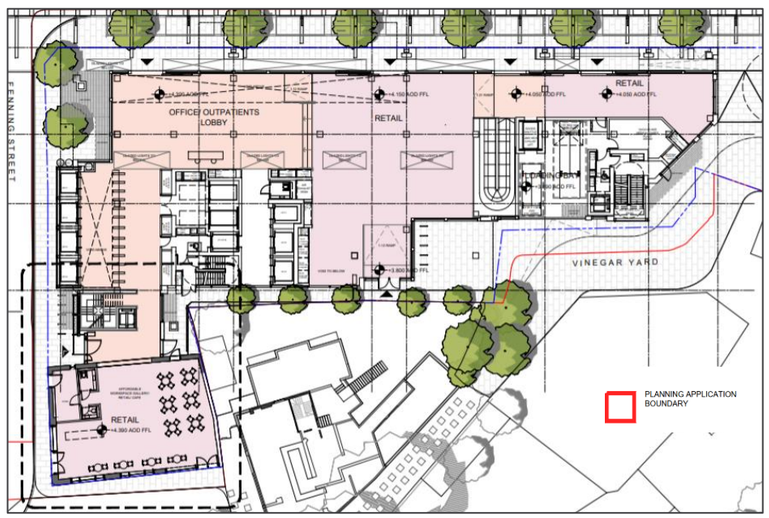

Figure 2-2 – Proposed Development

2.5 Energy Assessor

The energy assessment has been carried out and approved by CIBSE Energy Registered Low Carbon Energy Assessors based at Sweco UK – 1 Bath Road, Maidenhead, SL6 4AQ.

Mr Kartik Amrania

Head of Energy and Sustainability Department
CEng, BEng, MSc, LCC, LCEA

CIBSE LCEA Registration No: LCEA 133950

Email: Kartik.amrania@sweco.co.uk

2.6 Methodology

Sweco UK uses Integrated Environmental Systems' (IES) VE Compliance software to demonstrate Part L2A compliance for the non-domestic areas.

The IES VE Compliance software has been approved by the Department for Communities and Local Government (DCLG) for use as a Dynamic Simulation Model (DSM) software package. As part of its approval process, the IES software had to demonstrate that it satisfies all of the tests and other requirements defined in accordance with ISO 90003:2004 – 'Guidelines for the application of ISO 9001:2000 to computer software.

The methodology used by the IES accredited software is summarised below:

- A three-dimensional software model of the proposed non-domestic areas of the building is generated using the software's Model IT component. This model is based on the architectural drawings and is an accurate geometric representation of the building.
- The building usage is defined for the building as a whole in line with the National Calculation Method's (NCM) various definitions for building uses.
- The building systems are defined and allocated to each of the rooms within the building.
- The software calculates a Building Emissions Rate (BER) based on the geometry of the building, its use and the efficiency of the building systems defined.
- The software automatically generates a notional building using the geometry for the proposed building, but allocating glazing coverage, U-values and plant efficiency in accordance with the Elemental Method as defined in NCM modelling Guide 2013.
- The software calculates an Emissions Rate for the Notional building, which is the Target Emission Rate (TER) for the actual building.

2.7 Architectural Information

The energy model of the building areas uses the architectural design drawings issued by KPF Architects as the Application Submission drawings.

3 Legislation and Planning Policies

3.1 Legislation

3.1.1 Climate Change Act 2008 (2050 Target Amendment)

The Climate Change Act sets legally binding greenhouse gas emission reductions targets of 100% by 2050 (with an interim target of 26% by 2020) against a 1990 baseline, which are to be achieved through action taken in the UK and abroad. It contains provisions to enable the Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address the risk of climate change.

In May 2019, the Climate Change Committee recommended a new emissions target for the UK: net-zero greenhouse gases by 2050 to respond to the Paris Agreement commitments. The recommendation has been adopted by the government and the targets have been amended accordingly in June 2019.

3.1.2 Energy Act 2011

The Act includes provisions for the establishment of the Green Deal, which is a new financing framework to fund improvements to the energy efficiency of domestic and non-domestic properties. This will be paid back through a charge on the energy bill so that there is no upfront cost for consumers. The scheme was cancelled on July 2015.

The Act provides powers to ensure that from April 2018, it will be unlawful to rent out a residential or business property that does not reach a minimum energy efficiency standard (the intention is for this to be set at EPC rating 'E').

3.1.3 Building Regulations Part L 2013 (incorporating 2016 amendments)

The Proposed Development will need to conform to the requirements set out in Part L (Conservation of Fuel and Power) of the Building Regulations 2013.

Approved Documents are issued by the Secretary of State to provide guidance on compliance with specific aspects of building regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be accepted as a reasonable provision for compliance with the relevant requirement(s) of the Building Regulations to which they refer.

Approved Document Part L of the Building Regulations covers the carbon emissions that are attributable to buildings in use, resulting from lighting, heating, cooling and ventilation, excluding small power.

In summary:

- Non-domestic developments come under Part L2A of the Building Regulations 2013 for new buildings.
- A rigid calculation methodology is set out to show compliance. This is the National Calculation Method (NCM) for non-domestic buildings.
- The required maximum carbon emissions can be achieved by any mixture of passive design features (i.e. reducing energy demand) and energy efficiency measures, but minimum standards of thermal performance apply.

In all cases, the carbon emissions achieved are calculated by comparing the proposed design against a target which complies with Building Regulations values.

3.1.4 Building Regulation Part L 2013 applicable to the Proposed Development

The Proposed Development will be assessed under: Part L2A 2013 for the new non-domestic buildings.

It is a requirement that such buildings meet the minimum building regulations in terms of the maximum façade U-values, minimum values for energy efficiencies and minimum values for CO_2 reductions as listed within the Part L requirements, as shown in the following section: Baseline Carbon Emissions.

Fuel CO_2 emission factors are based on SAP 2012 and the NCM document for Part L 2013 compliance, considered within the energy model to calculate the CO_2 emissions that will be produced as a result of the running of the systems, as outlined within the report. Fuel CO_2 emission factors in terms of SAP10 carbon factors are provided as well.

Carbon emission factors are used to calculate the equivalent carbon dioxide emissions associated with different fuels. For example, 1 kWh of power from grid electricity will have a different environmental impact than 1 kWh of power from natural gas as presented in the table on the next page.

Grid electricity has significantly decarbonized since the last update of Part L in April 2014, and in July 2018, the Government published updated carbon emission factors (SAP 10) demonstrating this. These new emission factors will however not be incorporated into Part L of the Building Regulations until the Government has consulted on new Building Regulations. The impact of these new emission factors is significant in that technology generating on-site electricity (such as gas-engine CHP) will not achieve the carbon savings they have to date.

The Proposed Development energy strategy is based on an all-electric heat pump solution with thermal storage and free cooling from summer by-pass from the mechanical ventilation heat recovery units and openings on the facades for natural ventilation. A SAP10 analysis for the development, as per GLA guidelines and tools, has been undertaken using the emission figures, see Appendix B for more details.

Table 3-1 Fuel Factors 2013 Part L and SAP 10

System	Fuel Source	Emission Factor ($KgCO_2/kWh$)	
		SAP 2012	SAP10 (new)
LTHW Heating Energy	Natural Gas	0.216	0.210
Chiller Energy	Grid Electricity	0.519	0.233
Lighting Energy	Grid Electricity	0.519	0.233
Pump / Fan Energy	Grid Electricity	0.519	0.233
DHW Energy	Natural Gas	0.216	0.210

3.1.5 The Future Building Regulations – Part L 2021

The UK Government has committed to introduce the Future Homes Standard in 2025, as part of a journey towards the legal target of all the UKs greenhouse gas emission to be net zero by 2050. At the time of writing this report, the new Part L is under consultation which sets out plans for the Future Homes Standard, including proposed options to increase the energy efficiency requirements for new homes in 2021.

The Future Homes Standard will require new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency; it will be introduced by 2025.

Therefore, the new Part L is to be a meaningful step change (uplift) towards the Future Homes Standard. The intent being to make new homes more energy efficient and to future proof them in readiness for low carbon heating systems.

The consultation document issued by the government, is the first stage of a two-part consultation about proposed changes to the Building Regulations. It also covers the wider impacts of Part L for new homes, including changes to Part F (ventilation), its associated Approved Document guidance, airtightness and improving as-built performance of the constructed home.

In January 2021 the government has finally clarified the implementation of the new Part L. The timescale is as below:

Table 4 - Future Homes Standard implementation timeline	
Timing	Milestones
Phase 1 – Introduce interim 2021 Part L uplift for all building types	
Jan 2021	– Publish *The Future Buildings Standard consultation* document
Dec 2021	– Interim Part L, Part F and Overheating Regulations made for domestic and non-domestic buildings
June 2022	– Interim Part L, Part F and Overheating Regulations come into effect – Developers must submit building notice / initial notice or deposit plans by June 2022, for transitional arrangements to apply
Phase 2 – Technical work and engagement	
Ongoing	– Industry engagement, including through BRAC and technical working groups
Autumn 2021 – summer 2022	– Research and analysis to develop proposed technical specification
Summer 2022 – 2024	– Develop sector-specific guidance and embed understanding of the technical specification of the Future Homes Standard
Phase 3 – Consultation & policy development	
Spring 2023	– Technical consultation on the proposed specification for the Future Homes Standard
Phase 4 – Full FHS implementation	

The first interim target will see Future homes produce 31% less CO_2 emissions compared to current standards.

The government has settled on a revised package of performance metrics that will ensure a fabric first approach is at the heart of all new homes alongside a low carbon heating system. The Fabric Energy Efficiency Standard will be one of four performance metrics that achieve this balance.

To ensure as many homes as possible are being built in line with new energy efficiency standards, transitional arrangements will now apply to individual homes rather than an entire development and the transitional period will be one year

the government as set a reasonable period of one year, which will allow developers 12 months from when Regulations come into effect to commence work on each individual building on site. This is in line with the reasonable period that was in place for the 2013 Part L uplift; however, we recognise that applying this to individual buildings is a significant change.

Transitional arrangements in practice

- For transitional arrangements to apply to an individual building, developers will need to both:

  i. Submit a building / initial notice or deposited plans by June 2022; and
  ii. Commence work on each individual building by June 2023.

- Where notices or plans are submitted after June 2022, transitional arrangements will not apply, and homes must be built in line with 2021 Part L standards.
- Where notices or plans are submitted before June 2022 but work on any individual building does not commence by June 2023; the uncommented buildings must build in line with 2021 Part L standards.
- No individual building will need to change once building work has commenced, in line with the definition on commencement below, if work commences within the

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reasonable period. However, developers will need to plan their sites appropriately, and if work on a building commences outside of the reasonable period, they will need to ensure that it is compliant with new standards.

- For the purposes of transition, commencement will not change from the existing 2013 definitions

    a. Excavation for strip or trench foundations or for pad footings.
    b. Digging out and preparation of ground for raft foundations.
    c. Vibrofloatation (stone columns) piling, boring for piles or pile driving.
    d. Drainage works specific to the building(s) concerned.

3.2 Planning Polices

3.2.1 **National Planning Policy Framework (NPPF), England**

In July 2021, the Ministry of Housing, Communities, and Local Government revised the issue of National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England, and how development should happen in the country.

Chapter 14: "Meeting the challenge of climate change, flooding, and coastal change" is NPPF's relevant section to this energy, and sustainability statement. That chapter provides a framework for local authorities to address the following issues as regards planning applications: (Key paragraphs extracted)

The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

- New development should be planned for in ways that:

a) Avoid increased vulnerability to the range of impacts arising from climate change. When a new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and

b) Can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

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

c) Provide a positive strategy for energy from these sources, that maximises the potential for a suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape, and visual impacts);

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

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

Local planning authorities should support community-led initiatives for renewable, and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.

- In determining planning applications, local planning authorities should expect new development to:

f) Comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved, and its design, that this is not feasible or viable; and

g) Take account of landform, layout, building orientation, massing, and landscaping to minimise energy consumption.

- In determining planning applications, local planning authorities should expect new development to:

h) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and

i) approve the application if its impacts are (or can be made) acceptable 54 . Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

3.3 Regional Policies

3.3.1 **The London Plan (2021)**

The Mayor of London published the current “London Plan” in March 2021. This is the Spatial Development Strategy for Greater London. The Development Plan for each London Borough must ultimately comply with the general requirements of the London Plan (2012).

To support borough planners, the Mayor has previously published the following guidance documents through London Renewables: “Integrating Renewable Energy into New Developments: A Toolkit for Planners, Developers and Consultants”, and more recently the Supplementary Planning Guidance, “Sustainable Design and Construction”, 2013.

The London Plan includes planning policies both for reducing energy consumption within buildings and, more significantly, for promoting the use of decentralised electricity generation and renewable energy technologies. These policies cover the

requirements of each borough with respect to Energy strategies and planning applications.

The Energy Planning – 'GLA Guidance on preparing energy assessments as part of planning applications' (April 2020) states the requirements and guidance for energy strategies to ultimately reduce carbon dioxide emissions. These emissions should include those covered by the Building Regulations and those that are not covered by the Building Regulations.

The Mayor of London has declared a climate emergency and has set an ambition for London to be net zero-carbon. This means all new buildings must be net zero carbon. The Mayor's London Plan sets the targets and policies required to achieve this. It includes:

- A net zero-carbon target for all major developments, which has applied to major residential developments since 2016.
- A requirement for all major development to 'be seen' i.e., to monitor and report its energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor's net zero carbon target.
- A requirement for all referable planning applications to calculate and reduce whole life-cycle carbon emissions to fully capture a development's carbon impact.

Therefore, the target reduction on CO_2 emissions of the development according to the GLA's requirements is:

- Zero Carbon for Domestic Areas as compared to a Part L1A Compliant Build.
- Zero Carbon for Non-Domestic Areas as compared to a Part L2A Compliant Build

The London Plan recognises that energy efficiency should come before energy supply considerations and has suggested a simple strategy known as the Energy Hierarchy (Policy SI 2). The process follows good practice in the design of low carbon buildings and comprises four distinct stages and order of application:

1. Use Less Energy (Be Lean).
2. Supply Energy Efficiently (Be Clean).
3. Use Renewable Energy (Be Green).
4. Monitors verify and report on energy performance (Be Seen).

This strategy puts energy efficiency/conservation measures first to reduce the demand for energy, 'Be Lean'. Following this, consideration must be given to supplying the resultant reduced energy demand as efficiently as possible, including to exploit local energy resources (such as secondary heat) and supply energy efficiently, 'Be Clean'. Sources of low or zero carbon and renewable energy technologies should be then be examined for incorporation, 'Be Green'. Lastly, it is a requirement for developments to monitor and report energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor's net zero carbon target, 'Be Seen'.

A minimum on-site reduction of at least 35 per cent beyond Building Regulations. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1. through a cash in lieu contribution to the borough's carbon offset fund, or
2. off-site provided that an alternative proposal is identified, and delivery is certain

As Per London Plan Policy SI 3, developments in Heat Network Priority Areas (HNPAs) (i.e., areas in London where the heat density is sufficient for heat networks to provide a competitive solution for supplying heat to buildings and consumers) should have a communal low-temperature heating system and should select a heat source in accordance with the following heating hierarchy:

a) connect to local existing or planned heat networks

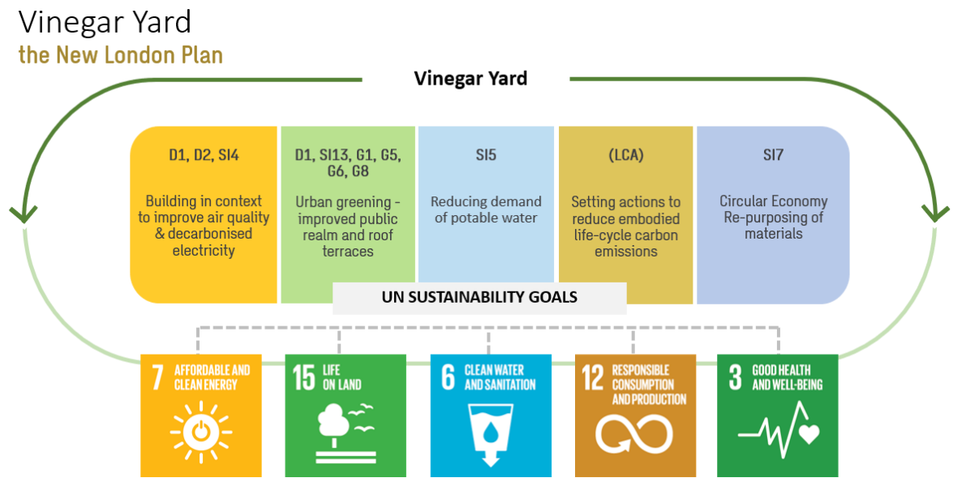
b) use zero-emission or local secondary heat sources (in conjunction with heat pump, if required)
c) use low-emission combined heat and power (only where there is a case for CHP to enable the delivery of an area-wide heat network, meet the development's electricity demand and provide demand response to the local electricity network)
d) use ultra-low NOx gas boilers.

The table below outlines compliance with the London Plan (2021).

Table 3-2 Compliance with London Plan (2021)

London Plan (2021)	Applied measure at the Proposed Development
Policy SI1 Improving Air Quality	Fossil-fuel free development with all-electric energy strategy based on reversible heat pumps (HVRF system) for heating and cooling with no gas-fired combustion engines on-site.
Policy SI2 Minimising greenhouse gas emissions	+25% carbon reduction via passive, and energy-efficient design, and use of green technologies such as high-efficiency HVRF system. Completion of a Whole Life Carbon (WLC) assessment in accordance with the process outlined by the GLA pre-consultation draft.
Policy SI3 Energy Infrastructure	Enabling potential for future connection to district energy networks.
Policy S14 Managing Heat Risk	Extensive passive measures adopted to reduce building cooling demand and mitigate overheating. Increasing urban green coverage on-site by 0.301 UGF (TBC) in comparing with previous buildings
Policy SI5 Water Infrastructure	Extensive water-saving measures to exceed BREEAM 2018 targets, and attenuate surface water run-off. Refer to Sections 10 and accompanying appendices with BREEAM pre-assessment.

London Plan (2021)	Applied measure at the Proposed Development
Policy SI7 Reducing waste, and supporting the circular economy	Relevant BREEAM 2018 credits targeted, life cycle assessment, and early considerations of applying the waste hierarchy through the design. Refer to Section 10, and accompanying appendices with BREEAM pre-assessment, and Draft Circular Economy Statement.
Policy SI8 Waste capacity, and net waste self-sufficiency	Relevant BREEAM 2018 credits targeted. Refer to Section 10 and accompanying appendices with BREEAM pre-assessment.
Policy SI10 Aggregates	Relevant BREEAM 2018 credits targeted, life cycle assessment, and early considerations of applying the waste hierarchy through the design. Refer to Section 10 and accompanying appendices with BREEAM pre-assessment.
Policy SI12 Flood risk management	Relevant BREEAM 2018 credits targeted. Refer to Section 10 and accompanying appendix with BREEAM pre-assessment. And separate submission on flood risk management via specialist consultants



3.3.2 London Environment Strategy – May 2018

The Mayor of London published the London Environment Strategy setting out London's plans to tackle environmental challenges by 2050. The aims are:

- For London to have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health, and minimise inequalities.
- For London to be the world's first National Park City, where more than half of its area is green, where the natural environment is protected, and where the network of green infrastructure is managed to benefit all Londoners.
- For London to be a zero-carbon city by 2050, with energy-efficient buildings, clean transport, and clean energy.
- To make London a zero-waste city. By 2026, no biodegradable or recyclable waste will be sent to landfill, and by 2030, 65 per cent of London's municipal waste will be recycled.
- For London, and Londoners to be resilient to severe weather, and longer-term climate change impacts. This will include flooding, heat risk, and drought.
- For Londoners' quality of life to be improved by reducing the number of people adversely affected by noise, and promoting quieter, and tranquil spaces.
- For London to transition to a low carbon circular economy.

As summarised in Table 3-2, and within section 5 to 11 of this report, the Proposed Development will positively contribute to achieving the objectives set out by the London Environment Strategy.

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3.4 Local Policies – Southwark Council (LBS)

The Development Plan comprises the London Plan (2016) alongside local policies of LBS which relevant for sustainable design and energy strategy for major developments include:

- Southwark saved Plan Policies (2007)
- Core Strategy (CS 2011), April 2011
- New Southwark Plan

Relevant supplementary planning documents (SPD), which are a material consideration, include:

- Sustainability Assessments, (SPD), February 2009
- Sustainable Design and Construction (SPD), February 2009

Some of the policies included in the Southwark Plan 2007 have been replaced by the Core Strategy, CS 2011, including policies pertaining to energy and sustainability. They are namely: SP 1, SP 11 and SP 14 with only Policy 3.5 superseded by the London Plan. In particular, saved policy 3.3 requires economic, social and environmental impacts of the proposal to be addressed through a sustainability assessment in a level of details corresponding to the scale and complexity of the development.

Moreover, Planning Guidance Supplementary Planning Documents (SPD) adopted in September 2009 support and detail the policies within the CS 2011.

The policies relating to Energy and Sustainable Design are outlined in the section "Strategic Policy 13 – High environmental standards" from the CS where the approach is:

"Development will help us live and work in a way that respects the limits of the planet's natural resources, reduces pollution and damage to the environment and helps us adapt to climate change."

LB Southwark is in the process of preparing a new Local Plan that will, upon adoption, replace the saved Southwark Plan policies and Core Strategy. The Examination in Public hearing sessions for the New Southwark Plan ended in April 2021. Most recently the London Borough of Southwark consulted on the Main Modifications to the New Southwark Plan between August and September 2021. It is anticipated the Inspectors Report will be issued in Autumn 2021 and the Cabinet and Council Assembly will consider the Plan for adoption at the end of 2021.

We consider relevant emerging policies in the NSP can be attributed 'significant weight' in the determination of this planning application, given its current state of preparation.

A detailed review of the New Southwark Plan has been carried out by the design team and all key areas of low energy and sustainable design have been adapted for the proposed development.

3.4.1 Borough Wide Strategic Policy - 13: High Environmental Standards

The council wants to achieve this by:

1. Requiring development to meet the highest possible environmental standards, including targets based on BREEAM.
2. Requiring all new development to be designed and built to minimise greenhouse gas emissions across its lifetime. This will be achieved by applying the energy hierarchy:
   a) Designing all developments so that they require as little energy as possible to build and use.
   b) Expecting all major developments to set up and/or connect to local energy generation networks where possible. We will develop local energy networks across Southwark.
   c) Requiring developments to use low and zero-carbon sources of energy.
3. Enabling existing buildings to become more energy-efficient and make use of low and zero-carbon sources of energy.
4. Increasing recycling and composting, minimising waste, reducing landfill and making more use of waste as a resource. By 2015 we will be recycling and composting at least 45% of municipal waste, 50% by 2020 and aspiring to achieve 60% by 2031. By 2020, we will be recycling at least 70% of commercial and industrial waste. Aiming to meet the Mayor's target of recycling or reusing 95% of construction, excavation and demolition waste by 2020.
5. Requiring applicants to demonstrate how they will avoid waste and minimise landfill from construction and use of development.
6. By meeting the London Plan waste apportionment target set for Southwark of managing at least 243,000 tonnes of waste by 2016, at least 275,000 tonnes by 2021 and at least 343,000 tonnes by 2031. Will implement this through a development plan document and our Waste Management strategy. The council are building a state-of-the-art resources centre at Old Kent Road to help meet this target. Enough facilities have been set aside and land to make sure we can fully meet our targets.
7. Requiring developments to minimise water use and use local sources of water where possible.
8. Setting high standards and supporting measures for reducing air, land, water, noise and light pollution and avoiding amenity and environmental problems that affect how we enjoy the environment in which we live and work. This includes making sure developments are designed to cope with climate conditions as they change during the development's lifetime.
9. Allowing development to occur in the protected Thames flood zone as long as it is designed to be safe and resilient to flooding and meets the Exceptions Test. Requiring developments to help reduce flood risk by reducing water run-off, using

sustainable urban drainage systems and avoiding the paving over of gardens and creation of hard standing areas.

Targets

These are the targets development will be expected to meet. They will be updated regularly to reflect changes in national, regional and local policy changes. For the latest targets, visit www.southwark.gov.uk/ldf:

- Residential development should achieve at least Code for Sustainable Homes Level 4.
- Community facilities, including schools, should achieve at least BREEAM "very good".
- New health facilities must be BREEAM "excellent" and any refurbishment should achieve BREEAM "very good."
- All other non-residential development should achieve at least BREEAM "excellent".
- Major development should achieve a 44% saving in carbon dioxide emissions above the building regulations from energy efficiency, efficient energy supply and renewable energy generation.
- Major development must achieve a reduction in carbon dioxide of 20% from using on-site or local low and zero carbon sources of energy.
- Major development must reduce surface water run-off by more than 50%
- Major housing developments must achieve a potable water use target of 105 litres per person per day.

Figure 3-1 energy and environmental targets

Note: *The new build non-domestic development is to comply with the carbon reduction commitment and achieve at least a **35% reduction** in **regulated** carbon emissions (Part L1A 2013 target) (equivalent to 44 % for Part L2A 2010 as mentioned under the above targets).*

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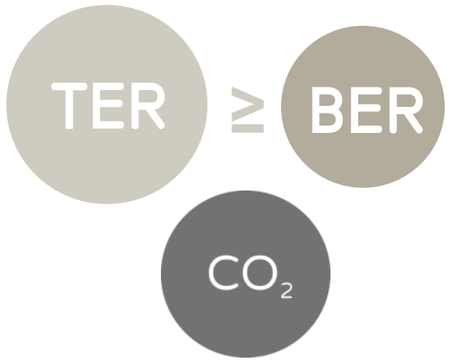
4 'Baseline' Carbon Emissions (TER)

The 'baseline' building represents a development which just meets the minimum standards of CO_2 emissions reduction (i.e. the Building Emissions Rate (BER) is equal to the Target Emissions Rate (TER), as defined by Part L of the Building Regulations 2013).

Allowances for energy consumption not included under Part L have been made by reference to published material or by calculation. These include small power (energy use for electrical appliances). The energy breakdown and carbon dioxide emissions by end-use and area are shown in the tables 4-1.1 to 4-1-4..

As part of the study for the commercial areas of the building, a thermal model of the building was developed and analysed using the approved IES Virtual Environment (VE) Software. This software models the carbon dioxide emission rates produced by a building in accordance with Part L2A of the Building Regulations (2013, including 2016 amendments). The software is approved for use by the Department for Communities and Local Government (DCLG) as a Dynamic Building Simulation Modelling Package (DSM).

Unregulated energy use and the associated carbon dioxide emissions for the non-domestic buildings has been calculated using the BRUKL document (typical output document) and Chartered Institution of Building Services Engineers' (CIBSE) publications for guidance, as well as evidence established through previous development work. Both sets of results, regulated and unregulated energy have been combined to form the tables 4-1.1 to 4-1-4.



4.1.1 Baseline TER: SAP 2012 Carbon Factors – Class D1 Medical

Table 4-1 Target Emission Rate Part L 2013, SAP 2012 Carbon Factors

Building Regulations 2013, Part L Compliant Development	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	**Unregulated Energy**
Non-domestic Buildings (Part L2A)	600.9	843.3

4.1.2 Baseline TER: SAP 10 Carbon Factors – Class D1 Medical

Table 4-2 Target Emission Rate Part L 2013, SAP 10 Carbon Factors

Building Regulations 2013, Part L Compliant Development	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	**Unregulated Energy**
Non-domestic Buildings (Part L2A)	302.0	378.6

4.1.3 Baseline TER: SAP 2012 Carbon Factors – Class B1b Research

Table 4-3 Target Emission Rate Part L 2013, SAP 2012 Carbon Factors

Building Regulations 2013, Part L Compliant Development	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	**Unregulated Energy**
Non-domestic Buildings (Part L2A)	556.0	846.1

4.1.4 Baseline TER: SAP 10 Carbon Factors – Class B1b Research

Table 4-4 Target Emission Rate Part L 2013, SAP 10 Carbon Factors

Building Regulations 2013, Part L Compliant Development	Carbon Dioxide Emissions (Tonnes CO_2 per Annum)	
	Regulated Energy	**Unregulated Energy**
Non-domestic Buildings (Part L2A)	281.9	379.9

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5 'Be Lean' - Reducing Energy Demand

This section of the report details the applied measures at the Proposed Development to reduce energy demand as part of the 'Be Lean' stage of the Energy Hierarchy and is based on the following strategies:

1. "**Fabric First Approach**" – designing of a high thermal performing building envelope, with optimised glazing ratio for daylighting and solar gains management during summer and winter;
2. Integrating thermal mass to the ceiling within the office spaces and provide openings for night-cooling;
3. Mixture of central air handing units for the potential clinical areas and on-floor ventilation strategy for the office to allow for flexibility and lower energy use due to improved energy efficiency;
4. Promoting energy savings and wellness initiatives through smart building strategy;
5. Energy-efficient equipment will be used throughout the development to reduce energy consumption; and
6. Setting an ambitious energy use intensity target (EUI) for operational energy.

5.1 Passive Design Features: Regulated Energy Use

Passive features take advantage of the climate, location and site context to reduce energy demand for regulated energy uses (e.g. heating, cooling, ventilation, lighting and pump energy). Examples of design features include maximising the use of natural resources, such as passive solar heating, daylighting, use of natural ventilation, and designing out unwanted gains through glazing ratio optimization, including thermal mass and greenery for stabilizing temperature conditions.

5.1.1 Building Envelope

The external envelope of a building can acts as an important climatic modifier, with a well-designed façade significantly reducing the buildings energy demand and contributing to a comfortable internal environment by minimising cold draughts and excessive solar heat gains in summer.

The outlined U-values in Table 5-1 are critical to reducing carbon emissions, and coordination on the practically of achieving these U-values has been discussed with the appointed façade consultant and architectural team, the next stages of design will provide more detailed calculations to confirm those.

Table 5-1 Building Fabric Thermal Performance

Parameter		Limiting Value	Notional Value	% Improvement	Target Values
Building Airtightness (@ 50Pa)		10 m³/h/m²	3 m³/h/m²	-	3 m³/h/m²
U-values	External Wall	0.35 W/m²K	0.26 W/m²K	4%	0.25 W/m²K Office/Retail
				23%	0.20 W/m²K Basement
	Roof	0.25 W/m²K	0.18 W/m²K	44%	0.10 W/m²K
	Exposed Floor	0.25 W/m²K	0.22 W/m²K	32%	0.15 W/m²K
	Curtain wall	2.2 W/m²K	1.6 W/m²K	25%	≤1.2 W/m²K (overall: glazing + frame)
Glazing U-value		2.2 W/m²K	1.6 W/m²K	25%	1.2 W/m²K
Pedestrian glazed doors		2.2 W/m²K	2.2 W/m²K	56%	1.2 W/m²K
High-usage entrance doors		3.5 W/m²K	2.2 W/m²K	0%	2.2 W/m²K
Glazing g-value (BS EN 410)		All elevations (offices)			0.33
		Shopfront glazing			≤ 0.5
Glazing Visible Light Transmittance		-	71%	-	≥ 60%
Thermal Mass		N/A			Exposed concrete soffit to perimeter zones
Percentage of Glazing (floor average)		1m high window across each elevation			Average 45%
Thermal Bridging (y-value)		To be calculated by façade specialist			0.05 W/m²K

Notes:

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1. The “Target Values” are the construction parameters applied to the Actual Building simulation model and should be reflective of the average of the actual building element U-value.
2. Glazing g-value can vary based upon exposure to sunlight, in order to balance daylighting against the cooling loads.
3. Above listed U values are targeted for detail design and may vary marginally, depending on buildability and material embodied carbon assessments.

5.1.2 **Site location and microclimate**

The Proposed Development sits in at the junction of St. Thomas Street and Fenning Street. Central London’s microclimate is fundamentally different from other parts of London where higher temperatures can be experienced due to urban heat island impact and within a densely urban environment with potential issues of sunlight availability at ground level during winter months. The design positively responds to the local environmental conditions by:

- Developing a massing that properly optimises the site potential, whilst trying to safeguard daylight and sunlight to existing nearby residential properties;
- Introducing materials with greater level of reflectivity that will enable more light to be reflected into nearby existing properties;
- Proposing light coloured materials to most exposed elevations to contribute to reducing urban heat island effect;
- Locating delivery and servicing routes away from heavily pedestrianised areas and cyclist routes;
- Locating intakes of air supply as far as possible from pollution sources;
- Improving local air quality by prioritizing electricity-based energy supply without on-site fossil fuels; and
- Providing more greenery to street level and terraces with green roofs across several floors.

The height of the neighbouring buildings can aid in mitigating direct solar radiation by providing appropriate amount of shading which has been recognised and accounted for in the energy model.

5.1.3 **Building orientation, layout and form**

The longest building axis is oriented towards north and south due to the plot boundary’s configuration. A permeable and inviting open space at ground floor will promote tenants and visitors to enjoy the mix of uses (more details can be found in the Design and Access Statement). The building’s massing carefully responds to townscape views, local context and constraints on viewing corridors.

5.1.4 **Facade Optimisation & Natural Ventilation**

Percentage of vision to solid areas has been derived from detailed thermal modelling analysis during the design process to optimise solar heat gains through glazing with daylighting and thus ensure good levels of natural daylight penetration whilst limiting unwanted solar gain and heat loss. Each elevation has a specific vision glazing area aiming to balance energy loads and views out. Additionally, the façade design provides extra depth for further shading. The optimised façade achieves the following:

The thermal comfort & energy efficiency with façade is a result of building design process which incorporates site appreciation to identify optimal orientation, solar gain analysis resulting into glazing percentage ratios & glass thermal specifications, followed by daylighting and glare control analysis. By analysis, these elements in the sequence, as they are closely interlinked, has resulted in an optimum façade to deliver occupant centric design. A tangible reduction in the primary energy consumption can be attributed to an optimised façade.

5.1.5 **Thermal mass and free cooling potential**

The structural design accounts for concrete planks which will be exposed to the internal environment to store the heat building up during the day and reduce fluctuations in temperature.

As part of the strategy for future adaptability to climate change at the Proposed Development openings in the façade are proposed for natural ventilation and night-cooling. Horizontal openings windows for air intake and vertical stack to exhaust the warm air from the basis of the natural ventilation design. When the outdoor air conditions are suitable, these openings will provide night-time ventilation to the internal environment using the summer by-pass mode from the localised MVHR units and purge out the heat stored during the day in the building thermal mass.

Vertical openings on the façade will futureproof the office spaces to account for natural ventilation to the perimeter zones, provided the external air quality and noise levels are acceptable. The fan coil units proposed at the perimeters, for cooling can easily accommodate a mix-mode ventilation scenario, increasing flexibility and adaptability for the future building occupants.

5.1.6 **Daylight Strategy**

The external façades have been optimised to minimise direct solar gains whilst maximising daylight provision into the occupied areas.

As well as improving occupant comfort by increasing natural daylight provision and visual stimulus, this will reduce the dependency on artificial lighting, thus resulting in energy consumption savings.

Internal daylighting levels are maximised in the perimeter zones across the majority of the floors and as the building steps upwards due to increased distancing from the surrounding obstructions. Generous floor to ceiling height is proposed to allow for deeper daylight penetration.

The external terraces and the open spaces of the ground floor promote sunlight exposure to the occupants of and visitors to the site.

Also, the impact of the Proposed Development on daylight and sunlight availability of the neighbouring building has been considered and further detailed in the accompanying Daylight and Sunlight Assessment by GIA the specialist consultants.

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5.2 Active Design Features: Regulated Energy Use

Active features include the power-driven systems used in to operate the building accounting for energy efficiency considerations as presented in this section.

5.2.1 Heating, Cooling and Ventilation Strategy

The heating and cooling strategy for the Proposed Development will primarily be achieved through reversible air sourced heat pumps (ASHP) located on the roof. The primary function of the heat-pumps will be to move heat around within the building as required during simultaneous heating and cooling operation and to inject heat from thermal storage when there is a deficit or to reject heat to outside when there is a surplus (cannot be stored).

The office buildings have enough thermal energy flows generated by human activity to provide the base for both heating and cooling of the entire site. By connecting buildings spaces with different needs and balancing the energy between them, effectively using all available energy flows makes it possible to decrease both pollution and the energy consumption on the proposed site.

During simultaneous heating and cooling operation, heat will be taken from spaces which require cooling and conveyed via a water loop to the ASHP. At the heat pumps, this heat will be upgraded and conveyed via a low temperature hot water loop to the spaces which require heating.

The ventilation strategy for the office spaces will primarily be achieved through floor by floor (floor void) mounted mechanical ventilation with heat recovery (MVHR) units distributed across the floor spaces. These units will interface with louvres in the external façade to convey air from outside into the building's internal occupied spaces while simultaneously exhausting a similar amount of indoor air. It is estimated that 20-40% of cooling energy can be saved through the use of free cooler outside air to ventilate the spaces during mid-season and night-time.

Heat exchangers within these units will transfer a large portion of the heat contained within the indoor air to the outdoor air being supplied which will mitigate excessive heat loss within the winter.

5.2.2 Building Management System and Metering

The development will be provided with a microprocessor based digital Building Management System (BMS).

The BMS will automate the building services systems within the building, helping building managers understand how the building is operating and allow them to control and adjust systems to optimise performance, in a simple, efficient manner.

BMS control of landlord plant and equipment will be designed with energy efficiency as the key driver. Some examples of the energy efficient controls include;

a. **Demand led control strategies** - The BMS shall use demand led strategies where appropriate, demands for heating shall be monitored by the BMS, evaluated and processed, prior to commanding systems operational.

b. **Time program control** - The BMS shall provide time schedules that can be programmed to define when an operation signal is to be sent to the controlled plant. The time schedules shall allow different on/off times for building/plant control strategies to be defined throughout the year.

c. **Optimisation Control** - The BMS shall provide individual optimisation programmes for the time schedules associated with temperature control of a space/zone, to enable the operation of the related heating and/or cooling systems prior to normal operating periods, in order to bring the zones within comfortable temperatures at the start of normal occupancy times. The optimisation programme shall be self-adaptive using an iterative process after each period of operation to improve its performance.

d. **Seasonal Operation** - Plant controls shall be pre-programmed for seasonal operation, allowing plant start-up routines and temperature control set points to be determined and automatically adjusted based on the season of operation.

5.2.3 Energy Metering and Billing

All landlord meters shall be connected and interfaced with the building management system (BMS) to enable energy consumption data to be collated, analysed and distributed as required by the metering and billing strategy.

The energy metering and sub metering strategy will be in line with best practice as outlined in CIBSE TM31, 39 and 46 to ensure compliance with current legislation, together with Parts L2A and L2B of the Building Regulations.

The strategy will be compliant with The **Heat Network (Metering and Billing) Regulations 2014** and the EU Energy Efficiency Directive. All notifications and assessments as required by the regulations shall be made by the Contractor.

Details about the metering and billing strategy will be established at RIBA stage 3, refer to appendix C regarding the **'Be Seen'** strategy for the development.

5.2.4 EC/DC Motors for Fan Coil Units

The current Part L Building Regulations set stringent efficiencies for the fans used in all air conditioning and mechanical ventilation systems. Recent advances in fan motor technology have resulted in substantial reductions in energy consumption, and otherwise significant proportion of building energy use.

EC/DC (electronically commutated direct current) motors will be used in place of conventional AC motors.

5.2.5 High-Efficiency Variable Speed Drives

By varying the fan and pump speeds for the water and air distribution systems to match the building load profiles, fan and pump energy consumption will be considerably reduced. This functionality will be afforded and managed via the intelligent Building Management System (BMS).

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5.2.6 Ventilation Heat Recovery

The energy required to heat or cool the incoming fresh air supply to the buildings will be significantly reduced by using an efficient heat recovery system. The heat recovery systems will utilise the thermal properties of the return air to transfer 'free' heat/cooling to the incoming fresh air supply. These will be controlled so as to minimise the demand for any heating and cooling of the fresh air supply.

Heat recovery between the return/exhaust air and outside air shall be provided on all supply and extract units via a plate heat exchanger with efficiencies of at least 78%. The efficiencies will conform to the European Directive 2009/125/EC, which requires increased efficiencies from 1st January 2018.

5.2.7 High-Efficiency Ground & Water Source Heat Pumps

Mechanical cooling will be minimised through the use of passive design features, as discussed earlier within this report. Having limited loads, the intention is to provide a central system using floor by floor high-efficiency mechanical ventilation heat recovery units supplying fresh air to ceiling-mounted fan coil units to provide space heating and cooling.

This will be derived from high efficiency ground and water sourced heat pumps which will effectively absorb excessive heat to be processed and reused elsewhere in the development as described in Section 5.3.

Typical refrigerants used for cooling purposes, such as R410A and R134A have a very high Global Warming Potential (GWP), often in excess of 2,000 (for reference, carbon dioxide has a GWP of 1, and methane a GWP of 28). By 2030 phasing down and out of high-GWP refrigerants will be required, and therefore the Proposed Development will be future proofed to use low-GWP refrigerants with a GWP of 700 or less.

This will be possible with refrigerants such as R513A and R452B, which have between 50% and 75% lower GWP impact than their current commonly used counterparts. There will also be specific focus on the following system attributes to ensure that refrigerant use is managed effectively at the Proposed Development by monitoring and quickly controlling potential leakages, for example. The above will also support the methodology of the BREEAM Pol 01 credit section and whole life carbon analysis.

5.2.8 Low Energy Lighting

A full lighting installation will be provided throughout the landlord and common areas of the buildings, generally comprising LED luminaires, with functional lighting. All luminaires will be provided with dimmable control gear (addressable) to suit its type and application. All landlord lighting will be controlled through the addressable lighting control system.

Lighting will be provided to the external areas, including public space at ground floor and on the external terraces. External luminaires will generally comprise suitably IP-rated LED luminaires to suit the architectural design. Luminaires will be provided with DALI-addressable dimmable control gear. Where proposed, external lighting will be controlled through the building lighting control and management system and minimised wherever possible to avoid light pollution. Lighting levels are listed in the next table.

Table 5-2 Applied Lighting Specifications

System	Parameter	Applied Value
Lighting Efficiency[1]: **Non-domestic Areas**	Reception Areas	10 W/m^2 Display lighting 35 lm/circuit watt Lighting level – 600 Lux
	Office Areas	6 W/m^2 Lighting level: 500 Lux
	Toilet Areas	95 lm/W
	Transient Areas	95 lm/W
Lighting Controls	Transient Spaces	Presence Detection On/Off
	Occupied Spaces	Presence Detection On/Off Daylight Dimming Control

Note 1: All installed Lighting will be LED and all-day lighting areas to have daylight dimming controls with local sensors with presence detectors. All transient areas will have presence detectors.

5.2.9 Automatic Monitoring and Targeting

The Building Regulations Approved Document L2A identifies that the provision of automatic monitoring and targeting with alarms for out-of-range values, can provide significant savings in energy consumption of the building services systems. A saving in electrical energy consumption of 5% is awarded for complete installations that measures, records, transmits, analyses, reports and communicates meaningful energy management information to enable the operator to interrogate and manage the energy it uses.

5.2.10 Power Factor Correction

The Building Regulations Approved Document L identifies that the provision of power factor correction to the building's electrical supply can provide significant savings in electrical consumption. A saving in electrical energy consumption of 1% is awarded for power factor correction to 0.9 and a saving of 2.5% awarded for power factor correction to 0.95 power factor. This Proposed Development intends to have a power factor correction of 0.95 as a minimum.

5.2.11 Efficient HVAC Parameters

The following design parameters were assigned to the base building heating, ventilation and air conditioning (HVAC) systems in order to establish its annual CO_2 emission rate.

Table 5-3 Applied HVAC Parameters for Main Central Plant, Non-Domestic Areas

System	Parameter	Applied Value
Cooling System[2] Office Building	Seasonal Efficiency (SEER)[3]	5.5
	Nominal Efficiency (EER)[5]	3.4
Heating System[2]	Seasonal Efficiency (SCOP)[3]	3.96

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System	Parameter	Applied Value
	Nominal Efficiency (COP)[4]	3.0
Central Air Handling Units for Clinical Areas	SFP	1.80 W/l/sec (average value)
	Ventilation Heat Recovery Efficiency	73% (plate heat exchanger)
	Demand Control Ventilation	Yes
Floor void mounted Air Handling units (MVHRs) **(Localised units spread over the floor void space for Office Areas)**	SFP	1.30 W/l/sec (average value)
	Ventilation Heat Recovery Efficiency	85% (plate heat exchanger)
	Demand Control Ventilation	Yes
Local Cooling Units (FCU's)	SFP	0.15 W/l/sec
WC Extract Fans	SFP	0.50 W/l/sec
Electric Water Heater - DHW Toilets	Seasonal Efficiency	100%
	Delivery Efficiency	95%
Water Source Heat Pump - Showers DHW	Seasonal (SCOP)	3.96
	Delivery Efficiency	95%
Pumps	Pump Type	Variable Speed with multiple pressure sensors
Domestic Hot Water	Storage Volume (for office Showers)	5,000 L
	Storage Volume (for clinical area)	14,000 L
	Storage Losses	0.004 (kWh/(l.day)
	Circulation Losses	5 W/m
	DHW Controls	Timed Control
Electrical / Metering	Power Factor	Greater Than 0.95
	Lighting system have provision for metering	Yes
	Automatic Monitoring of energy Data?	Yes
	Controls	Central Start & Stop Optimum Start & Stop Local time & temperature Control Weather Compensation Control

Note 1: Standard gas-fired boiler (91%) used for the lean building as per GLA assessment guidance to provide space heating and DHW for the commercial areas.
Note 2: All-electric combined air source and ground source heat pumps solution with thermal storage and free cooling potential from reversible heat pump units.

Note 3: SCOP and SEER of overall heating and cooling system have been evaluated carrying out an extensive heat pump balance study based on hourly cooling and heating building loads.

5.3 Active Design Features: Unregulated Energy Use

Unregulated energy refers to 'plug loads' such as:

- Lifts, escalators;
- Refrigeration systems;
- Computers, laptops, printers, photocopiers, audio visual equipment;
- Server rooms and other electrical loads.

Unregulated energy use can account for a large portion of the total energy consumption within office buildings according to CIBSE TM54 – prediction of operational energy use (Figure 5-1). Therefore, in order to bridge the performance gap of design performance versus actual measured performance during operation of the building it is important to address unregulated energy use as it is not considered under Approved Document Part L of the Building Regulations.

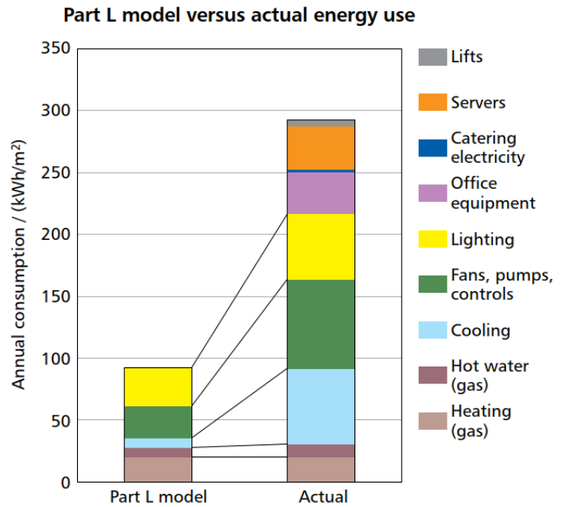


Figure 1 Comparison of ADL2A calculations and operational performance for a case study

Figure 5-1 Comparison of operational energy use: Part L versus actual measured energy use (extracted from CIBSE TM54:2013)

This section summarizes how the Proposed Development will control unregulated energy use and achieve an ambitious target of energy use intensity (EUI) target which accounts for both regulated and unregulated energy use.

5.3.1 Low Energy Culture

Providing building users and operators with practical guidance on the importance and methods of energy efficiency can lead to effective, cost-free reductions in energy usage and carbon emissions. Savings can be expected in, for example:

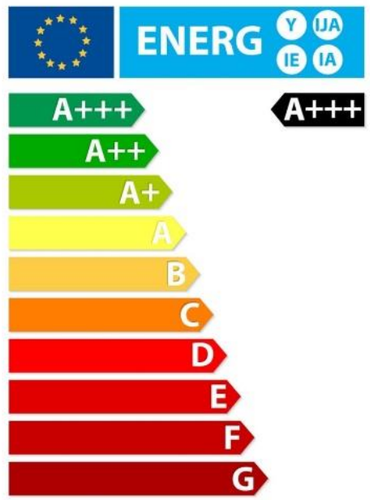
- Operating comfort cooling systems efficiently.
- Lighting Energy: a culture of 'turn-it-off', providing task lighting wherever possible.
- Small Power: prefer electrical equipment with energy labelling and avoiding monitors and PCs etc. in stand-by mode.
- Cooling/Heating Energy: widening 'acceptable' temperature range.
- Vertical transportation: promote the use of stairs with lift-trimming strategy (see 5.3.3).

Training of operators and facility managers is particularly important to provide them with the skills and knowledge to implement and continue to improve an energy management programme.

The amount of energy that can be saved will be dependent upon the motivation of the occupants and the effectiveness of the awareness programmes. The development will actively encourage a low energy culture as part of its building operation and commercial leasing strategy.

5.3.2 Low Energy White Goods

White goods are to be provided with a certified energy label. Under the EU Framework Directive (2010/30/EU) these are rated from A+++ to D, with D being the least efficient.



Wherever white goods are provided within the development, including washing machines, dryers, dishwashers and fridge/freezers, they will achieve:

- Minimum "A+" for fridges, freezers or fridge-freezers;
- Minimum of "A" for washing machine and dishwasher; and
- Minimum of "B" for washer dryer or tumble dryer.

Information on the EU Energy Efficiency Labelling Scheme of efficient white goods will be provided to the white goods supplied by the developer.

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5.3.3 **High-Efficiency Vertical Transportation**

The vertical transportation systems are to be specified with several energy-saving features intended to reduce energy use both whilst moving and when in standby mode. Such measures can be particularly beneficial when applied to passenger lifts in large workplaces which typically deal with high numbers of people moving in, out and around the building. These measures may include:

- Specification of modern VVVF drive systems.
- Quantity, size and speed of passenger lifts minimised to meet agreed performance benchmarks and thereby minimise base energy load.
- Real-time monitoring of prevailing passenger demand and switching of lifts in and out of service in order to minimise the energy consumption whilst maintaining specified performance benchmarks.
- Energy-efficient lighting.
- Control that switches off the lighting when the car is not occupied.
- Optimise the dispatcher and drive control to minimise energy usage.
- Promote the use of stairs for single or two-floor travel as part of the lift-trimming strategy to remove single floor trips which can be overridden for those less able to use the stairs.
- Implementing novel technologies, such as the “green” button for energy efficient trip using energy optimisation algorithms, and “black” button for a lift-performance call and allocated according to waiting time optimisation algorithms (or time to destination minimisation algorithms.

5.4 Be Lean – Reduction on Carbon Emissions

5.4.1 **SAP 2012 carbon factors**

Based on the above design parameters, a summary of the energy consumption and CO2 emissions rate for the ‘Lean’ building can be seen in table and figures below. The ‘Lean’ energy efficiency measures described here are calculated to reduce regulated carbon dioxide emissions of the Proposed Development by 44% (Class D1) and 41% (Class B1b) compared to Part L2A 2013.

Based on the energy-efficient design parameters, a summary of the energy consumption and CO_2 emissions rate for the Lean non-domestic building can be seen in tables and figures below based on the BRUKL report within Appendix A and following the GLA’s Energy Assessment Guidance.

The ‘Lean’ building exceeds the minimum percentage of savings of 15% required for new non-domestic buildings under Policy SI2 of the new London Plan.

Table 5-4 Detailed Regulated Emissions for the Lean Building, Non-Domestic Areas – Class D1 Medical

Carbon Dioxide Emissions (Tonnes CO_2 per Annum)					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Lean Regulated % Reduction**	**Lean Unregulated % Reduction**
Building Regulations 2013, Part L Compliant Development	600.9	843.3	-	-	-
‘Lean’ Building after Energy Demand Reduction	339.2	674.6	430.4	44%	20%

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Table 5-5 Detailed Regulated Emissions for the Lean Building, Non-Domestic Areas – Class B1b research

Carbon Dioxide Emissions (Tonnes CO_2 per Annum)					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Lean Regulated % Reduction**	**Lean Unregulated % Reduction**
Building Regulations 2013, Part L Compliant Development	556.0	846.1	-	-	-
'Lean' Building after Energy Demand Reduction	329.6	676.9	395.6	41%	20%

5.4.2 SAP10 carbon factors

The values shown in the previous tables and bar charts has been converted using the GLA spreadsheet to reflect the changes in the carbon factors, as shown in the following table.

The percentage of savings from the "Lean" building using SAP10 carbon factors is **34% (Class D1) and 31% (Class B1b).** This improvement is smaller than the one observed using SAP 2012 factors due to the calculation methodology of the "Lean" building baseline as per GLA's Energy Assessment Guidance which accounts for heating using gas boilers which deviates from the heating strategy of the Proposed Development of all-electric energy supply.

The 'Lean' building exceeds the minimum percentage of savings of 15% required for new non-domestic buildings under Policy SI2 of the new London Plan.

Table 5-6 Detailed Regulated Emissions for the Lean Building, Non-Domestic Areas – Class D1 Medical

Carbon Dioxide Emissions (Tonnes CO_2 per Annum) - SAP10					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Lean Regulated % Reduction**	**Lean Unregulated % Reduction**
Building Regulations 2013, Part L Compliant Development	302.0	378.6	-	-	-
'Lean' Building after Energy Demand Reduction	199.9	302.9	177.8	34%	20.0%

Table 5-7 Detailed Regulated Emissions for the Lean Building, Non-Domestic Areas – Class B1b Research

Carbon Dioxide Emissions (Tonnes CO_2 per Annum) - SAP10					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Lean Regulated % Reduction**	**Lean Unregulated % Reduction**
Building Regulations 2013, Part L Compliant Development	281.9	379.9	-	-	-
'Lean' Building after Energy Demand Reduction	193.6	303.9	164.3	31%	20%

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6 Cooling and Overheating

6.1 Cooling Hierarchy

Policy SI 4 of The London Plan (2021), and Policy SI 4 of the Intended to Publish London Plan (2019) state that major development proposals should reduce potential overheating, and reliance on air-conditioning systems, and demonstrate this in accordance with the following cooling hierarchy:

Table 6-1 London Plan Cooling Hierarchy and Proposed Development Strategy

Cooling Hierarchy	Proposed Strategy
1. Minimise internal heat generation through energy-efficient design	Glazing ratio optimised throughout the building to provide enough daylight and solar control glass applied to minimise solar gains. LED lighting is proposed to reduce internal heat gains.
2. Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls.	The glazing ratio has been derived by data-driven design in limiting solar gains and managing daylight levels and respond to the solar exposure and façade orientation. Glazing area is maximised to the north for daylighting and optimised to the most exposed elevations to manage solar gains. Also, external shading elements have been dimensioned to assist in providing shading without significantly increasing embodied carbon. Roof terraces and green roofs are proposed to various office levels and plant roof. The plant screen will be covered by a green wall and these urban greening strategies will contribute to creating a microclimate to reduce the urban heat island impact locally.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings	A minimum of 2.9m of floor to ceiling height is proposed to the office areas. Moreover, concrete plank slabs will be exposed and provide thermal mass storage internally.
4. Passive ventilation	Natural ventilation is possible through openings and vents in the façade for natural ventilation and for night-time cooling.
5. Mechanical ventilation	Highly efficient mechanical ventilation with heat recovery is proposed for fresh air supply all year round.
6. Active cooling systems	All previous measures contributed to reducing the peak cooling demand and decreasing the size of fan coil units for thermal comfort as well as using efficient heat pumps with waste heat recovery opportunity.

6.2 Overheating Analysis

The full thermal comfort assessment is included in **Appendix E** of this application document and is therefore not repeated in full here. The thermal modelling results demonstrate that the building design and services strategy of comfort cooling can deliver thermal comfort levels in occupied spaces in accordance with the criteria set out in CIBSE Guide A Environmental Design Table 1.5 by using Design Summer Year (DSY) weather file London DSY1, DSY2 and DSY3.

The report shows the scenarios assessed to determine the risk of overheating and thermal comfort conditions. The percentage of annual occupied hours that the operative temperature exceeds 25°C in offices and reception areas as well as retail in all the areas assessed, considers 3% as the maximum allowance to ensure thermal comfort conditions. The threshold is given by CIBSE Guide A.

Office's areas comply with the criteria for the current scenario DSY1 and future weather conditions when the cooling set point is 22°C. As specified by the M&E design, this set point sits within the band 24°C ±2. In office lobby, a set point of 24°C is required to comply with thermal comfort criteria. Retail also performing well for both summer and winter operative temperatures checks.

In line with the GLA Guidance paragraph 9.2 all room pass Part L2A Criterion 3, the BRUKL reports are included in **Appendix A** of this application document.

The design proposes façade openings across all elevations to enhance the free cooling potential from night-time ventilation and enable flexibility to adopt a mixed mode ventilation solution in the future if required.

A free-running building relying solely on natural ventilation scenario would not be able to reach adequate levels of thermal comfort due to the deep floor plan of the building which reduces the ventilation effectiveness. However, perimeter zones could be naturally ventilated when the internal office space has cooling in operation, thus reducing cooling energy demand.

Further control and operation strategies will be investigated in the next stages of design to maximise the savings in cooling demand by allowing cooler external air into the building to purge the heat out.

A detailed analysis can be found in **Appendix E** - Thermal Comfort Assessment.

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6.3 Active Cooling Demand

The GLA's Energy Assessment Guidance requires that developments report the active cooling demand predicted by the energy modelling compliance tool.

Cooling loads taken from compliance tools should only be referred to satisfy GLA's requirement of data collection for monitoring purposes, and it is not indicative of the designed cooling demand of the buildings. Those tools are used for compliance, with a rigid methodology and the mechanical design will better inform the cooling demand within the occupied areas of the development.

The following measures have therefore been applied to reduce the cooling loads from outset:

- Optimised glazing ratio to significantly reduce solar gains and achieve adequate daylighting.
- Potential for free cooling through openings in the façade & stack effect.
- Exposed concrete soffit with thermal mass.
- External shading and opaque façade elements are present in the office areas to reduce solar heat gains.
- Consideration of surrounding buildings to cast shadows on the lower levels.

The active cooling demand for the Proposed Development as per 'Lean' BRUKL report (HVAC Systems Performance) is summarized in the table below:

Table 6-2 Active Cooling Demand – Vinegar Yard 'Lean' building

Building	Area weighted average building Cooling Demand (MJ/m^2)	
	Actual	Notional
Vinegar Yard – Class D1	76.55	81.72
Vinegar Yard – Class B1b	74.47	77.21

The results show reduction in the cooling demands of **19.6%**, compared to the notional building values. This can be attributed to the passive design measures such as optimised glazing ratio, shading elements and to the high performing cooling systems integrated to the building, and for office space, it includes potential for free cooling from natural ventilation.

The result from the façade optimisation and managing heat risk is reflected by all spaces passing comfortably the requirements of Criterion 3 – Limiting Solar Gains of Part L2A 2013 – see Appendix A.

7 'Be Clean' - Heating Infrastructure

This section outlines the feasibility of clean energy supply to the Proposed Development as required by the 'Be Clean' stage of the Energy Hierarchy.

After careful selection of appropriate servicing strategies and plant selection, the design team agreed to meet the energy demand of the Proposed Development without using district heating networks or on-site generations schemes.

This section provides justification to why relevant technologies and systems have been excluded and summarises the feasibly study carried out by the design team.

7.1 District Heating and Cooling Networks

The feasibility of connecting the Proposed Development to a district heating (DH) network has been assessed, making reference to the London Heat Map (refer to www.londonheatmap.org.uk).

The image below, has been adapted from the London Heat Map website.

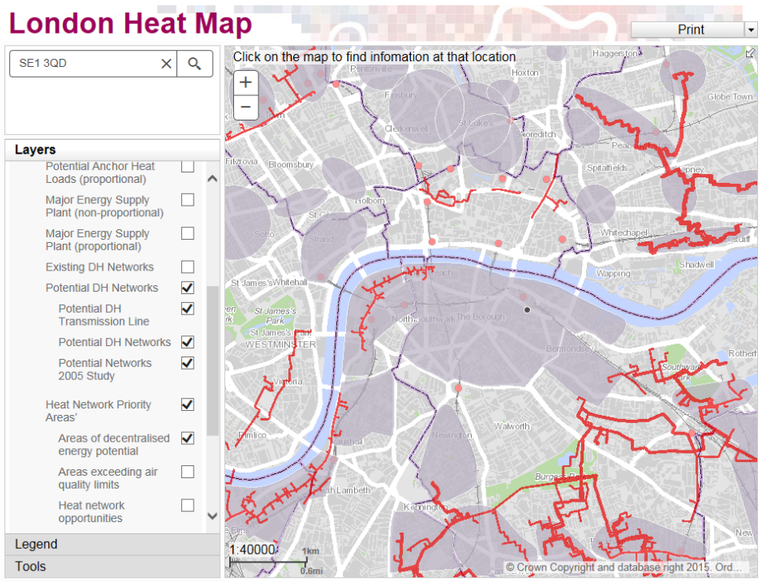

Figure 7-1 London Heat Map – Potential DH network at Vinegar Yard (source: www.londonheatmap.org.uk)

At the time of compiling this energy strategy, there is currently no district heating network which the proposed development could connect to immediately.

The LBS have aspirations for developing a district heating system in the area, and the aspiration would be for this development to be able to be connected in the future. There is no designated energy officer at the Southwark Council. Sweco has contacted an officer at Southwark Council to confirm the time frame of the heat network scheme for an adjacent development, as recommended by the GLA and is awaiting his confirmation and we didn't receive any feedback.

The development will have pipe sleeves and plant rooms to accept future connections and the associated plant from a district heating system within **10 metres of the development**, should one be available in the future.

In addition, as per GLA October 2018 guidance, Sweco also contacted private network providers and ESCOs to investigate if there is a network with spare capacity to service the building. However, there was no confirmation that there is any established network in the adjacent area.

7.2 Combined Heat and Power (CHP)

As a result of reviewing project location, site context, energy demand and load profiles, CHP technology was **not considered** in the building design due to facts below:

1. The Proposed Development aims to have no on-site combustion engine sources to significantly contribute to improving local air quality;
2. The decarbonization of the grid with increased share of renewable energy in the mix make the on-site generation from natural gas fuelled CHPs a more carbon-intensive process; and
3. Exporting electricity to the grid will not be economically viable solution for this development.

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7.3 Be Clean – Reduction on Carbon Emissions

The emissions under the 'Clean' stage are equal to the 'Lean' stage figures for this building due to the arguments discussed above.

7.3.1 SAP 2012 Carbon Factors

Table 7-1 Detailed Regulated Emissions for the Clean Building, Non-Domestic Areas – Class D1 Medical

Carbon Dioxide Emissions (Tonnes CO_2 per Annum)					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	600.9	843.3	-	-	-
'Lean' Building after Energy Demand Reduction	339.2	674.6	430.4	44%	20%
'Clean' Building after heat connection	As above	As above	As above	0%	0%

Table 7-2 Detailed Regulated Emissions for the Clean Building, Non-Domestic Areas – Class B1b Research

Carbon Dioxide Emissions (Tonnes CO_2 per Annum)					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	556.0	846.1	-	-	-
'Lean' Building after Energy Demand Reduction	329.6	676.9	395.6	41%	20%
'Clean' Building after heat connection	As above	As above	As above	0%	0%

7.3.2 SAP10 Carbon Factors

Table 7-3 Detailed Regulated Emissions for the Clean Building, Non-Domestic Areas – SAP10 – Class D1 Medical

Carbon Dioxide Emissions (Tonnes CO_2 per Annum) - SAP10					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	302.0	378.6	-	-	-
'Lean' Building after Energy Demand Reduction	199.9	302.9	177.8	34%	20.0%
'Clean' Building after heat connection	As above	As above	As above	0%	0%

Table 7-4 Detailed Regulated Emissions for the Clean Building, Non-Domestic Areas – SAP10 – Class B1b Research

Carbon Dioxide Emissions (Tonnes CO_2 per Annum) - SAP10					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	281.9	379.9	-	-	-
'Lean' Building after Energy Demand Reduction	193.6	303.9	164.3	31%	20%
'Clean' Building after heat connection	As above	As above	As above	0%	0%

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8 'Be Green' - Renewable Energy

Further energy and carbon dioxide emissions savings could, in principle, be made through the adoption of renewable technologies. This section provides an appraisal of the renewable energy technologies suitable for the Proposed Development as part of the 'Be Green' stage of the Energy Hierarchy.

The suitability of available technologies is sensitive to a number of factors, including site constraints, development footprint, surrounding environment, access limitations and development type.

To this end, the following renewable energy technologies have been investigated to establish their suitability and feasibility.

8.1 Consideration of Low and Zero Carbon Technologies

8.1.1 Photovoltaic

Photovoltaic panels convert solar energy into electricity and are best placed in an unobstructed location, generally south facing at 30º inclination, ideally. When located vertically, the output can be reduced by about 15%. PV panels provide a visible green label for the building and makes use of space at the top of the buildings.

The lack of greening in the area and associated health and well-being benefits related to connection with nature prioritise the inclusion of greenery and social spaces to the terraces, reducing the available area for roof mounted structure for PV.

In order to maximise the on-site energy generation façade mounted PV's have been proposed for the project, as part of the commitment and sustainability focused design of the building.

New Generation high efficiency façade mounted Photovoltaic Panels to generate on-site energy to further the Net-Zero carbon objective for the proposed development. 35 MWh per annum generation via façade mounted PV's. The energy generated by the glass-based façade mounted PV's will depend upon the technology available at the time of procurement and viability of installation design. Details of the PV panels and expected payback is detailed within the Appendix.

8.1.2 Wind Turbines

Wind turbines produce electricity directly from the energy in wind. This is then fed into the buildings electrical system via a control gear. Two types of wind turbines are available; horizontal axis and vertical axis. The former tends to be noisy and produce vibration. The latter are quieter in operation and more suited to installation on buildings but are generally less efficient and more expensive.

Although wind turbines are a highly visible form of renewable energy, they can normally provide only a very small contribution to the total electrical consumption of buildings in city and urban locations. Probably visually unacceptable in planning terms, there are also concerns that such a turbine would create unacceptable noise levels during day and night. As a consequence, **wind turbines are not considered to be suitable for this project.**

8.1.3 Solar Hot Water

Solar hot water panels must be located in a generally south facing position, ideally at about 30° to the horizontal. If located vertically, output is reduced by about 15%.

The scheme investigated is based on installing a nominal active area of high efficiency (evacuated tube) solar hot water panels, accommodated on the roof of the building. Such systems are relatively low maintenance, are a proven technology and are a visible indication of the development's green aspirations.

Although efficient and cost-effective in implementation, solar hot water systems can only offset a fraction of the domestic hot water demand for the site. Due to the same targets on the roofscape as for the PV panels, in order to prioritize greenery and urban farming opportunities, **solar hot water panels are therefore not suitable for this development.**

8.1.4 Aquifer Heat Pumps or Open Loop Ground Source Heat Pumps

The use of the London aquifer to reject heat to (in cooling mode) and to draw heat from (in heating mode) can reduce emissions from a development, depending on the number of boreholes and the potential yield.

In an open-loop aquifer-based heat pump system, boreholes are sunk into the chalk strata. Aquifer water is pumped up to the surface and stored temporarily in a tank. This water is usually at 12-14°C year-round. The water is passed through a heat exchanger where it heats or cools the condenser water circuit serving the heat pumps. The water is then pumped back into the aquifer. Boreholes are normally sunk in pairs, one abstraction and one discharge. A licence from the Environment Agency is required to extract aquifer water.

The limitations imposed by the existing lower ground floor and difficulties of achieving acceptable separation on-site would severely restrict the effectiveness of any aquifer system.

Also given the relatively small contribution to the site compared with the benefits of the community energy system it is not proposed to pursue this option for the Proposed Development.

Aquifer heat pumps are therefore not appropriate for this development.

8.1.5 Air Source Heat Pumps

The building cooling and heating load calculations have been calculated, and the annual profiles shown that they will be buildings space heating requirements is significantly low due to the level of insulation and the airtightness specified. The profiles show that they will be a considerable time when the building will need Simultaneous heating and cooling

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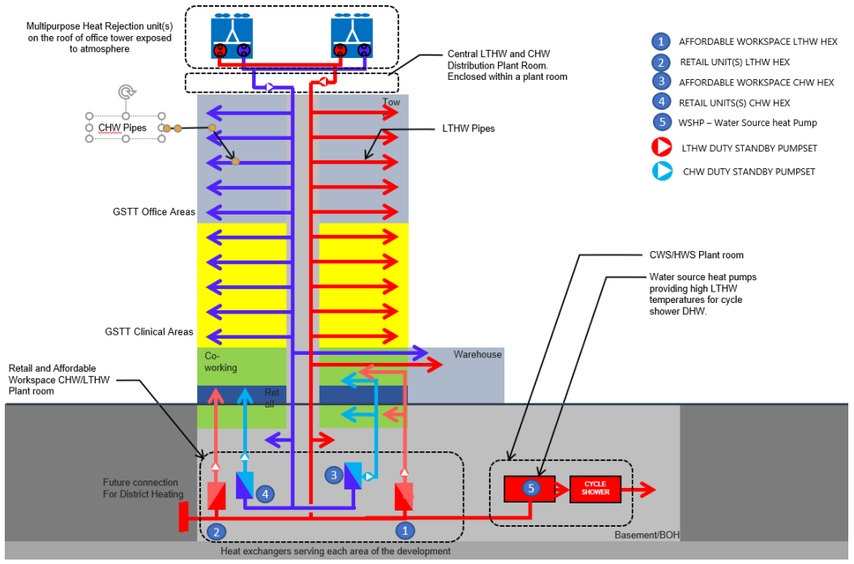
The standard model for heating and cooling commercial buildings uses a chiller running at around 6 to 12 ºC and a separate gas-fired boiler usually hotter at 60ºC to 80ºC for heating and cooling. This hence requires 2 separate pieces of equipment and controls. New modern buildings and modern system design can make use of multi-function 4 pipe heat pumps

The scenario described above makes this building ideal for air to water Heat Pump solation. Multi-function heat pumps have additional heat exchangers and intelligent controls and can make use of waste heat and produce heating and cooling at the same time and independently

Air Source Heat Pumps (ASHP) are typically all-electric systems which perform very well when applying the new SAP 10 carbon factors. They are capable of serving multiple zones in a building and provide simultaneous heating (40 ºC to 48 ºC) and cooling (12 ºC to 6 ºC). When these units are used to provide space heating, air-source heat pumps (ASHP) work similarly to a fridge, but in reverse. It extracts heat from the outside air in the same way that a fridge extracts heat from its inside. The heat they extract from the air is constantly being naturally renewed.

According to the GLA energy assessment guide, the space heating provided via heat pump should be considered as a renewable heat source and included in the 'Green' carbon emission. As mentioned in the 'Lean' section, the heat pumps will be used to provide space heating and cooling for all the development. The hybrid operation and the ability to provide heat recovery will increase the sessional efficiency of the units which will make the system suitable for the office application.

A high efficiency air source heat pump is considered for the proposed building to allow for higher energy efficiency operation.



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8.2 Be Green – Reduction on Carbon Emissions

8.2.1 SAP 2012 Carbon Factors – Class D1 Medical

Based on the above design parameters, a summary of the energy consumption and CO_2 emissions rate for the 'Green' stage at the Proposed Development are shown in tables below.

The 'Green' measures described reduce the regulated carbon dioxide emissions of the commercial areas by **8%** (hence the cumulative savings are **52%** against Part L2A 2013.

Table 8-1 Detailed Regulated Emissions for the Green Building, Non-Domestic Areas

Carbon Dioxide Emissions (Tonnes CO_2 per Annum)					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	600.9	843.3	-	-	-
'Lean' Building after Energy Demand Reduction	339.2	674.6	430.4	44%	20%
'Clean' Building after heat connection	339.2	674.6	0	0%	0%
'Green' Building after renewable energy	290.1	674.6	49.1	8%	0%

Table 8-2 Site-Wide Regulated Operational Carbon Dioxide Emissions and Savings

	Total Regulated Emissions (Tonnes CO_2/year)	CO_2 Savings (Tonnes CO_2/year)	Percentage Savings (%)
Part L 2013 baseline	600.9	-	-
Be Lean	339.2	261.7	44%
Be Clean	339.2	0.0	0.0%
Be Green	290.1	49.2	8%
Cumulative on-site Savings	**-**	310.9	**52%**
CO_2 savings off-set (Tonnes CO_2)			
Off-set		**290.1**	

*Green Power Purchase Agreement allow the building to operate at "Zero Carbon" operation. The Power Purchase Agreement will be made available to the local authorities at time of completion.

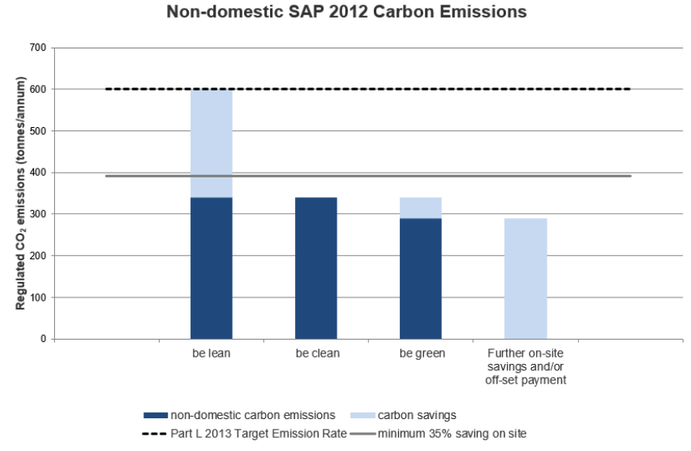

Figure 8-3 GLA's Energy Hierarchy for the Proposed Development as per SAP 2012 Carbon Factors – Class D1 Medical

8.2.1.1 Site Total

The site-wide percentage of savings resulted in **52%** as per table below.

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8.2.2 SAP10 Carbon Factors – Class D1 Medical

The values shown in the previous tables and bar charts has been converted using the GLA spreadsheet to reflect the changes in the carbon factors, as shown in the table below.

The 'Green' measures described reduce the regulated carbon dioxide emissions of the commercial areas by 23% hence the cumulative savings on regulated energy of **57 %** against Part L2A 2013.

Table 8-3 Detailed Regulated Emissions for the Green Building, Non-Domestic Areas – SAP10

Carbon Dioxide Emissions (Tonnes CO_2 per Annum) - SAP10					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	302.0	378.6	-	-	-
'Lean' Building after Energy Demand Reduction	199.9	302.9	177.8	34%	20.0%
'Clean' Building after heat connection	199.9	302.9	0.0	0.0%	0%
'Green' Building after renewable energy	130.2	302.9	69.6	23%	0%

8.2.2.1 Site Total

The site-wide percentage of savings resulted in 57 % as per table below.

Table 8-4 Site-Wide Regulated Operational Carbon Dioxide Emissions and Savings – SAP10

SAP10	Total Regulated Emissions (Tonnes CO_2/year)	CO_2 Savings (Tonnes CO_2/year)	Percentage Savings (%)
Part L 2013 baseline	302.0	-	-
Be Lean	199.9	102.2	34%
Be Clean	199.9	0.0	0.0%
Be Green	130.2	69.6	23%
Cumulative on-site Savings	**-**	171.8	**57%**
CO_2 savings off-set (Tonnes CO_2)			
Off-set		**130.2**	

As shown from the previous tables, the all-electric HVAC system design for the Proposed Development demonstrated to achieve better improvement against Part L2A using new SAP 10 carbon factor, as the adopted approach to calculating carbon emissions.

This is a clear indicator that the design is likely to performed well based on the current energy scenario and shows significant carbon reduction in comparison with the traditional gas fire boilers and chiller systems.

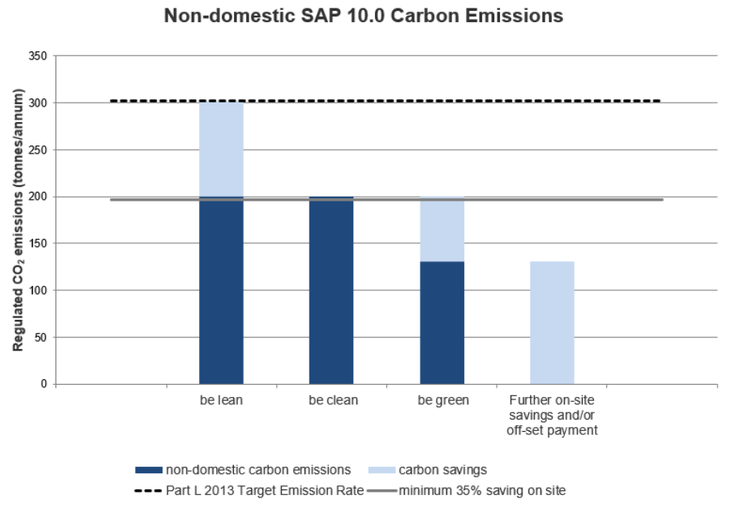

Table 8-6 GLA's Energy Hierarchy for the Proposed Development as per SAP 10 Carbon Factors Class D1 Medical

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8.2.3 SAP 2012 Carbon Factors – Class B1b Research facility

Based on the above design parameters, a summary of the energy consumption and CO_2 emissions rate for the 'Green' stage at the Proposed Development are shown in tables below.

The 'Green' measures described reduce the regulated carbon dioxide emissions of the commercial areas by **9%** (hence the cumulative savings are **49%** against Part L2A 2013.

Table 8-5 Detailed Regulated Emissions for the Green Building, Non-Domestic Areas

Carbon Dioxide Emissions (Tonnes CO_2 per Annum)					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	556.0	846.1	-	-	-
'Lean' Building after Energy Demand Reduction	329.6	676.9	395.6	41%	20%
'Clean' Building after heat connection	329.6	676.9	0.0	0%	0%
'Green' Building after renewable energy	282.1	676.9	47.5	9%	0%

8.2.3.1 Site Total

The site-wide percentage of savings resulted in **49%** as per table below.

Table 8-6 Site-Wide Regulated Operational Carbon Dioxide Emissions and Savings

	Total Regulated Emissions (Tonnes CO_2/year)	CO_2 Savings (Tonnes CO_2/year)	Percentage Savings (%)
Part L 2013 baseline	556.0	-	-
Be Lean	329.6	226.5	41%
Be Clean	329.6	0.0	0.0%
Be Green	282.1	47.5	9%
Cumulative on-site Savings	**-**	274.0	**49%**
CO_2 savings off-set (Tonnes CO_2)			
Off-set		**282.1**	

*Green Power Purchase Agreement allow the building to operate at "Zero Carbon" operation. The Power Purchase Agreement will be made available to the local authorities at time of completion.

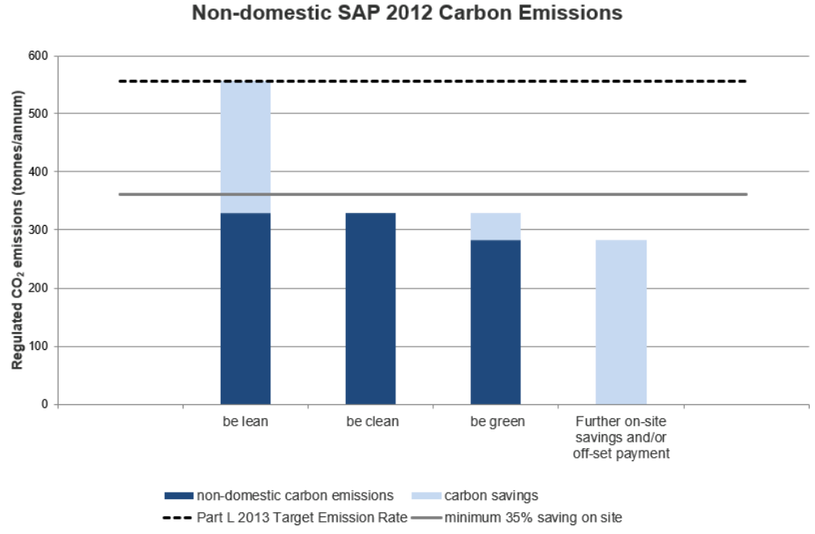

Figure 8-3 GLA's Energy Hierarchy for the Proposed Development as per SAP 2012 Carbon Factors – Class B1b Research facility

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8.2.4 SAP10 Carbon Factors – Class B1b Research facility

The values shown in the previous tables and bar charts has been converted using the GLA spreadsheet to reflect the changes in the carbon factors, as shown in the table below.

The 'Green' measures described reduce the regulated carbon dioxide emissions of the commercial areas by 24%, hence the cumulative savings on regulated energy of **55 %** against Part L2A 2013.

Table 8-7 Detailed Regulated Emissions for the Green Building, Non-Domestic Areas – SAP10

Carbon Dioxide Emissions (Tonnes CO_2 per Annum) - SAP10					
	Regulated Energy	**Unregulated Energy**	**Total CO_2 Reductions**	**Regulated Energy % Reduction**	**Unregulated Energy % Reduction**
Building Regulations 2013, Part L Compliant Development	281.9	379.9	-	-	-
'Lean' Building after Energy Demand Reduction	193.6	303.9	164.3	31%	20%
'Clean' Building after heat connection	193.6	303.9	0	0%	0%
'Green' Building after renewable energy	126.6	303.9	67	24%	0%

8.2.4.1 Site Total

The site-wide percentage of savings resulted in 55 % as per table below.

Table 8-8 Site-Wide Regulated Operational Carbon Dioxide Emissions and Savings – SAP10

SAP10	Total Regulated Emissions (Tonnes CO_2/year)	CO_2 Savings (Tonnes CO_2/year)	Percentage Savings (%)
Part L 2013 baseline	281.9	-	-
Be Lean	193.6	88.3	31%
Be Clean	193.6	0.0	0.0%
Be Green	126.6	67.0	24%
Cumulative on-site Savings	**-**	155.2	**55.0%**
CO_2 savings off-set (Tonnes CO_2)			
Off-set		**126.6**	

As shown from the previous tables, the all-electric HVAC system design for the Proposed Development demonstrated to achieve better improvement against Part L2A using new SAP 10 carbon factor, as the adopted approach to calculating carbon emissions.

This is a clear indicator that the design is likely to performed well based on the current energy scenario and shows significant carbon reduction in comparison with the traditional gas fire boilers and chiller systems.

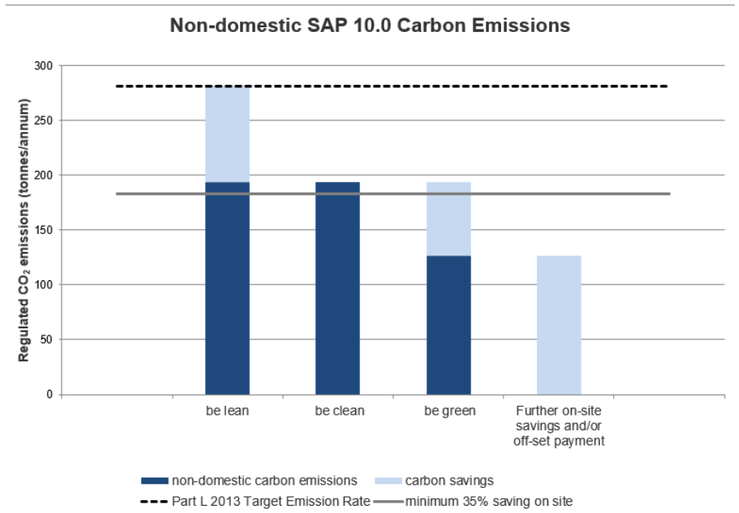

Table 8-6 GLA's Energy Hierarchy for the Proposed Development as per SAP 10 Carbon Factors – class B1b research facility

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9 Energy & Sustainability Strategy

The diagram below illustrates the energy strategy & sustainability strategy for the Proposed Development.

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10 Sustainability Statement

10.1 Sustainable Development

10.1.1 Introduction

Sustainability is ingrained within the fabric of the design, construction and operational development aspirations of the Proposed Development. The climate emergency dictates urgent and high-impact action from all stakeholders, with the ultimate goal of goal of supporting the UK Government declaration of Net Zero Carbon by 2050. Only with a clear focus on sustainable development can the UK meet these goals.

With a firm basis of collaboration, innovation and expertise between many disciplines from Stage 1 of design, the design team have developed a project-specific sustainability framework and action plan to facilitate the implementation of specific sustainable outcomes. The sustainability plan draws on the knowledge base of the UN Sustainable Development Goals, highlighting those actions relevant to the built environment and the focus areas for achieving sustainable development. Holistic sustainability is at the heart of the goals set for the project, covering the widest possible array of environmental and sustainable performance indicators, from materials and energy to water and waste. An all-inclusive process, monitored and reported against at key project delivery stages, ensures that sustainability factors that are intrinsically linked are considered together, and not in isolation.

The project sustainability approach draws on and challenges the most robust current industry best-practice and targets, which provide a basis for wider industry comparison and benchmarking of the project. These include the RIBA 2025 Climate Challenge, which sets benchmark reduction targets for embodied carbon and potable water consumption, as well as suitable target metrics from UKGBC Net Zero guidance, London Energy Transformation Initiative (LETI) and Greater London Authority (GLA) requirements set out in the current and Intend-to-Publish London Plans. The development will also utilise a Sweco-led framework approach to third-party verified sustainability assessment schemes such as BREEAM and the WELL Building Standard, hand-picking credits which support the overall sustainability aspirations of the project to deliver the agreed targets.

For the purposes of this application, this sustainability strategy will demonstrate how the aspirational goals and targets of the Proposed Development underwrite and support the relevant sustainability-led policies of the Southwark Council (both adopted and proposed), as well as the relevant environmental and sustainability policies of the GLAs London Plan. The focus is on how these core targets provide a future-proof sustainable urban development which adds value in its local context within in the heart of London, rather than simple box-ticking of policy.

Principles of environmental, social and economic sustainability are considered throughout the Proposed Development sustainability approach and are covered within various aspects of the submitted planning application documentation. The objectives are also ingrained within the 6 main sustainability themes and aspirational targets of the development, as set out in the following sections of this submission.

Sustainability has played a central role in the plan-making and decision-taking at the pre-planning stage for the Proposed Development, with key aims set out at the earliest opportunity (RIBA Stage 1) and underwritten by a strong client brief, which established the core objectives. Supplementary steering groups and committees have been set up during the pre-planning stage within the project design team to ensure that the developing design is evaluated and interrogated in respect of environmental and sustainable performance.

The sustainability steering group has been chaired by Sweco UK, and each session includes input from representative members of each core project consultant team, as well as review and input from the Applicant & the lead designers KPF Architects.

This meant that decisions made at the early project stage could be evaluated for feasibility, suitability and sustainable impact covering the entire design and construction process, to practical completion and beyond.

This highly collaborative, involved and multi-disciplinary approach has ensured that sustainability is kept at the top of the development agenda and incremental design development during the pre-planning stages is regularly assessed against the project's sustainable outcomes and targets.

10.1.2 Influence of the New Southwark Plan (Submission Version February 2020)

LB Southwark is in the process of preparing a new Local Plan that will, upon adoption, replace the saved Southwark Plan policies and Core Strategy. The Examination in Public hearing sessions for the New Southwark Plan ended in April 2021. Most recently the London Borough of Southwark consulted on the Main Modifications to the New Southwark Plan between August and September 2021. It is anticipated the Inspectors Report will be issued in Autumn 2021 and the Cabinet and Council Assembly will consider the Plan for adoption at the end of 2021.

We consider relevant emerging policies in the NSP can be attributed 'significant weight' in the determination of this planning application, given its current state of preparation. This policy again has three core messages, which this submission will address:

- Reduce energy use and emissions that contribute to climate change during the life cycle of the development. Energy Targets set using the UKGBC and LETI – Paris Agreement.

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- Ensure the reduction, reuse or recycling of resources and materials, including water, waste and aggregates.

- Planning for extended lifetime of the development through excellence in design, durable materials, efficient operation.

Although the new Southwark plan is not yet formally adopted, and therefore the policies contained within carry limited weight, the design team felt it is important that the sustainability decision making for the Proposed Development is in appreciation of the local development policy progress, to ensure that sustainability is futureproofed against expected standards.

The application will also be in appreciation of the policies set out in the Intend-to-Publish London Plan (December 2019), specifically noting where the independent Sustainability Strategy underwrites and upholds the key criteria for sustainable development set out in Chapter 9 – Sustainable Infrastructure. Particular regard will be given to how the strategy meets Policies SI1 to SI13, as appropriate to the context of this application document.

10.1.3 **The Proposed Development Sustainability Strategy**

The sustainable intent for the Proposed Development has been established from the earliest project stages. A strong client brief, top-down approach to ingraining core principles of sustainable design into plan-making and decision-taking, and an involved collaborative response from the design team led to the establishment of six core targets/principles, which form the basis of the sustainability strategy. The six key principles and targets specific to this project have been presented throughout the pre-application process which preceded this application and have been well received by both Southwark Council and the GLA as targets which are supportive of, and in many cases in exceedance of meeting the aims of sustainable development in London.

These targets are interdependent and are to be pursued in mutually supportive ways; for example, there is strong interrelationship between operational and embodied carbon performance, and therefore the Whole Life Carbon assessment approach is taken for the Proposed Development to ensure that the impact of these issues are considered as a whole and not in isolation. Similarly, alignment with benchmarks such as the RIBA 2025 Climate Challenge allows targets to be set concurrently for embodied carbon, operational energy intensity (and therefore consequent carbon impact) and potable water consumption, creating a ‘resource use framework’ approach covering three key pillars of sustainable design. These are but a few examples of the cross-compatibility of these targets, and relationships will be established in more detail in the following sections of this application.

Alongside these headline principles for the Proposed Development are key target metrics which have been established and agreed at the pre-application stage, informed by specialist involvement and input. These project goals are centred on pushing the boundaries of existing target frameworks and benchmarks within the context of the development, including those set out in the RIBA 2030 Climate Challenge, UKGB Net Zero Carbon Framework, LETI Climate Emergency Design Guide and the GLA’s Intend-to-Publish London Plan (December 2019).

The process and detail behind these strategies is set out in the relevant category sections of this Sustainability Statement. Progress against these goals will be monitored through the project design and construction stages using Sweco’s Sustainability Matrix, and, importantly, the successful implementation of these goals will later be monitored in operation, to evaluate how the development goals have positively influenced operational performance and occupant experience.

The goals set out above have been established to set a benchmark in Southwark for sustainable development, going beyond expected policy practice to deliver an exceptional mixed-use scheme that pushes the boundaries of what is considered conventional commercial development in London. The implementation of supporting measures and monitoring/reporting against these goals throughout design and construction of the development will be of paramount importance to their success. Additionally, longer-term monitoring in operation will be critical to ensuring that the aims of the strategy are met in respect of sustainable performance and enhanced user experience.

Through engagement with these development goals and targets, it will be possible to show how they support the Southwark development plan policies, Core Strategy and GLA policy requirements set out in the respective City Plans and the London Plan. Section 10.3 onwards demonstrates this alignment, both against our independent sustainability strategy and also through wider sustainability actions that form part of the development approach.

10.2 Sustainability Assessments

10.2.1 **BREEAM**

BREEAM is a third-party verified holistic sustainability assessment and certification scheme, operated by the Building Research Establishment (BRE). It is the most established sustainability scheme in the world, with more than 590,000 developments certified and 2.3 million developments registered. The BREEAM New Construction assessment methodology is split into 9 environmental categories, with individual credits and criteria within those categories, where credits are awarded based on compliance with best-practice environmental and sustainability performance indicators.

BREEAM assessment forms a key component of the Proposed Development Sustainability Strategy, and the various credits available in the scheme have been purposely selected to support the project targets set out in Section 10.1.2. The design team recognise that, when used in a framework approach, BREEAM assessment is a powerful tool to underwrite design intent and provide established methodologies for completion of core tasks that deliver sustainable development. BREEAM should always be viewed as framework rather than a box-ticking exercise, with significant interconnectivity between credits allowing sustainable performance to be gauged in consideration of the myriad of impacting factors.

The New Southwark Plan also highlights the importance of using BREEAM as a tool to support sustainable development. The Strategic Policy 13, part of the saved policies of the Southwark Core Strategy, sets out “how we will make sure development helps us live and work in a way that respects the limits of the planets natural resources, reduces pollution and damage to the environment and helps us adapt to climate change”. Non-residential developments should achieve at least BREEAM ‘Excellent’.

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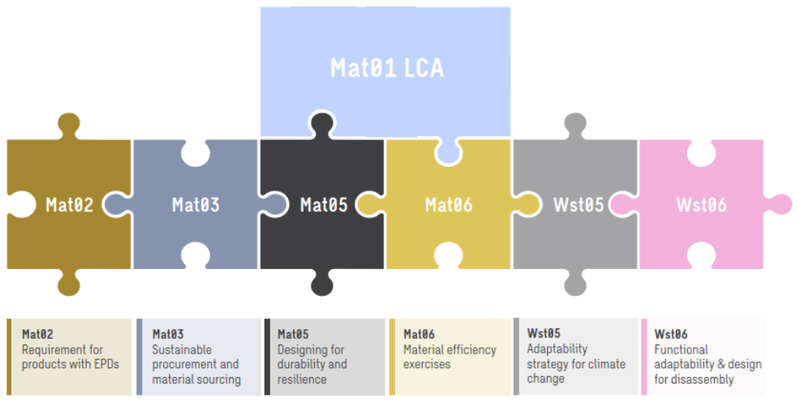
Fig. 10-3: Puzzle diagram demonstrating credit interdependence in the BREEAM 2018 assessment methodology (example of credits working to support Mat01 LCA).



BREEAM is also useful as a timeline management device, setting deadline targets for provision of design information in accordance with the RIBA Plan of Works. The latest version of the scheme, BREEAM 2018 New Construction, places heavy emphasis on completion of early actions prior to the conclusion of RIBA 2. This focus on early action and integration of sustainable thought-processes is synchronised with the independent Sustainability Strategy process, therefore the processes are both complementary and interdependent.

The Proposed Development will be assessed under the latest and most onerous version of the BREEAM methodology, BREEAM 2018 New Construction (v3). Based on the current design strategy, there are two separate BREEAM assessments to be undertaken for the development. Table 10-1 sets out the assessment types, scope, methodology and the proposed performance targets.

Table 10-1: Table to show the BREEAM assessments being for the Proposed Development, including scope and minimum performance targets.

Assessment	Scheme	Scope	Minimum Target
Office	BREEAM 2018 NC v3	Shell & Core	'Excellent' (score of ≥70%)

As an office scheme, the Proposed Development will seek to achieve a minimum of BREEAM 'Excellent' under the 2018 New Construction scheme, in compliance with Southwark Core Strategic Policy 13. Please refer to the Sweco BREEAM pre-assessment tracker document for the office appended to this report (Appendix D), which demonstrates the credits targeted for the office use to meet this minimum requirement.

It has been assumed that the restaurant/retail units will be built to a Shell Only scope and will be occupying the minority of the overall use of the development. Sweco believe that undertaking a BREEAM assessment on the restaurant/retail areas will not add any additional value to the sustainable goals of the building as a whole. Furthermore, a BREEAM assessment would be particularly onerous due to the scope of the units. The key to this lies in the complexity with BREEAM 2018 NC shell only assessments and the Ene01 credit section in particular. The shell only Ene01 section relies on heating and cooling demand only to award credits, and Sweco experience and sensitivity analysis demonstrates that it is very difficult to achieve the minimum 4 no. credits for 'Excellent'. This is typically due to the key fabric design elements for restaurant units to meet other key marketability and tenant requirements being in conflict with how the BRE approach this credit section, and a lack of ability to use building services to improve performance under a shell only scope.

BREEAM will be used as a framework to support and underwrite the Proposed Development sustainability strategy. In the headline sections which follow, the strategy shows how key BREEAM credits have been selected to support this, and also to address some of the core Southwark policy requirements in respect of sustainable development.

10.2.2 WELL

The WELL v2™ Pilot is the next version of the pioneering WELL Building Standard™, the first rating system to focus exclusively on the impacts of buildings on human health and wellness. WELL is equitable, evidence based, technically robust and resilient, helping businesses all over the world to address the two greatest challenges faced today: Stress and the war for talent. WELL goes beyond the health and wellbeing of the occupants by assisting in maintaining the building in its 'as designed' form by regular monitoring of all the systems, it also influences people's behaviours to make healthier more environment friendly choices, which also benefit the energy performance of the building. WELL is particularly attractive as formal certification of design and performance for multinational corporate tenants who have strong CSR and sustainability aspirations.

WELL follows a similar scoring methodology to BREEAM, with a number of mandatory credits known as 'Preconditions' and tradable criteria known as 'Optimisations'. The certification levels range from Silver to Platinum (with the latter being the highest possible certification level in WELL) – for each certification level, you must achieve 100% of the 'Preconditions' and a set percentage of the 'Optimizations', as defined by the International WELL Building Institute (IWBI).

Office spaces at the proposed development will be assessed under WELL Standard v2 Pilot 'Ready', targeting to achieve 70 points leading to WELL Ready Gold with an aspiration to achieve 105 points for WELL Ready Platinum. the pre-assessments can be found in Appendix F, targeting all the features required for the GOLD rating.

Currently, a decision is made not to go for formal certification. By adopting the WELL Ready approach, we will ensure that all the WELL requirements are included in the base built, so that we do not preclude the tenant's ability to undertake formal WELL certification for their fit-

out space and achieve the highest possible WELL rating if they aspire to do so. The WELL requirements are only focused on the base built, mainly the client owned areas of the project and do not bind the tenant in any way.

Evidence from the design team will not be collated at this stage, however all the requirements will have to be included and addressed in the reports and specifications to demonstrate compliance to the WELL requirements. Early Stage 3, WELL focused workshops will be conducted for each design team separately to provide additional guidance and address any concerns.

There are a few updates made to the WELL Tracker to address features that will be important post COVID-19. The key themes are as below.

1. **Promote clean contact**

   W08: Handwashing
   X09: Cleaning Products and Protocol

2. **Improve air quality**

   A03: Ventilation Effectiveness
   A06: Enhanced Ventilation
   A07: Operable Windows (Potential)
   A12: Air Filtration
   A14: Microbe and Mold Control

3. **Manage humidity and control sources of indoor moisture**

   W07: Moisture Management
   T07: Humidity Control (Potential)

4. **Maintain water quality**

   W01: Fundamental Water quality
   W02: Water Contaminants
   W04: Enhanced Water Quality
   W05: Water Quality Consistency

5. **Manage risk and create organizational resilience**

   C15: Emergency Preparedness
   C10: Family Support (Not targeted)

6. **Support movement and comfort, including work from home**

   C03: Occupant Survey
   C04: Enhanced Occupant Survey (Potential)
   V02: Visual and Physical Ergonomics
   V07: Active Furnishings (Potential)

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   V10: Enhanced Ergonomics (Not targeted)
   V12: Self-Monitoring (Not targeted)

7. **Strengthen immune systems**

   N01: Fruits and Vegetables (N/A)
   W06: Drinking Water Promotion
   C05: Health Services and Benefits (Potential)
   M03: Mental Health Support
   C06: Health Promotion
   A02: Smoke free Environment
   M13: Tobacco Prevention and Cessation
   V06: Physical Activity Opportunities
   V08: Physical Activity Spaces and Equipment
   V11: Physical Activity Promotion
   L03: Circadian Lighting Design
   M11: Sleep Support (Not Targeted)

8. **Foster mental resilience**

   M01: Mental Health Promotion
   M04: Mental Health Education
   M05: Stress Support
   M06: Restorative Opportunities (Potential)
   M08: Restorative Programming

9. **Champion community resilience and recovery**

   C11: Civic Engagement
   C16: Community Access and Engagement
   N12: Food Production (Potential)
   N13: Local Food Environment

10.3 LETI & UKGBC Based Energy Targets

The energy strategy for the Proposed Development is covered in earlier sections of this report and is therefore not repeated in full within this section.

This section intends to provide a brief overview of the targets and goals associated with the energy strategy and describe some of the key actions undertaken at pre-application stages to align the development with the 2040 net zero aspirations of WCC and best-practice energy benchmarking schemes.

LETI consider a building's low-energy consumption to be a defining characteristic of an operational zero carbon building. The performance indicator typically used to demonstrate this is Energy Use Intensity (EUI). EUI is the metric describing the total energy consumption

of a development, accounting for both regulated and unregulated energy, divided by the building area (either NLA or GIA dependant on the benchmark you are comparing against). EUIs are useful for setting performance-based design goals, and the indicator provides a means to equalise the way energy is compared between various types of buildings, assisting in the benchmarking process. The EUI targets for the Proposed Development draw upon those set out in the UKGBC '*Net cero carbon: energy Performance targets for offices'* (January 2020), focusing on the base building energy consumption which is directly under landlord control. The targets were to be based on NLA and are shown in Table 10-2 below.

Table 10-2: Energy performance targets for buildings targeting net zero carbon for operation energy, with provisional targets highlighted for the Proposed Development (UKGBC, 2020).

		Interim Targets			Paris Proof Target
Scope	Metric	2020-2025	2025-2030	2030-2035	2035-2050
Whole building energy	kWh_e/m^2 (NLA) / year	160	115	90	70
	kWh_e/m^2 (GIA) / year	130	90	70	55
	DEC rating	D90	C65	B50	B40
Base building energy	kWh_e/m^2 (NLA) / year	90	70	55	35
	kWh_e/m^2 (GIA) / year	70	55	45	30
	NABERS UK star rating	4.5	5	5.5	6
Tenant energy	kWh_e/m^2 (NLA) / year	70	45	35	35

NLA = net lettable area GIA = gross internal area

As described in section 5.3, the design team provisionally set a target EUI of **70 kWh/m²** (NLA) per annum (Base Building Energy), with an intent to explore opportunities to further reduce this, working towards the 'Paris Proof Target' where it is deemed feasible. To ensure that all energy consumption is included, the EUI calculation data must be supported by an advanced energy modelling process such as CIBSE TM54. This process accounts for both regulated and unregulated energy and is an instrumental tool in helping the industry close the 'performance gap' between design and operation. Typical modelling under Part L of the Building Regulations accounts for regulated energy only, and a significant proportion of operational energy is associated with unregulated consumption. Therefore, the Proposed Development will be using the CIBSE TM54 process to determine energy performance and declare the EUI. This methodology also feeds into the Whole Life Carbon assessment process and provides a more accurate insight into the proportionality and relationship between embodied and operational energy consumption.

Identification of the path to net zero was important and was informed by recent industry frameworks and documentation from the UKGBC and LETI. Additionally, the approach was supported by the Mayor's Energy Hierarchy from the GLA, which assisted the decision-making process and informed approach at key stages of design development at the pre-application stage.

The path to net zero carbon begins with the actions undertaken to ensure that the development maximises opportunities to reduce energy consumption through passive means. A 'fabric first' approach to achieving net zero goals is directly referenced as a strong foundation to create a low-energy asset by both UKGBC in the Net Zero Carbon Framework Approach and within LETI's Climate Emergency Design Guide. The design team have embraced this approach, using early-stages computer based dynamic simulation modelling (DSM) studies to understand and quantify solar gains to office perimeter zones, setting a minimum target of <65 W/m2 in accordance with BCO guidance documentation, and an aspirational goal towards reducing it further. Controlling solar gains in office zones is important, because a significant proportion of annual operational energy consumption in an office is associated with cooling, and therefore passively controlling solar gains limits heat gains to internal spaces and reduces the requirement for consequent mechanical cooling.

To further support this, optimisation exercises during the early design stages ensured that the percentage of vision to solid areas was also assessed through DSM studies, to ensure that the solar gains targets were balanced against daylighting. This ensures that good levels of natural daylight penetration are maintained, which has positive effects on both occupant wellbeing and on lighting loads for the office floorplates, whilst limiting unwanted solar gain and heat loss. Each elevation has a specific vision glazing area aiming to balance energy loads and views out. Strong fabric performance requirements have been set out in Table 5-1 to support the overall fabric efficiency approach.

The design team have also explored opportunities for free cooling to further reduce cooling loads. The design includes natural ventilation strategy using innovative stack ventilation. It also allows the building to be adaptable to potentially becoming mixed mode in the future when air quality improvements are realised, and external noise levels are further reduced.

With regards to active design measures, the Proposed Development HVAC strategy takes an all-electric approach, with ground source heat pumps (WSHP) located in the basement providing both heating and cooling to the development. This focus on electrically-driven systems allows the development to take advantage of the diminishing carbon factor of the UK grid, with significant carbon factor reductions up to 2050 even under the National Grid's 'slow progression' scenario, which is used for reporting of whole life carbon in this report – refer to section 11.6 for further details. Having no combustion-led energy-generating technology on site will assist the development in mitigating negative impacts on local air quality, particularly through reduced NOx emissions.

The development includes a number of complementary energy efficiency measures across both regulated and unregulated sources, which are set out in section 5.2 and 5.3 of this application documents. Specific building services performance and efficiency required have been set, including lighting and base build plant equipment, to support the Proposed Development sustainability narrative. It is especially important the unregulated energy is included in this picture given the proportional impact of this category, and this has been facilitated by the pre-application CIBSE TM54-led advanced modelling approach. The TM54 exercise also allows the team to explore the potential energy impact of the tenant fit beyond landlord services, and this will be used to steer the setting of green performance requirements for incoming tenants to uphold the target energy performance characteristics of the building.

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The result of this highly involved and integrated approach to energy efficiency is that Proposed Development achieves a 49.5**%** reduction in CO_2 emissions (SAP 2012) against Building regulations Part L2A 2013, exceeding the current GLA target emissions reduction for non-domestic buildings and also exceeding the minimum requirement set out in Intend-to-Publish London Plan Policy SI 2 (item C). Additionally, the 'be lean' performance in Section 5.4 is significantly beyond the minimum 15% required by GLA Policy SI 2 (item C), facilitated by the fact that ASHP technology is technically considered an 'energy efficiency' measure and therefore falls under the 'lean' category of the Mayor's Energy Hierarchy. The reductions over Part L2A 2013 also allow for 6 no. credits to be awarded under the BREEAM 2018 scheme, which is the minimum performance requirement for an 'Outstanding'-rated development.

Other sections of the BREEAM 2018 assessment methodology will be used to help support the energy efficiency of the development and provide further evidence of the measures implemented that will be third-party verified by the BRE. Rather than use BREEAM to 'tick the boxes', the overall energy strategy approach is already set up to address many of the criteria, including ingraining use of TM54 into project decision-making, development of a metering stagey in accordance with CIBSE TM39, lighting efficiency, passive design focus, and optimising the energy efficiency of the lift systems. At this stage it is highly likely that all of the currently targeted credits in the 'Energy' section of BREEAM will be achieved as part of this development approach.

The energy strategy has also considered the potential reductions in carbon emissions against the latest SAP10 carbon factors. The carbon factors in Part L 2013 have not been updated, but the national grid has undergone significant decarbonisation in the period since the last version of Part L was released. This has particularly impacted the emissions factor for electricity, and therefore for a GSHP-led, all-electric scheme it is unfair to measure carbon reductions against outdated carbon factors. The GLA have provided a separate spreadsheet for such schemes to calculate consequent emissions reductions when using the more recent SAP 10 emissions factors. Using this method, the Proposed Development achieves a carbon emissions reduction after the final stage of the Energy Hierarchy in excess of 50%.

Significant steps have been taken to reduce carbon emissions in the first instance through strong passive design, energy efficiency and incorporation of low-carbon technologies. This demonstrates clear and effective direction to reduce emissions on-site within the scope of development, in accordance with the steps to achieve Net Zero set out by the UKGBC. The development will achieve Net Zero operational carbon for the base build (i.e. elements of the development directly under landlord control) through the use of 100% purchased renewable energy from approved suppliers which prove 'additionality'. This is allowable as per the requirements of Section 4 of the UKGBC Net Zero Carbon Framework Definition. Given that the energy strategy described in the sections above is all-electric, and all electricity will be supplied via approved, verified, renewable sources, the landlord operational carbon outlay will be Net Zero from the first day of operation in 2026. Agreements will be in place to ensure that this is upheld for the life of the development. Tenants will be encouraged to support this by also purchasing energy from 100% renewable sources. Additional voluntary offsets for base build operational carbon will therefore not be required, as the Proposed Development meets operational Net Zero Carbon at the conclusion of Step 4 of the UKGBC Framework approach ('Increase Renewable Energy Supply').

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On this basis, the three key performance metrics for the Proposed Development energy section can be summarised as follows:

<35% — **% savings in CO_2 emissions**
Savings against Building Regulations Part L2A 2013 using SAP 2012

<50% — **% savings in CO_2 emissions**
Using the updated carbon factors from SAP10

70 — **kWh/m² (NLA) per annum Base Building Energy**
Energy Use Intensity (EUI) of the base building energy (via CIBSE TM54)

The operational energy performance and consequent carbon emissions will also be captured in the Whole Life Carbon (WLC) study. The WLC study will also utilise the National Grid's Future Energy Scenarios to model the diminishing grid emission factors over time using the 'slow progression' scenario, as per the rules of the RICS Professional Statement for WLC assessments.

However, it is also appreciated that the operational carbon outlay for the base build/landlord spaces will be Net Zero from Day 1 of operation, thanks to the all-electric strategy and the purchase of 100% renewable electricity, so this should also be reflected in the whole life carbon assessment.

10.4 Water consumption

The Proposed Development has set strong aspirational project targets for potable water consumption. The development will seek to achieve this in a number of ways, through integrating low consumption thinking into the earliest stages of project design, focusing on water recycling, providing crossover with our urban greening aspirations and looking at water management holistically.

The stated potable Water Use Intensity (WUI) target of 16 litres/person/day is based on the RIBA 2030 Climate Challenge, which is a thematic benchmarking target that runs throughout this sustainability strategy. The Proposed Development is aiming for the current best practice standards of '2020' target band of this scheme, as shown in the figure below.

Fig. 10-5: RIBA 2030 Climate Challenge performance benchmarks for potable WUI (via RIBA 2030 Climate Challenge, 2019).

RIBA 2030 Climate Challenge target metrics for non-domestic buildings

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Potable Water Use Litres/person/day	>16 l/p/day (CIRA W11 benchmark)	< 16 l/p/day	< 13 l/p/day	< 10 l/p/day	CIBSE Guide G

To show how this compares with current and good-practice Buildings in the UK to date, in March 2020 the Better Buildings Partnership (BBP) released their REEB 2019 Benchmark data. As a partnership of developers and supporting industry organisations, the BBP have collated significant data on the annual water consumption of office buildings in the last 3 years to 2019, with performance data on annual water consumption taken from 810 commercial offices. Properties included in these benchmarks must meet very strict data quality controls. The collated data shows that typical practice WUI for operating developments is 35 litres/person/day, and a 'good practice WUI', covering those developments who have imposed water-efficiency measures, is 23 litres/person/day. Targeting a WUI of 16 litres/person/day demonstrates a 45% reduction over what is considered current good practice in operating buildings today, underlining the intent to address this resource use as a priority.

The target approach is also in accordance with the requirements of the Saved Southwark Plan Policy 3.9, which asks that the development "incorporate measures to reduce the demand for water and recycle grey water and rainwater".

The low-consumption culture begins with the intent to specify water-consuming components and sanitaryware with a high standard of water efficiency. Components will be selected in accordance with the EU Water Efficiency Label, targeting the top two 'green' bands of this label to provide performance verification and support the project approach. In addition, sanitaryware will have set performance requirements to help facilitate the first stage of water-use reduction from end users. This is based primarily on the performance criterial set out in BS 8542:2011 Table 8.6, which sets out the sanitary components water efficiency criteria and water recycling contributions to achieve certain levels of water efficiency.

The Proposed Development will target a minimum of 3 no. BREEAM 2018 - Wat01 credits and go beyond this to seek to achieve further credits, which will be supported by the WUI target approach. This is also in exceedance of the requirements of the Intend-to-Publish London Plan Policy SI 5 item C (2).

Table 10-3: below sets out the proposed minimum performance requirements, in accordance with the WUI intent, BS 8542:2011 Table 8.6 and the target BREEAM Wat01 credits.

Water fitting – Non-Domestic Areas	Capacity / flow rate	Units
WC, dual flush (effective)	2.95	litres
Urinals (2 or more)	0.0	Litres/bowl/hour
Wash hand basin taps	3.0	litres/minute
Showers	6	litres/minute
Commercial dishwashers	5	litres/rack
Commercial washing machines	4.85	litres/kg
Kitchen sink taps	5	litres/minute

Referring back to the BREEAM assessment, engagement and target of credits such Wat 02, Wat 03 and Wat 04 also assist in supporting the development water strategy and answering the requirements of Intend-to-Publish London Plan Policy SI 5 item C (3). Sufficient water metering will be provided within the development, covering both the incoming supply and also monitoring water usage of high-consumption systems and building areas. A water leak detection system will be provided, which will monitor leaks throughout the development and synchronise with the BMS to ensure that leaks are identified and can be mitigated quickly. In addition, sanitary supply shut off devices, such as PIR linked to the lighting systems, will be included to only supply water to spaces (such as WCs and hand basin taps) when it is required. All of these solutions support the low flow sanitaryware specification requirements and water recycling approach.

To ensure that the approach to water efficiency is robust and comprehensive, where irrigation systems are required, the following solutions will be prioritised to ensure that their operation meets with the project water targets.

- Where possible, and subject to supply distribution and availability, water for irrigation should be provided through recycled water supplies.
- Species selection for planted/landscaped areas should accord with local climatic context and be drought-resistant where this also supports the UGF target for the development.
- Irrigation systems should be sub-surface, drip-fed in design.
- Moisture sensors should be included to ensure that water is not supplied when soils/substrates already hold sufficient moisture.
- Zoning of irrigation should be implemented.
- Controllers and monitoring systems (including weather systems) should be considered to ensure automated supply.

10.5 Flood Risk, Water Management & Drainage

10.5.1 Flood Risk Assessment

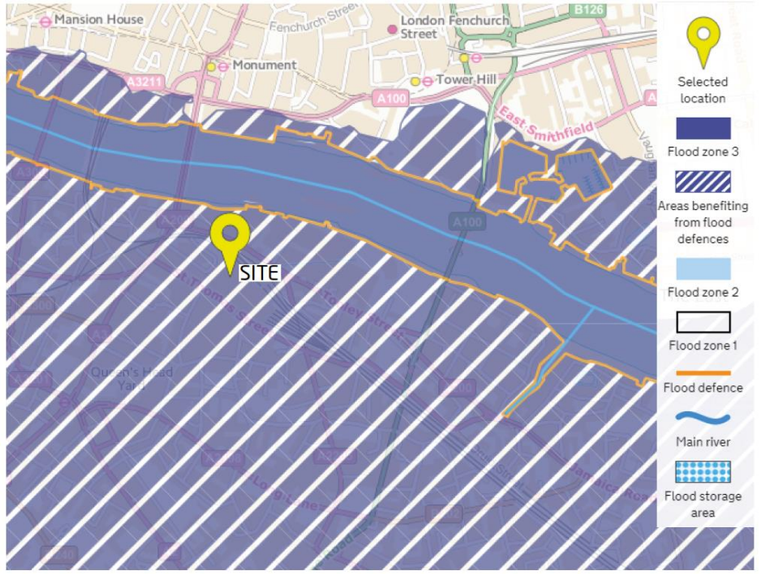
Managing flood risk is an important aspect of the sustainability strategy. This issue is particularly relevant to developments seeking to address the impacts of climate change, as an increase in potential for future UK flooding is one of the more likely and better-understood scenarios from the latest UKCP data. The issue also has covers factors such as robust design, occupant safety/means of escape and the potential for significant future economic impacts in a flooding scenario, so it is imperative that the risk is understood and mitigated.

Understanding and managing flood risk also form core policies in both Southwark Core Strategy and GLA documentation. The Saved Southwark Plan Policy 3.9 and the Core Strategic Policy 13 both cover requirements for flood risk assessment in detail, with the latter also noting compliance is required with other local and regional strategic flood risk documentation such as the Mayor's Regional Flood Risk Appraisal (RFRA). The GLA's Intend-to-Publish London Plan Policy SI 12 also gives specific guidance on provision of flood-resilient development, which is also relevant to this development.

Project civil engineer AKT II have provided a full, detailed flood risk assessment (FRA) as part of this application, and in accordance with the key policy requirements set out above. This section provides a summary note of the project strategy and risk, and inclusion of key climate change metrics; please refer to the AKT II FRA for full details of the approach.

The Proposed Development is located in flood Zone 3A, which is designated as having a high risk of flooding from fluvial/tidal sources. Figure 10-7 shows the location of the site on the Environment Agency's Flood Map for Planning.

Fig. 10-7: Potential flood extent map to show the location of the Proposed Development within Flood Zone 3A (EA Flood Map from the AKT II Flood Risk Assessment).



Environment Agency Flood Map for Planning (Rivers and Sea)

Although the Proposed Development is located in Flood Zone 3A, the above map clearly demonstrates that it will be afforded protection from the Thames Barrier. The London Borough of Southwark SFRA confirms that the flood defences in the areas are well-maintained in good condition and are therefore unlikely to fail. As a result, the ultimate risk from tidal and fluvial sources are low.

Regardless of this fact, where developments are located in an area of high flooding probability, the NPPF requires both a 'sequential test' and 'exception test', which are methods to demonstrate and help ensure that flood risk to people and property is managed satisfactorily, while allowing necessary developments to progress where other sites at lower risk of flooding are not viable. The AKT II FRA demonstrates that these tests have been met in full, and through the following means:

- Proposed Development provides sustainable benefits to wider community through reduced surface water flow and implementation of SuDS.
- EA inspect defences biannually, ensuing maintenance in good condition.
- Site is located appropriately given historical commercial context.
- Safe access and escape are accounted for.
- Development is safe over its lifetime, both under current and future modelling scenarios including climate change.

Allowances for climate change have also been included in the FRA for the Proposed Development. The FRA uses climate change allowances from the Environment Agency for peak river flow, peak rainfall intensity, sea level rise, offshore wind speed and extreme wave height. Climate change allowances have been made when considering the various different sources of flooding. For example, an allowance of 40% increase in peak rainfall intensity is considered when considering surface water runoff and potential for flooding. This allowance has also influenced the Sustainable Drainage Systems (SuDS) design, as referenced in section 11.5.2. Table 11-4 below shows the flood risk from the various sources identified in the AKT II FRA.

Table 11-4: Table to show flood risk form various identified sources, as per the AKT II FRA submitted for application.

Potential Source of Flooding	FRA Identified Risk Level
Fluvial/tidal	Very Low*
Sewers	Low
Groundwater	Low
Artificial Sources	Low
Surface Water	Low

*when considering benefits of existing Thames defences.

The flood risk from all sources is either considered to be 'low' or 'very low', as per Table 11-4 above and the AKT II FRA. These results will support the aware of the BREEAM 2018 Pol 03 credit section, and the FRA provided for the planning application is sufficient to award the first 2 no. BREEAM 2018 Pol 03 credits, given the results noted in the above table. Full detail of how specific risk levels were identified and claimed are captured within the FRA.

10.5.2 Sustainable Drainage Systems (SuDS) & Project Approach

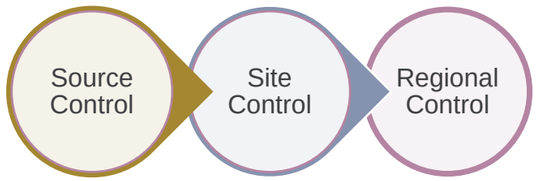
Although Table 10-4 in section 10.5.1 demonstrates that the risk of flooding from surface water flooding is low for the Proposed Development site, it is still imperative that this is effectively managed, and that the new development does not worsen the existing condition. The use of Sustainable Drainage Systems (SuDS) can reduce the impact of urbanisation on watercourse flows, ensure the protection and enhancement of water quality and encourage recharging of groundwater in a manner which mimics nature. Additionally, the NPPF requires that site water should be managed effectively and sustainably, to ensure that the post-

development site does not exacerbate the pre-development condition in the 1-in-100-year storm event, whilst being conscious of impact on flood risk and taking into account the impacts of climate change.

Intend-to-Publish London Plan Policy SI 13 (and existing policy 5.13) goes beyond this, with Item B noting that developments should aim to achieve greenfield runoff rates and ensure that runoff is managed as close to source as possible. The policy also provides a drainage hierarchy, in which preference is given to solutions which best deliver sustainable surface water management.

The Proposed Development has embraced this challenge and has utilised the SuDS Management Train to help steer the approach for the development. The SuDS Management Train is a sequential method for using drainage measures, in order of proportional positive impact, to change flow and quality characteristics of the runoff in stages. Source control is preferential in the first instance, as it controls runoff in smaller catchments. Where this does not provide adequate protection in terms of flood risk and watercourse pollution, site control may be required. Regional control can be utilised where there are a number of sites and communal storage and mitigation can be provided.

Fig. 10-8: The SuDS Management Train



At the Proposed Development, management will focus on source and site controls to ensure that surface water is managed. All of the calculations for achieving the base performance (i.e. no worse than pre-development) and for achieving the greenfield rate include an allowance of 40% for climate change, as per the flood risk assessment. Including this allowance supports the overall project intent to effectively manage projected climate change impacts and is a key strategy in the approach to futureproofing the development. Based on current design as submitted for planning, the maximum discharge rate, including an allowance for climate change, is $Q_{100(+40\%CC)}$ = 89.9 litres/second. To achieve greenfield rate, AKT II have calculated that the discharge rate would need to achieve 2.65 litres/second, which is a 97% reduction compared to existing condition.

To achieve this significant reduction, and number of solutions are being investigated, and it has been determined that a minimum of 150 m^3 of storage volume is required to support this. The final solution is likely to involve a combination of these measures, as suitable for the scheme development, but may broadly include the following features:

- Blue roof (dual ecological and drainage/water storage benefits)
- Rainwater retention and recycling systems
- Geocellular storage tanks located below ground level

The Proposed Development shows strong position for addressing the intent of Core Strategic Policy 13, in that it embraces a design methodology that accounts for climate change and reduced the risk of future flooding within the local context. The approach noted within this section also shows integration of SuDS management processes and hierarchy approach into design. Through this approach, it is also assumed that the full value of BREEAM 2018 Pol03 surface water runoff credits will be achieved, further underlining the positive nature of the approach taken on this development. By aiming for the greenfield runoff rate, which results in a very significant reduction in discharge rate, and addressing the reduction of peak rate runoff, the Proposed Development contributes positively to the London Borough of Southwark's flood risk mitigation and sustainable drainage strategy.

10.6 Materials

10.6.1 The Importance of Materials

The Proposed Development considers life-cycle material impacts to be of critical importance to the successful integration and implementation of the overall sustainability aspirations of this application. An assessment of Whole Life Carbon (WLC) was viewed as an essential requirement for the Proposed Development from the earliest project stages, and the core principles of this methodology have been integrated into design at the pre-application stage. Engagement with WLC analysis allows the design team to consider both embodied and operational carbon impacts and interrogate the synergies and interplay between these two-key metrics.

It is acknowledged that the proportional impact of embodied and operational carbon over a building's life cycle is beginning to change; the focus in the past few decades has been almost solely on tackling operational carbon emissions, with embodied carbon impacts largely dismissed. However, as the industry continues to innovate and drive down operational energy consumption and its consequent emissions, the importance of embodied carbon impacts become more pronounced. For an energy-efficient building in 2020, embodied carbon emissions can make up 60-70% of the whole life cycle impacts; therefore, it is not reasonable to claim to have developed a low-carbon development without a strategy to address and reduce the embodied carbon impacts associated with materials.

The Proposed Development aims to provide a strategy that looks at each stage of the development's life cycle to establish targets and goals for reducing embodied carbon. The concept is to move away from the linear economy, and treat the development more like a 'resource bank', which begins with establishing what can be reused from the existing building, and ends with a strategy for deconstruction, recycling and reuse at the conclusion of the development's design life. It is important that target metrics are carefully chosen to support this, as some of the benchmarking schemes do not consider whole life cycle of the development for embodied carbon, focusing rather on embodied impacts to practical completion, which are better understood and arguably more straightforward to verify when considering Net Zero claims.

In respect of relevant planning policy, there is only minor mention in Southwark Local Plan (2011) Strategic Policy 13 (item 5.121) of requirements related to consideration of low-carbon

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materials, which notes that “it is important that the whole of a development’s life-cycle is considered, including the energy and CO2 involved in manufacturing building materials”. However, this does suggest that a life-cycle approach to material selection and use is a preferred approach to sustainable development in Southwark.

The Southwark Sustainable Design & Construction SPD (2009) Section 3.2 ‘Choosing materials and fittings carefully’ suggests that developments need to consider reuse and recycling of materials, sourcing buildings from local suppliers and consideration of low-impact materials in respect of their environmental performance. Section 6.1 of the SPD also supports this, noting that demolition materials should be investigated for reuse first (see Section 11.7 of this Sustainability Statement), and that where additional building materials are required, the use of sustainably sourced and recycled materials from local sources are preferred. This section also highlights the importance of life cycle thinking with respect to materials, noting that they should be robust and long-lasting, and that buildings should be adaptable asper their design life. All of these requirements are supported through the WLC approach for the Proposed Development.

Section 10.5 of the Southwark Sustainable Design & Construction SPD also contains some ‘preferred standards’ that are appropriate to major developments and this section, which includes the following key items:

- 50% of construction materials by mass to be sourced within 35 miles of the site.
- 10% total value of materials to be derived from recycled and reused content in products and materials selected.
- At least 75% of the main elements of the building achieve an ‘A’ rating in the BRE Green Guide to Specification (also captured in the ‘Preferred Standards’ of SPD Section 11.2 – Standards for energy use and minimising climate change).

The implications of the initial two points will be considered carefully as part of the Proposed Development WLC approach; other sustainability factors of greater gravity and impact may preclude the ability of the project to achieve this, particularly associated with transport distances in relation to the Proposed Development site. The latter point is no longer relevant, as the BRE Green Guide is no longer fit for purpose, thanks to the introduction of a more robust, onerous and involved embodied and whole-life carbon assessment process both in BREEAM and within the industry to address the climate emergency. The most recent and onerous approach is being applied in the context of the Proposed Development.

The GLA’s Intend-to-Publish London Plan goes one step further, and explicitly notes a preference for WLC assessment for new developments within Policy SI 2 (F), which is supported by their pre-consultation draft Whole Life Carbon Assessments Guidance, released in April 2020. However, it should be noted that at this point this document is strictly a pre-consultation draft, requiring feedback from industry before it is implemented (likely in accordance with the full release of the intend-to-publish London Plan), and therefore carried limited weight at this time. Regardless, the process set out in this section does support the intent and process requirements of that guidance document.

BREEAM 2018 is used to supplement the process, although it is not the ultimate driver here, and the LCA study required in Mat 01 is not viewed as the most robust and complete methodology by key industry bodies (UKGBC, RIBA, LETI etc.). However, the overall process and key supporting approaches to a WLC assessment are assisted by the targeting of credits within the BREEAM 2018 Materials section (see credits Mat01-Mat06 in BREEAM pre-assessment trackers via Appendix D), which provide a methodology basis and framework through which successful integration of these themes can be realised.

The materials section links closely with the following waste and flexible design/future adaptability sections of this report, along with many others such as energy and circular design.

10.6.2 **Embodied & Whole Life Carbon Assessment**

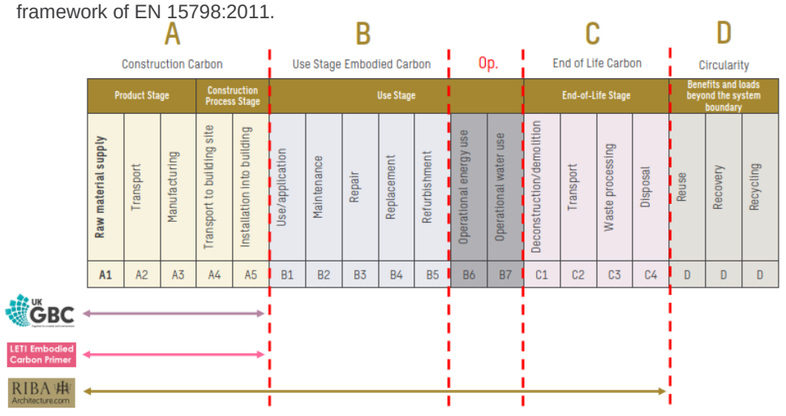
Whole Life Cycle carbon emissions are those associated with the construction, use and eventual deconstruction of a development over its whole life cycle, considering impacts of construction materials, along with their repair, maintenance and replacements, as well as regulated and unregulated operational carbon emissions. The process follows the method set out in EN 15978:2011, which is the European methodology for life cycle assessment.

The development strategy has been informed by current industry best-practice guidance and benchmarks, including those from UKGBC, RIBA, LETI and the GLA, as well as the methodology requirements of RICS and BREEAM. The development team have reviewed all of the current guidance documents available at concept design stage during a pre-application presentation delivered by Sweco, the results of which informed the establishment of the methodology approach and key targets for the Proposed Development.

Ensuring that a benchmarking scheme was chosen that reflected the project teams’ aspiration to address whole life cycle embodied carbon of the development, and not just the impact associated with construction, was key to informing the decision-making process at concept design stage. It was agreed that the RIBA 2030 Climate Challenge, released in October 2019, offered the best opportunity for realising this strategy, and allowed the team to investigate some of the wider implications of material decision-making to support the overall approach.

The decision was made on the basis that the embodied carbon assessment benchmarks & requirements set out in the UKGBC Net Zero Carbon Framework (April 2019) and the LETI Embodied Carbon Primer (January 2020) focused solely on embodied carbon to practical completion, covering EN 15978:2011 Modules A1-A5 only. The reasoning behind this, as set out by the UKGBC, is that there is not enough valid industry scenario data to accurately model and set targets associated with EN 15978:2011 Modules B & C, which cover repair/replacement emissions and end-of-life emissions respectively. However, Sweco have established that only ~60-70% of life cycle embodied carbon emissions fall within EN 15978:2011 Modules A1-A5, and therefore without assessment of Modules B & C, ~30-40% of the development impact is missing from the results. The development team also have a keen interest in exploring and challenging scenarios and assumptions made within the in-use and end-of-life module stages, therefore only a benchmark which allows for the whole life cycle (Modules A-C +D) to be included was suitable for consideration. This decision was supported by the project team at pre-application stage, as an approach that facilitated best-practice and a means to achieve the key sustainability aims of the Proposed Development. This also accords with the approach taken in the GLA’s Whole Life Carbon Assessment Guidance, which requires reporting against EN 15978:2011 Modules A-C.

Fig. 11-9: Demonstration of the embodied carbon benchmarking scope/module inclusion for UKGBC, LETI and RIBA frameworks/benchmarks, shown against the modular assessment framework of EN 15798:2011.



The next step was to determine the suitable target benchmark based on the RIBA 2030 Climate Challenge. It is widely acknowledged that, without intervention to reduce embodied carbon from the early project design stages, the majority of developments are either closely aligned to or exceed the 'current benchmark' for embodied carbon intensity of **1,100** $kgCO_2e/m^2$ GIA. The recent project examples within the appendices of the GLA's WLC guidance support this.

Fig. 10-10: RIBA 2030 Climate Challenge embodied carbon target benchmarks for non-domestic buildings (October 2019).

RIBA Sustainable Outcome Metrics	Current Benchmarks	2020 Targets	2025 Targets	2030 Targets	Notes
Embodied Carbon $kgCO_2e/m^2$	1100 $kgCO_2e/m^2$ (M4i benchmark)	< 800 $kgCO_2e/m^2$	< 650 $kgCO_2e/m^2$	< 500 $kgCO_2e/m^2$	RICS Whole Life Carbon (A-C) 1. Whole Life Carbon Analysis 2. Using circular economy Strategies 3. Minimum offsetting using UK schemes (CCC)

In determining a target that the development team deemed both achievable for the wider strategy and onerous enough to support the strong sustainability goals, all of the benchmark bands were considered. It was agreed that the '2020' benchmark, with an embodied carbon intensity target of **≤800** $kgCO_2e/m^2$ GIA was the correct aspirational target to set for the project. This reflects an embodied carbon reduction of ~**19%** when compared to the 'current benchmark' of RIBA 2030, inline with the GLA aspirational embodied carbon intensity benchmark for non-domestic buildings, which currently sits at 800 $kgCO_2e/m^2$ GIA (when considering EN 15978:2011 Modules A-C).

To report against the RIBA 2030 Climate Challenge, and in order to fulfil the aspiration of completing the most robust WLC assessment possible at this time, the methodology set out in the *RICS Professional Statement – Whole Life Carbon assessments for the build environment (2017)* has been followed. The RICS method aligns closely with the modular structure of EN 15978:2011, and provides set rules for calculations and data provisions, as well as element scope (as per RICS NRM 1) and sequential modelling requirements. The initial model should provide a baseline and a set of reduction measures either under consideration or implemented to work towards the achievement of project targets. The RICS document also provides sets of assumptions and base scenarios for material specifications, transport distances and replacement cycles, where these are not readily available due to the staging of the modelling works. Along with the RIBA 2030 Climate Challenge, the UKGBC, LETI and GLA requirements all call for use of the RICS method when providing reporting against WLC goals.

As previously noted, BREEAM 2018 also now has a section which deals with embodied carbon in a greater level of detail compared to previous schemes. The old BRE Green Guide to Specification is now defunct, replaced with a more robust LCA methodology using approved software, therefore making Southwark Sustainable Design & Construction SPD (2009) Section 11.5 reference to the Green Guide no longer fit for purpose. The Mat01 credit section can be viewed as a 'RICS Lite' approach, in that the scope of element/material inclusion is lower, and BREEAM has fewer sequential modelling steps compared to the full RICS approach. Sweco work has also demonstrated that a BREEAM-led method only accounted for ~60% of the total whole life embodied impact of a development, and therefore this is not the most complete and robust method of WLC assessment.

10.6.3 Offsetting to Net Zero

It is the intent of the project team to ensure that Net Zero is achieved for both operational and embodied carbon. The results of the final RICS assessment at practical completion will be used to determine the quantum of voluntary offset required to achieve Net Zero for the development. For embodied carbon, it is appreciated that in a new-build development, new materials are often used and therefore there is an inherent associated embodied impact. However, it is not acceptable to simply design, build and operate in a 'business as usual' approach and then just pay to offset the carbon, as this undermines the intent of the issue. Both the materials and energy sections of this statement clearly demonstrate the significant thought that has gone into reducing both operational and embodied carbon in the first instance and reflects a strong commitment to driving down whole life carbon impacts prior to considering offsetting. The voluntary offsets for embodied carbon will be chosen to reflect some of the key sustainability aspects of the development, and will be procured through robust and approved schemes, as defined by Net Zero Framework operators such as the UKGBC.

Moreover, a design competition will be launched with this planning application to promote innovative thinking on how to use parts of the Proposed Development at the end of life, by keeping materials with higher embodied carbon content circulating in the economy. The aim of the competition is to raise awareness about the challenge of deconstruction and repurposing of existing building materials.

10.6.4 Material Data – EPDs

Environmental Product Declarations (EPDs) form the basis of the WLC assessment process, particularly for embodied carbon of materials. They are the third-party verified quantified assessment of a product or material's life cycle impacts, either from cradle-to-gate (raw

extraction to delivery on site), or cradle-to-grave (raw extraction to demolition & disposal). EPDs are used in the WLC process to provide the data for embodied carbon, and databases such as One Click LCA, which Sweco utilise for WLC, have >25,000 EPDs in the system to complete this work. EPD data is also directly requested for supporting embodied carbon assessment as part of the RICS method.

Although the number of EPDs in the software seems large, this is only a very small fraction of construction products and materials available on the market today. Some materials groups are more likely to have supporting EPD than others; for example, there is good EPD availability for concrete, gypsum and insulation products, but only very limited EPD information for building services equipment.

Given the importance of EPD information in the verification of project impacts and in underwriting any WLC process or Net Zero claims, requests for EPD have been included as part of the Proposed Development Sustainable Procurement Plan (more on this in Section 10.6.5). During the procurement process, a preference for products and materials with supporting EPD information will be stated in Pre-Qualification Questionnaires (PQQs), and such information will be requested direct from suppliers to inform the decision-making process when selecting materials for use on the project.

The project team may request EPDs from a wider range of materials should the research conducted with the supply chain at RIBA 3 suggest that it is possible to do so without significantly limiting procurement decisions. At present, the credit associated with EPD provision in BREEAM 2018, Mat 02, is highlighted as 'potential' in the BREEAM pre-assessments included in Appendix D. This is to reflect the fact that there is still limited availability of EPD information on the market. However, to help stimulate uptake of such information from suppliers, EPD will be requested as part of the procurement process, and the credit may be awarded at a later date subject to further review. As noted, preference will be given to those who can provide this detail, subject to assessment against other core performance goals linked with the sustainable procurement exercise.

10.6.5 Sustainable Procurement of Materials

The proposed development will seek to ensure that the principles of sustainable procurement are ingrained within the materials decision-making process. Ensuring that products are procured sustainably is a key feature in Southwark Sustainable Design & Construction SPD (2009) Section 6.1 and Section 10.5, which requires the preparation of a 'green procurement plan', with a focus on local sourcing, encouraging the use of materials with high recycled content and procuring low carbon materials. The BREEAM 2018 process is particularly effective in this regard, specifically within the Mat 03 credit section which can be used to steer success.

The preferred process will be established within a project Sustainable Procurement Plan (SPP). The SPP will follow the RIBA 2020 Plan of Works, specifically picking out key sustainability goals and aligning this with activities around sustainable procurement. This process also aligns closely with other material and waste considerations of the project; the WLC analysis, requirement for EPD, material efficiency measures, adaptability to climate change, pre-demolition audit and general project waste aspirations are all influenced by the SPP. The SPP will also capture the key themes required by the BREEAM 2018 Mat03 process, which sets out what is expected from these documents.

The input into these themes is informed by the Sweco approach to capturing and implementing the core aspects of sustainable sourcing and procurement for construction projects, assisted by the aims of the WLC study and the BREEAM Mat 03 process, and includes the following core input items:

The SPP will include advice and measures to influence sustainable procurement of a number of key material groups, including concrete, steelwork and aluminium amongst others. The contents of the Procurement Plan can largely be split into 6 cores 'themes', which contribute to the decision-making process when selecting sustainable materials. This includes a requirement to consider sourcing distances of materials as per Southwark Sustainable Design & Construction SPD (2009) Section 10.5, but also respecting the fact that the WLC study often demonstrates that transport impacts (from factory gate to site) in the majority of cases are small overall proportion of whole life material impact. Therefore, those associated savings will be weighed up against other potential savings in the whole life context, to ensure that decision-making is informed by the myriad considerations that constitute a successful WLC process.

The implementation of the above will be monitored through the project procurement phases and into construction, to ensure that the requirements are upheld. It is likely the outputs of the SPP will be used to inform Pre-Qualification Questionnaires (PQQs) for potential material suppliers for the Proposed Development, to ensure that the aims of the plan are implemented. Regular review of the SPP will also take place throughout the project, in line with project progression against the RIBA Plan of Works. This will ensure that the SPP is able to influence project decision-making, rather than be an early-stages BREEAM item that is then ticked off and forgotten. This is a good example of how BREEAM methodologies are used as a framework approach to drive value in sustainable design.

Some key materials will have mandatory requirements in respect of responsible sourcing. 100% of timber products used within the scope of the Proposed Development, be that in temporary works, formwork or in construction itself, will be procured in accordance with the UK Government's Timber Procurement Policy, and will be required to carry FSC (or equal approved) responsible sourcing certification. This is in exceedance of the current Southwark Sustainable Design & Construction SPD (2009) Section 11.5 requirement that 90% of structural timber should carry FSC certification. The project team understands that failure to comply with this standard will result in the inability to secure any BREEAM rating for the project, and therefore compliance is essential.

Responsible sourcing certifications
Setting minimum levels of responsible sourcing certification for key materials (FSC, BES 6001 etc.)

Requesting Environmental Product Declarations (EPDs)
As per Section 11.6.4 – where available for particular material groups, EPDs will be requested from suppliers.

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Key considerations for the Whole Life Carbon approach
Includes steering information on sustainable procurement to support the successful delivery of project WLC goals.

Setting provisional material sourcing distances
Setting base requirements for sourcing materials locally, subject to the material in question and impacts on other factors (i.e. WLC).

Key considerations for construction
Input from principal contractor (Stage 4) and the project team on the core considerations for each material group through construction.

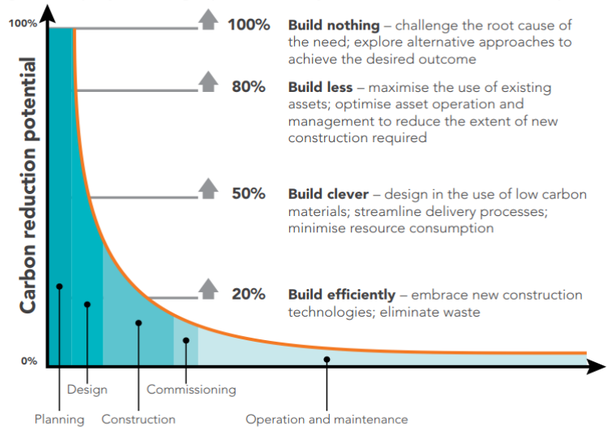
Material considerations for a circular economy
Key considerations for the material in respect of how it is likely to impact the circular economy and future reuse/resource efficiency.

10.6.6 Material Efficiency Actions

"Using less" material in design and embracing material efficiency exercises are two of the most important methods of ensuring efficient resource use and are identified by the UKGBC as some of the most effective ways of reducing a development's embodied impact. Designing to use less should always supersede the choice of low carbon materials in the design decision-making process, because very few things are more sustainable that a material that isn't there in the first place.

Integration of material efficiency into decision-making supports the aims of Southwark Sustainable Design & Construction SPD (2009) Section 6.1 'Building Construction'; construction process should be managed to reduce waste creation, including careful material specification and use of prefabrication where appropriate. Engagement with material efficiency processes is strongly linked to reduced wastage and effective management of construction materials, as well as supporting more onerous waste performance targets.

Figure 11-11: Graph to show embodied carbon reduction potential hierarchy at different stages of a project design (HM Treasury Green Construction Board)



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The project team have been integrating material efficiency processes into design decision-making from the earliest project stages, where it also meets the wider goals of the project beyond sustainability. Part of this is influenced by the pre-demolition audit; being able to use materials from the existing building to offset the consumption of new resources is a strong strategy towards using less material, and the audit will be used to steer and support these decisions during the next stages of design development. BREEAM 2018 also supports the material efficiency process, with strong influence from many of the materials and waste credits, which have been selected to support the project materials and waste approach. The Mat06 credit section in particular deals specifically with material efficiency and has been targeted by the project team. Some of the early feedback from the wider project team on measures to facilitate material efficiency include the following measures:

10.7 Waste Management

10.7.1 Demolition

The Proposed Development is taking a 'whole life' view of waste, aiming to tie waste targets in with the WLC process and opportunities to embrace circular economy principles. The process begins with an assessment and quantification of the ability to reuse materials from existing structures and buildings on the development site, prioritising reuse in the new development where possible/suitable. These materials should be considered alongside new materials and construction techniques that support a low-waste ethos, using the frameworks and approaches set out in Section 11.6 to help design out wastage, as well as inform and drive selection of materials and products which help realise this goal. Further to this, suitably onerous site waste targets should be set both for the production of construction waste and for diverting excavation, demolition and construction waste from landfill. The third part of this process is ensuring that suitable facilities and management procedures are in place to support a low-waste operational culture, which ensures waste is managed effectively through design, construction and operation.

The first important step in resource efficiency is to engage in a process of quantification and identification of products and materials within the existing building that could potentially be reused in new applications for the Proposed Development. This encourages principles of circularity and reuse and enables opportunities to be identified. The timing of such a study is also important; it needs to be undertaken early enough in the design process for there still to be opportunity to integrate some of the reuse opportunities into the developing design. The Southwark Sustainable Design & Construction SPD (2009) Section 6.1 'Building Construction' is fairly effusive in its requirement for the assessment of existing structures for material reuse and waste reduction opportunities, so this approach also supports the local planning requirements.

10.7.2 Construction Waste Management

In the next stage of waste management for the Proposed Development, onerous waste management targets will be set for excavation, demolition and construction waste generated by the development. The 'Preferred Standards' set out in Southwark Sustainable Design & Construction SPD (2009) Section 11.5 requires 95% of all construction, demolition and excavation waste to be diverted from landfill and reused or recycled. These targets also tie

in with the approach of quantifying and identifying potential materials for reuse directly on site as well as recycling offsite through other applications.

The current waste management targets are set at less than 7.5m3 of construction waste generated per 100m2 (GIA). Diversion from landfill targets will achieve and exceed the Southwark requirements of 95% of demolition and construction waste diverted from landfill.

The targets set for the Proposed Development in respect of diversion of resources from landfill are more onerous than those required by the BREEAM 2018 assessment, which only requires 80% by tonnage construction waste / 90% by tonnage of demolition waste to be diverted from landfill. This demonstrates the strong intent of the project to manage waste associated with construction sustainably and in accordance with current best-practice.

In contrast, the BREEAM 2018 targets in respect of construction waste have consistently proved to be onerous for developments to achieve, which is suggestive of why these targets have not been upgraded by BRE since the 2011 version of the BREEAM. Achieving 2 no. credits of the 3 no. available for construction resource efficiency is notoriously difficult; this is less about how the contractor manages waste on site, and more about how the development is designed with low waste in mind as part of the sustainability approach. Reflecting the fact that this approach is ingrained within the sustainability story for the Proposed Development, the project is targeting 2 no. credits for Wst 01 construction resource efficiency, equating to a target of < 7.5m^3 construction was per 100m^2 GIA. This target, set at an early project stage, is deemed tough enough to drive low-waste performance.

Effective monitoring and recording of site waste will also be a requirement of the project, again driven largely by the BREEAM 2018 assessment process. Resource Management Plans (RMP) will be required for both construction waste and demolition waste. Draft versions with waste estimates and calculations showing how the project waste targets might be achieved are required prior to construction, and these should be checked against the final RMP documents with actual site waste to assess the effectiveness of target setting and demonstrate 'lessons learned'.

10.7.3 Operational Waste Management

Another key aspect of whole life waste consideration is how waste is managed during the operation of the building and ensuring that adequate provision is provided to support building occupants in their sustainable waste decision-making. This is typically through the provision of facilities for recycling and composting of organic waste streams, and through the accessibility of these services to building occupants and facilities management teams. Lack of such facilities can undermine the strong low-waste approach set out during design and construction of the Proposed Development.

Southwark also see this as a core provision for sustainable outcomes. Section 11.5 of the Southwark Sustainable Design & Construction SPD (2009) set out the following relevant requirements for suitable management of operational waste in non-residential developments:

- Applications to provide waste volume calculations and explain how storage provision is adequate, including for organic waste streams.
- Storage on the street will not be supported.
- Waste storage should be separated where possible.
- Recycling facilities should be easy to access.
- An operational waste management plan should be submitted.

Requirements for operational waste management are also driven by the BREEAM 2018 credit process, particularly the Wst 03 credit, which is a mandatory credit for the achievement of BREEAM 'Excellent'. This upholds similar requirements to the Southwark SPD, but also includes better separation of recyclable waste streams, labelling and provision for cleaning facilities associated with organic waste. The BREEAM Wst 03 credit it targeted for the Proposed Development, as per the BREEAM Pre Assessment in Appendix D.

10.8 Flexible Design & Future Adaptability

The development team recognise that design for minimised whole life carbon impact does not just relate to the capital embodied carbon and the operational impacts of the building systems over time. This is reflected in the choice of benchmarking standards (RIBA 2030 Climate Challenge) that provide a whole-life overview and analysis basis. Facilitating future flexibility has the ability to reduce waste and costs associated with future fit-out or refurbishment works, improves the ability to cost-effectively reuse and recycle materials, increases the lifetime value of materials and products, and encourages circular thinking (refer to Section 11.9 below).

The BREEAM 2018 Wst 06 credit section deals specifically with design for disassembly and the potential for future functional adaptability of spaces. As per the BREEAM pre-assessments provided in Appendix D, the credit has been targeted for this development. The intent of the early-stage assessment (before the end of RIBA 2), is to collate thoughts and ideas on how future flexibility will be achieved, considering structural, architectural and MEPH engineering strategies to support this.

10.9 Air Quality & Pollution

10.9.1 External Air Quality

Section to reflect the air quality assessment submitted for planning – Sweco sustainability will request a summary section direct from the air quality assessor to ensure that the wording and terminology is correct.

Consider implications of claims with respect to air quality – 'air quality neutral' vs. 'air quality positive' (latter is contentious and should be avoided unless it can be categorically proven to be the case by the qualified professional).

Link back to energy section – all-electric strategy = no on-site NOx emissions from combustion equipment.

Comment on BREEAM Pol 01 and the impact on local air quality.

Key policy references for this section:

Local Plan 2015 Policy CS15, Policy DM 15.6

City Plan 2036 Policy S8: Design (items 5), Policy D1: Sustainability Standards (item 2), Policy S1: Healthy & Inclusive City, Policy HIC2: Air Quality There are also a number of sections within the IWBI's WELL Building Standard, applied at the Proposed Development in a 'WELL-ready' approach, which seek to support development with reduced impact on external air quality, for example:

- Testing and monitoring air quality around the building
- Promoting a smoke free environment
- Increasing ventilation rates for effectiveness of pollutant removal
- Managing construction pollution impacts prior to occupation of the building
- Promoting the use of openable windows
- Managing infiltration and condensation build-up
- Promoting the use of low VOC materials.

10.9.2 **Maintaining Internal Air Quality**

When considering air quality performance, it is important to consider mitigation of internal air quality impacts for the building occupants as well as the external air quality concerns raised in the policy documentation. The Proposed Development is designed to ensure that optimal indoor air quality is maintained for the building occupants and uses the best-practice methodologies set out in BREEAM and WELL to help establish this.

An indoor air quality plan (IAQP) will be developed at RIBA Stage 3, in accordance with the BREEAM Hea 02 methodology and WELL Air section and once the ventilation strategy reaches a well-defined stage of design development, to facilitate maintenance of good indoor air quality. The IAQP will define sources of indoor air pollutants and will establish mitigation and flush-out measures based on the specific ventilation design and construction practices for the development. The study will also set out a strategy for avoidance of deleterious and high-VOC internal fixings and finishes and propose a strategy for specification and determination of low-impact materials. This will be further underwritten by the engagement with BREEAM ad WELL approaches to this subject, which provide supporting information and set targets for VOC and internal air pollutant compliance.

The primary focus of ambient air quality is limited to a small number of pollutants (NO2, PM10 and PM2.5), while for indoor air quality there are a far greater range of pollutants which need to be considered in addition to NO2, PM10 and PM2.5 including volatile organ compounds (VOCs) and CO. There are limited regulations and legislation on indoor air quality in new buildings other than the requirements in Part F of the building regulations regarding ventilation and workplace exposure limits for employers. It is recommended that an indoor air quality strategy is developed for the development which focuses on materials used in the development, ingress of pollutants from outdoor air, sources of pollutants indoors and recirculation of air within the building due to mechanical ventilation.

The Proposed Development's indoor air quality will be enhanced by:

- Use of low VOC paints, adhesives, coatings, finishing's, carpets, furniture etc.
- Mechanical ventilation system which ensures suitable air flow changes and where air is sourced from an external location, that it is located away from pollution emissions and most likely filtered to improve the air quality indoors in relation to outdoors.
- Forced ventilation/extraction in rooms or enclosed spaces where there are direct emission sources, like for example commercial kitchens.
- Use of internal plants / greenery to improve CO levels.
- Consideration of pressure differentials in tall buildings with voids from ground level to the top of the building where air movement can pull in ground level pollution and 'suck' it up to the higher levels.
- Restrictions for smoking/vaping throughout the Proposed Development.
- Maintain damp or covered soil in all planting areas to minimise the potential for soil dust.
- Use of only necessary and appropriate pest control practices, and nonchemical methods where possible.
- Provision of regular cleaning of all areas used by bicycles, to minimise dirt and dust.
-

10.9.3 **Noise Pollution**

Acoustic consultant at Sweco have been appointed to provide a Noise Impact Assessment as part of this application submission, to accord with the requirements for addressing and mitigating external noise impacts of the development.

A plant noise assessment will has also be undertaken, and this study demonstrates that noise emissions from mechanical plant equipment are expected to comply with the requirements. It is unlikely that the retail units will result in significant noise impact or require any special noise mitigation measures.

10.9.4 **Light Pollution**

Potential impacts of light pollution will be managed at the Proposed Development. The development team recognises that such pollution is not limited to localised light spill and has knock-on impacts on other sustainability features such as ecological enhancement, and therefore needs to be considered in the round alongside those strategies.

Features from the BREEAM 2018 'Pol 04 – reduction of night-time light pollution' credit section in particular will be used as a base method for limiting external light pollution, where relevant to the base build design. All external lighting will be designed in accordance with the Institute of Lighting Professionals (ILP) Guidance note for the reduction of obtrusive light, 2011, which sets standards to limit external light pollution from developments. The standard allows the development to meet the following key recommendations:

- Limit the average upward light ratio of luminaires to restrict sky glow.
- Limit illuminance at the windows of nearby properties for which light trespass may be an issue.
- Limit intensity of each light source in particularly obtrusive directions beyond the boundaries of the site.

Where relevant to the base build lighting provision to terraces or external areas, curfews for the external lighting of the development will also be set to limit external light pollution, in accordance with the operation times. Where provided, all external lighting (besides that in the covered walkway) will be switched off automatically, using timeclock controls (or similar), during 23:00 to 07:00. If safety or security lighting is provided external to the development and will be used between the hours noted above, this lighting will be expected to comply with

the recommended levels of lighting set out in Table 2 of the ILP guidance notes. External lighting will also be required to support the low-energy ethos of the development, and will need to meet the performance requirements associated with external lighting set out in BREEAM 2018 credits Hea 01 and Ene 03, specifically achieving a luminous efficacy of >70 lm/W. Considerations of both light spill and energy performance will be made in appreciation of one another at the Proposed Development.

10.10 Health and Wellbeing

Air quality and noise pollution are the greatest external environmental issues for the future occupants of the Proposed Development. As previously mentioned, the Proposed development will be air quality neutral. The WELL Building Standard focus heavily on the air quality performance of the building and by adopting its framework the following will be encouraged:

- Air quality sensors and display implementation, where possible;
- Construction management practices to avoid contamination of ducts and ventilation systems;
- Consideration of potential to increase ventilation rates for enhanced indoor air quality such as with the façade openings for natural ventilation;
- Healthy material pre-specification and guidance for future tenant fit-out and cleaning practices.

Thermal comfort can be maximised through managing solar gains, integrating exposed concrete soffits coupled with openable windows for free cooling using night-time ventilation responding to the emerging policies on mitigating the risk of overheating from GLA.

Further effects on physical health and wellbeing of its occupants and visitors can be seen in the public realm design and proposals to reduce traffic prioritise pedestrians and cyclist's arrival.

Social well-being is encouraged by creating a central open space which is open to the public and fosters encounters and a mix of uses. Moreover, affordable workspace will be provided where collaborative working can be developed.

10.11 Adaptation to Climate Change

Ensuring that a development is adaptable to potential future variation is climate is a feature that feeds into the majority of sections within this report and is ingrained within the project approach, and therefore this section does not need to be exhaustive in its list of measures that have been included in design, as they are captured elsewhere.

A formal risk assessment will be provided post-planning in accordance with the BREEAM 2018 Wst 05 Climate Change Adaptability credit section, at the conclusion of RIBA Stage 2. This assessment will draw on the latest scientific research on UK climate change, including research and data from UKCCC and UKCP18, to set out the risks associated with future variations in temperature, flood risk, precipitation, drought, storm events and localised air pollution. The document will challenge the design team to consider the potential impacts of hazards and determine how these will be mitigated through robust and adaptable design.

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The RIBA 2 measures will be reviewed at RIBA 4 to ensure that the proposals have been implemented in final design ahead of construction.

Some key features and design measures have already been highlighted within this energy and sustainability application document. They can be summarised as follows:

Changes in temperature & solar radiation
Overheating studies & assessments.
BREEAM Hea04 thermal modelling for future weather scenario.
Potential to combat UHI effect through urban greening strategy.

Flood risk & drainage
FRA completed which shows development is at low risk of flooding.
SuDS calculations include 40% allowance for climate change.
Dual benefit SuDS proposed with runoff/greening benefits.

Localised air pollution
All-electric strategy with zero on-site NOx emissions.
Internal buildings services design facilitates good indoor air quality.

The document provided by the design team at the conclusion of RIBA 2 will set out all of the proposed measures, with input from the sustainability steering group, and in particular KPF, AKT II and Sweco MEPH, who are required as part of the BREEAM process to provide feedback on this for completion of the mitigation strategy. It is important that these items are considered at the early project stages to facilitate early consideration of their potential impacts an ensure that the design has not progresses past the stage by which they can be feasibly implemented without significant redesign or cost uplift.

The Wst05 credit is targeted in BREEAM, as per the BREEAM pre-assessment trackers set out in Appendix D. Given the current performance of the design at pre-application stage, it is also expected that the development will be able to achieve the 'exemplary' credit associated with climate change adaptability, which is achieved by securing certain credits in other BREEAM sections that are believed to facilitate a climate-resilient design.

10.12 Biodiversity & Green Infrastructure

Enhancing site biodiversity and facilitating urban greening is one of the six core development strategies for the Proposed Development. The development team have acknowledged that focus on this area has wider benefits to the scheme beyond simply providing better habitats for wildlife, and also enhances the strategies related to surface water management, occupant health and wellbeing, and potentially helping to tackle an aspect of the Urban Heat Island (UHI) phenomenon.

To demonstrate this approach, the team developed three core target goals, which were established by the project team during pre-planning stages. These targets are as follows:

1. Aspire to achieve a UGF of 0.4, with a minimum of 0.301.
2. Achieve biodiversity ‘net gain’ with a focus on local context
3. Focus on wellness and user experience when creating green spaces.

A Phase 1 Habitat Survey, completed by Schofield Lothian and referenced in the technical appendices of the Design & Access Statement (DAS), notes that the site is currently formed of an entire single building, with fragmented sections of only common and widespread habitats within the site boundary. The existing site has negligible potential to support roosting bats and moderate potential to support breeding birds; to ensure that disturbance of the latter is avoided in the new construction, clearance works should avoid the nesting season, and where this cannot be avoided, nest checks are to be undertaken by a qualified ecologist at least 48 hours prior to any clearance works taking place. The existing site was determined to have negligible potential to support any other protected species.

The Urban Greening Factor (UGF) is a recent addition within the Intend-to-Publish London Plan Policy G5 – Urban Greening. The UGF model has been developed by the Mayor to assist boroughs and developers in determining the appropriate provision of urban greening for new development. A ‘factor’, between 0 and 1, is applied to various surface cover types as a simplified measures to account for the benefits provided by soils, vegetation and water as a proxy of how their provision facilitates a range of positive interventions such as improved health, climate change adaptation and biodiversity conservation. Those surface cover types that contribute most positively to these goals have a contributing UGF closer to 1. At the other end of the spectrum, sealed impermeable surfaces have a contributing UGF of 0. The overall UGF is an area weighted average of planted and hardstanding areas.

Intend-to-Publish London Plan Policy G5 requires commercial developments to achieve a UGF of 0.301, to demonstrate the positive contribution to urban greening, but also in appreciation of the fact that all already of the public realm be publicly accessible and provide good amenity spaces, which is not always conducive of large species-rich planted areas. The development team are looking to exceed the performance requirement by setting an aspirational target for a UGF of 0.4, to demonstrate the commitment to providing a biodiverse site that contributes positively to the urban greening of the borough.

The targeted UGF figure can be achieved through a mixture of planting provision which will be developed through the next stages of project design through further discussion between the Sweco Suitably Qualified Ecologist (SQE) and KPF Architects.

The delivery of the urban greening strategy at the Proposed Development also serves to connect and contribute to other sustainability goals of the project, including those associated with surface water management and air pollution. The dual benefit of urban greening and managing surface water runoff is well documented, and ‘mimicking nature’ by utilising green surfaces and soil moisture storage capacities is one of the core principles of SuDS management and integration. Project team liaison between the SQE and KPF have included discussions regarding the use of green infrastructure within surface water management and where this can be feasibly implemented within the public realm. Designs are to be finalised in due course.

Throughout the post-planning stages, the project development team, led by landscape architect KPF and specialist ecological consultant at Sweco UK, will ensure that the urban greening design continues to develop and that the process for the selection of species is clearly established. The key guiding principles of this process will be to facilitate an increase in ecological value compared to the pre-development site and ensure that careful consideration is given to substrates. Considerations of climate change impact and water consumption through irrigation demands will also help to inform the decision-making process on species selection; unless irrigated, plants will need to be hardy to survive potential prolonged periods of future drought, and their specification should not impact the ability of the development to meet its set unregulated water targets. Only where these key performance criteria are considered in the round can a project claim to have made an informed species selection.

Provision of urban greening is also understood to have positive health and wellbeing benefits for building occupants. Enhancing biophilic design is a cornerstone of the WELL Building Standard approach, and the mental & physical health benefits of providing outdoor space with greenery and interactive environments for building occupants is well understood. Some of the measures that facilitate this are set out in Section 11.11 (Health & Wellbeing).

The BREEAM 2018 scheme also has a new ecology framework, which better supports positive ecological outcomes compared to previous schemes. The appointed SQE is now more involved at Stage 2 of design, allowing better consultation with the wider design team for more appropriate and timely integration of ecological enhancements, enabling determination of recommendations that are suitable in the development context and support overall aims. Given the pre-development site condition for the existing building, and the level of planting proposed for by this application, the Proposed Development is targeting 100% of the available credits from LE 02-LE 05 in BREEAM 2018, which underlines our demonstration of intent. The BREEAM pre-assessment trackers in Appendix D provide further evidence of this.

10.13 Sustainable Transport

Include a summary and overview of the Transport Assessment and the Framework Travel Plan, and how this supports sustainable transport at the proposed development. Make sure that this is accurate and reflects the TA/FTP submissions as they are for planning. Ensure cycle spaces etc. match the crib sheet.

References to developer drivers for this approach for the project – Sustainable Development Brief ‘creating sustainable spaces’ sub-item ‘exercise and commuting’.

Include the list and some images (CGIs would be great, GA’s showing locations and sizes of the spaces for cyclists, changing etc, would be ok). Reference how people will get in and out of the building and how the layout/access facilitates and encourages the use of sustainable transport in the development.

BREEAM 2018 Tra 01/02 references and how this is used to steer success.

10.14 Construction

Sustainability and environmental considerations must also be managed throughout construction of the development if the intent within this application document is to be upheld.

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A Site Waste Management Plan will be required as part of the BREEAM strategy. This will set out waste management targets to include:

- Non-hazardous waste materials including demolition and excavation waste
- Accurate data records on waste arising and waste management routes.

The principal contractor will be required to hold an Environmental Management Scheme such as ISO 14001 and comply with the best practice pollution prevention guidelines PPG6.

During construction, the principal contractor will also have to uphold the construction management credits associated with BREEAM 2018, which include monitoring of site water use, energy use, waste production and material deliveries to and from the site, and actions in many of the key categories noted above.

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11 Conclusion

A detailed Energy and Sustainability Statement has been developed for the Proposed Vinegar Yard Development conforming to the guidelines set out in all relevant local, regional and national documents. The strategy has appropriately considered the full array of options and technologies available now and in the future.

The development will consider how high levels of sustainability can be achieved not just in its design and construction, but through the entirety of its operational life, integrating whole life thinking and considerations of adaptability to future climate change into the decision-making processes.

It is proposed that extensive energy efficiency measures will be incorporated into the design, along with proposed LZC measures, will result in the following:

1. A world-class long-lasting asset that positively impacts the local community and environment.
2. Regulated carbon dioxide savings of **57% (Class D1)** relative to a New-Build Part L2A 2013 compliant development for the non-domestic areas;
3. Regulated carbon dioxide savings of **55% (Class B1b)** relative to a New-Build Part L2A 2013 compliant development for the non-domestic areas;
4. Commitment in place to be net-zero operational carbon commercial building from the outset;
5. BREEAM New Construction 2018 “Shell and Core” targeting “Excellent” rating for the office areas;
6. WELL-ready building enabling future tenant to achieve a minimum of Gold rating; and
7. Fossil fuel-free and all-electric development which will significantly improve the air quality in the area.

Regarding Policy 5.2 of the adopted London Plan, the Mayor’s Energy Hierarchy has been followed. The tables included in the Executive Summary summarise the performance of the Proposed Development relative to the London Plan in accordance with the GLA’s Energy Assessment Guidance (2018).

Certification

Target a minimum of BREEAM 2018 ‘Excellent’ (>70%).
Integrate the principles of the WELL Building Standard

Operational Energy & Carbon Emissions

Target a minimum of 35% emissions reduction vs. Part L (SAP10 carbon factors).
Undertake a CIBSE TM54 Advanced Energy Modelling process
Define an Energy Use Intensity (EUI) target in line with UKGBC guidance.

Embodied Carbon

Undertake full whole life carbon analysis for the proposed development, delivered to the RICS Professional Statement methodology.
Target an embodied carbon intensity of 800 $kgCO_2e/m^2$ GIA, covering EN 15978:2011 Modules A1-A5 (embodied carbon to practical completion).
Integrate Circular Economy principles into the WLC approach.

Managing Water Resources

Target a 40% reduction in potable water consumption against the BREEAM 2018 Wat01 baseline performance.
Consider the integration of Sustainable Drainage Solutions (SuDS).

Managing Waste

Engage with a ‘whole life waste approach, and Circular Design principles.
Target a minimum 95% diversion rate from landfill for non-hazardous construction, and demolition waste.

Ecology & Urban Greening

Target a 10% increase in ecological value using the BREEAM 2018 Ecology Framework approach.
Consider assessment using the GLA’s Urban Greening Factor (UGF) of 0.301

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Appendix A – **Part L2A - BRUKL Reports**

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BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Vinegar Yard- B1b Lean

As designed

Date: Mon Oct 25 15:56:59 2021

Administrative information

Building Details

Address: Southwark, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Kartik Amrania

Telephone number: 44(0)1628623423

Address: Sweco UK, 1 Bath Road, London, SL6 4AQ

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	19.9
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	19.9
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	11.8
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	0.23	0.25	L000001C:Surf[1]
Floor	0.25	0.15	0.15	B0000010:Surf[0]
Roof	0.25	0.1	0.1	B0000049:Surf[2]
Windows***, roof windows, and rooflights	2.2	1.2	2	B000005D:Surf[1]
Personnel doors	2.2	1.2	1.2	L00001E0:Surf[0]
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	3

Building services

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

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

1- 01c FCU system - ASHP_heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

2- 02a Extract system_Elec_WC&Changing only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

3- 01a FCU system - ASHP_office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.44	0	1.3	0.85
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.

4- 01b FCU system - ASHP_Clinical/Outpatients Reduced SFP and HRE

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.44	0	1.8	0.75
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.

"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
B01 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Lobby 02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Security Office	-	-	-	-	-	-	-	0.3	-	-	N/A
B01 Workspace I01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace N P02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace NW P01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace SW P03	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Lift Lobby 01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Lobby 01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Workspace	-	-	-	-	-	-	-	0.2	-	-	N/A
B02 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_lift Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_lift Lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_int_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_int_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_S1	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L04_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research3_peri_S2	-	-	-	-	-	-	-	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
L07_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research2_peri_E	-	-	-	-	-	-	-	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
L10_Research2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_E	-	-	-	-	-	-	-	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
L12_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L13_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peir_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L14_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_02	-	-	-	-	-	-	-	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
L15_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_E4	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E3	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_I01	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_Retail 01_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_Retail 01_peri_W	-	-	-	-	-	-	-	0.3	-	-	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
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
B01 Circ 01	-	95	-	25
B01 Circ 02	-	95	-	25
B01 Circ 03	-	95	-	68
B01 Circ 04	-	95	-	20
B01 Circ 05	-	95	-	13
B01 DIS. Showers	-	95	-	35
B01 Lobby	-	141	-	356
B01 Lobby 02	-	99	-	701
B01 Lockers	-	95	-	102
B01 Security Office	135	-	-	269
B01 Showers	-	95	-	143
B01 Stairs 01	-	95	-	25
B01 Stairs 02	-	95	-	56
B01 Stairs 03	-	95	-	47
B01 Stairs 04	-	95	-	41
B01 Substation & Switchroom	95	-	-	255
B01 Switchroom	95	-	-	57
B01 Water Meter Room	95	-	-	72
B01 WC 01	-	95	-	49
B01 WC 02	-	95	-	33
B01 WC 03	-	95	-	28
B01 Workspace I01	125	-	-	2334
B01 Workspace N P02	126	-	-	1812
B01 Workspace NW P01	131	-	-	562
B01 Workspace SW P03	129	-	-	824
B01-Mezz Circ 01	-	95	-	30
B01-Mezz Circ 02	-	95	-	31
B01-Mezz Circ 03	-	95	-	71
B01-Mezz Circ 04	-	95	-	25

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B01-Mezz Cycle Store	95	-	-	149
B01-Mezz Gas Meter Room	95	-	-	73
B01-Mezz Lift Lobby 01	-	95	-	41
B01-Mezz Lobby 01	-	131	-	276
B01-Mezz Stairs 01	-	95	-	27
B01-Mezz Stairs 02	-	95	-	61
B01-Mezz Stairs 03	-	95	-	49
B01-Mezz Stairs 04	-	95	-	46
B01-Mezz Switchroom	95	-	-	62
B01-Mezz WC 01	-	95	-	58
B01-Mezz WC 02	-	95	-	42
B01-Mezz Workspace	124	-	-	2877
B02 Bin Store	95	-	-	56
B02 BOH	-	95	-	83
B02 Circ 01	-	95	-	45
B02 Circ 02	-	95	-	31
B02 Corridor	-	95	-	453
B02 Generator 01	95	-	-	1706
B02 Generator 02	95	-	-	240
B02 Landlord HV/LV Substation	95	-	-	539
B02 Lobby	-	178	-	160
B02 Stairs 01	-	95	-	75
B02 Stairs 02	-	95	-	73
B02 Substation	95	-	-	646
B02 Switchroom 01	95	-	-	183
B02 Switchroom 02	95	-	-	251
B02 Switchroom 03	95	-	-	121
B02 Ventilation Plant	95	-	-	195
B02 Waste Store	95	-	-	47
B03 AWS Ventilation Plant	95	-	-	339
B03 BOH	-	95	-	150
B03 Circ 01	-	95	-	47
B03 Circ 02	-	95	-	49
B03 Circ 03	-	95	-	37
B03 Corridor	-	95	-	369
B03 CWS Tank	95	-	-	86
B03 Diesel Storage	95	-	-	126
B03 Grey Water Tanks and Pumps	95	-	-	195
B03 Heating Plant	95	-	-	246
B03 Plant	95	-	-	830
B03 Retail Plant	95	-	-	245
B03 Stairs 01	-	95	-	66
B03 Stairs 02	-	95	-	71

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B03 Tanks and Pumps	95	-	-	721
B03 Ventilation Plant	95	-	-	218
B03 Water Storage	95	-	-	248
L00-Mezz_Circ_01	-	95	-	54
L00-Mezz_Circ_02	-	95	-	22
L00-Mezz_Gas Storage	95	-	-	27
L00-Mezz_lift Lobby	-	95	-	40
L00-Mezz_lift Lobby_peri_S	-	95	-	39
L00-Mezz_refuge	95	-	-	11
L00-Mezz_refuge	95	-	-	12
L00-Mezz_stairs	-	95	-	51
L00-Mezz_Stairs_01	-	95	-	33
L00-Mezz_stairs_peri_S	-	95	-	52
L00-Mezz_WC	-	95	-	40
L00-Mezz_WC_01	-	95	-	63
L00-Mezz_WC_02	-	95	-	71
L00-Mezz_WC_03	-	95	-	34
L00-Mezz_Workspace_I01	127	-	-	593
L00-Mezz_Workspace_peri_E	141	-	-	183
L00-Mezz_Workspace_peri_N	123	-	-	1867
L00-Mezz_Workspace_peri_S	134	-	-	469
L00-Mezz_Workspace_peri_W	129	-	-	552
L00_circ_01	-	95	-	60
L00_circ_02	-	95	-	14
L00_lift Lobby	-	95	-	44
L00_lift Lobby	-	95	-	40
L00_lift Lobby_peri_S	-	95	-	39
L00_Loading Bay	95	-	-	313
L00_Lobby_I01	-	125	-	291
L00_Lobby_I02	-	98	-	565
L00_Lobby_peri_E	-	109	-	269
L00_Lobby_peri_N_01	-	104	-	988
L00_Lobby_peri_W_01	-	280	-	95
L00_Lobby_peri_W_02	-	215	-	169
L00_Lobby_peri_W_03	-	117	-	517
L00_Lobby_peri_W_04	-	105	-	394
L00_refuge	95	-	-	15
L00_refuge	95	-	-	14
L00_Retail 02_I01	-	89	35	1192
L00_Retail 02_peri_E	-	102	35	326
L00_Retail 02_peri_E	-	94	35	648
L00_Retail 02_peri_N_01	-	96	35	954
L00_Retail 02_peri_N_03	-	108	35	195

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00_Retail 02_peri_S	-	99	35	735
L00_stairs	-	95	-	54
L00_stairs	-	95	-	97
L00_Stairs_01	-	95	-	40
L00_stairs_peri_S	-	95	-	55
L00_WC	-	95	-	45
L01_lift lobby	-	95	-	44
L01_lift lobby_peri_S	-	95	-	43
L01_refuge	95	-	-	17
L01_refuge	95	-	-	15
L01_Research_int_01	140	-	-	221
L01_Research_int_02	125	-	-	1714
L01_Research_peri_E	156	-	-	117
L01_Research_peri_E2	142	-	-	139
L01_Research_peri_E2	159	-	-	154
L01_Research_peri_N	128	-	-	930
L01_Research_peri_N2	128	-	-	1003
L01_Research_peri_S	129	-	-	585
L01_Research_peri_S1	150	-	-	154
L01_Research_peri_S2	129	-	-	542
L01_Research_peri_SW	160	-	-	90
L01_Research_peri_W_01	125	-	-	411
L01_Research_peri_W_02	136	-	-	241
L01_stairs	-	95	-	59
L01_stairs_peri_S	-	95	-	61
L01_storage	95	-	-	21
L02_lift lobby	-	95	-	42
L02_lift lobby_peri_S	-	95	-	41
L02_refuge	95	-	-	14
L02_refuge	95	-	-	15
L02_Research_int	124	-	-	2109
L02_Research_int	129	-	-	488
L02_Research_peri_E	152	-	-	117
L02_Research_peri_N	132	-	-	313
L02_Research_peri_N	127	-	-	1619
L02_Research_peri_NE	158	-	-	101
L02_Research_peri_S	149	-	-	166
L02_Research_peri_S	160	-	-	93
L02_Research_peri_S	133	-	-	304
L02_Research_peri_SE	131	-	-	341
L02_Research_peri_SE	153	-	-	108
L02_Research_peri_SE	159	-	-	88
L02_Research_peri_SW	160	-	-	90

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L02_Research_peri_W	139	-	-	118
L02_Research_peri_W	140	-	-	241
L02_stairs	-	95	-	56
L02_stairs	-	95	-	60
L02_storage	95	-	-	20
L03_lift lobby_int	-	95	-	51
L03_lift lobby_peri_S	-	95	-	49
L03_Plant	95	-	-	1694
L03_Plant3	95	-	-	372
L03_refuge	95	-	-	18
L03_refuge	95	-	-	16
L03_Research_I01	132	-	-	762
L03_Research_I02	157	-	-	284
L03_Research_peri_N	132	-	-	1127
L03_Research_peri_NW	158	-	-	179
L03_Research_peri_S	151	-	-	148
L03_Research_peri_SW	138	-	-	95
L03_Research_peri_W_01	124	-	-	418
L03_Research_peri_W_02	154	-	-	139
L03_stairs	-	95	-	68
L03_stairs	-	95	-	65
L03_storage	95	-	-	24
L04_lift lobby	-	95	-	42
L04_lift lobby_peri_S	-	95	-	41
L04_refuge	95	-	-	14
L04_refuge	95	-	-	15
L04_Research3_peri_E	158	-	-	102
L04_Research3_peri_S3	131	-	-	542
L04_Research3_peri_SE	153	-	-	112
L04_Research_int	123	-	-	3266
L04_Research_peri_E	152	-	-	117
L04_Research_peri_N	126	-	-	2101
L04_Research_peri_NE	158	-	-	101
L04_Research_peri_NW	141	-	-	179
L04_Research_peri_S	134	-	-	277
L04_Research_peri_S04	155	-	-	100
L04_Research_peri_W	145	-	-	152
L04_Research_peri_W	137	-	-	139
L04_stairs	-	95	-	60
L04_stairs	-	95	-	56
L04_storage	95	-	-	20
L05_lift lobby	-	95	-	42
L05_lift lobby_peri_S	-	95	-	41

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L05_refuge	95	-	-	15
L05_refuge	95	-	-	14
L05_Research3_peri_E	158	-	-	102
L05_Research3_peri_S3	131	-	-	542
L05_Research3_peri_SE	153	-	-	112
L05_Research_int	123	-	-	3266
L05_Research_peri_E	152	-	-	117
L05_Research_peri_N	125	-	-	2101
L05_Research_peri_NE	158	-	-	101
L05_Research_peri_NW	134	-	-	179
L05_Research_peri_S	134	-	-	277
L05_Research_peri_S04	155	-	-	100
L05_Research_peri_W	145	-	-	152
L05_Research_peri_W	137	-	-	139
L05_stairs	-	95	-	56
L05_stairs	-	95	-	59
L05_storage	95	-	-	20
L06_lift lobby	-	95	-	43
L06_lift lobby_peri_S	-	95	-	41
L06_refuge	95	-	-	15
L06_refuge	95	-	-	14
L06_Research3_peri_E	162	-	-	99
L06_Research3_peri_S2	134	-	-	119
L06_Research3_peri_S3	128	-	-	429
L06_Research3_peri_SE	144	-	-	117
L06_Research_int	124	-	-	2670
L06_Research_peri_E	153	-	-	117
L06_Research_peri_N1	130	-	-	474
L06_Research_peri_N2	134	-	-	372
L06_Research_peri_N3	128	-	-	505
L06_Research_peri_N4	133	-	-	383
L06_Research_peri_NE	155	-	-	154
L06_Research_peri_NE1	149	-	-	108
L06_Research_peri_NW1	149	-	-	108
L06_Research_peri_NW2	149	-	-	109
L06_Research_peri_S	134	-	-	277
L06_Research_peri_S04	160	-	-	98
L06_Research_peri_SW	142	-	-	194
L06_Research_peri_W	137	-	-	221
L06_stairs	-	95	-	56
L06_stairs	-	95	-	20
L06_stairs_peri_S	-	95	-	47
L06_storage	95	-	-	20

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L07_lift lobby	-	95	-	43
L07_lift lobby_peri_S	-	95	-	41
L07_refuge	95	-	-	15
L07_refuge	95	-	-	14
L07_Research3_peri_E	162	-	-	99
L07_Research3_peri_S2	130	-	-	257
L07_Research3_peri_S3	145	-	-	180
L07_Research3_peri_SE	141	-	-	175
L07_Research_int	125	-	-	2494
L07_Research_peri_E	136	-	-	117
L07_Research_peri_N1	130	-	-	474
L07_Research_peri_N2	132	-	-	401
L07_Research_peri_N3	128	-	-	505
L07_Research_peri_N4	131	-	-	383
L07_Research_peri_NE	155	-	-	154
L07_Research_peri_NE1	149	-	-	108
L07_Research_peri_NW1	149	-	-	108
L07_Research_peri_NW2	149	-	-	109
L07_Research_peri_S	134	-	-	277
L07_Research_peri_S04	160	-	-	98
L07_Research_peri_SW	142	-	-	195
L07_Research_peri_W	137	-	-	221
L07_stairs	-	95	-	56
L07_stairs	-	95	-	20
L07_stairs_peri_S	-	95	-	47
L07_storage	95	-	-	20
L08_lift lobby	-	95	-	51
L08_lift lobby_peri_S	-	95	-	49
L08_Plant	95	-	-	1458
L08_Plant3	95	-	-	372
L08_refuge	95	-	-	16
L08_refuge	95	-	-	18
L08_Research_I02	163	-	-	374
L08_Research_Internal	129	-	-	1189
L08_Research_peri_N	131	-	-	1424
L08_Research_peri_NW	158	-	-	179
L08_Research_peri_S	186	-	-	100
L08_Research_peri_SE	191	-	-	102
L08_Research_peri_SW	155	-	-	210
L08_Research_peri_W	154	-	-	139
L08_stairs	-	95	-	68
L08_stairs	-	95	-	65
L08_storage	95	-	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L09_lift lobby	-	95	-	43
L09_lift lobby_peri_S	-	95	-	42
L09_Plant	95	-	-	79
L09_refuge	95	-	-	14
L09_refuge	95	-	-	16
L09_Research2_peri_E	163	-	-	102
L09_Research2_peri_S4	161	-	-	100
L09_Research2_peri_SW	149	-	-	154
L09_Research_Internal	124	-	-	3130
L09_Research_peri_N	124	-	-	2039
L09_Research_peri_NE	129	-	-	235
L09_Research_peri_NW	144	-	-	179
L09_Research_peri_S	134	-	-	320
L09_Research_peri_S	131	-	-	399
L09_Research_peri_SE	152	-	-	146
L09_Research_peri_SE	145	-	-	167
L09_Research_peri_W	140	-	-	139
L09_stairs	-	95	-	61
L09_stairs	-	95	-	58
L09_storage	95	-	-	21
L10_lift lobby	-	95	-	42
L10_lift lobby_peri_S	-	95	-	41
L10_refuge	95	-	-	15
L10_refuge	95	-	-	13
L10_Research2_peri_E	163	-	-	99
L10_Research2_peri_S4	161	-	-	98
L10_Research2_peri_SW	142	-	-	194
L10_Research3_peri_S2	153	-	-	119
L10_Research3_peri_S3	131	-	-	428
L10_Research3_peri_SE	155	-	-	117
L10_Research_int	124	-	-	2436
L10_Research_peri_E	133	-	-	309
L10_Research_peri_E2	182	-	-	129
L10_Research_peri_N	131	-	-	437
L10_Research_peri_N2	128	-	-	458
L10_Research_peri_N3	131	-	-	323
L10_Research_peri_NE	150	-	-	108
L10_Research_peri_NE	240	-	-	77
L10_Research_peri_NW	150	-	-	108
L10_Research_peri_NW	142	-	-	179
L10_Research_peri_S	134	-	-	277
L10_Research_peri_W	138	-	-	139
L10_stairs	-	95	-	56

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L10_stairs	-	95	-	57
L10_storage	95	-	-	20
L11_Office2_peri_E	154	-	-	99
L11_Office2_peri_S5	151	-	-	98
L11_Office2_peri_SW	141	-	-	160
L11_Office3_peri_S2	128	-	-	561
L11_Office3_peri_S4	165	-	-	103
L11_Office3_peri_SE	144	-	-	112
L11_Office_int	124	-	-	2733
L11_Office_peri_E	140	-	-	139
L11_Office_peri_N	129	-	-	437
L11_Office_peri_N2	126	-	-	458
L11_Office_peri_N3	129	-	-	431
L11_Office_peri_NE	143	-	-	108
L11_Office_peri_NW	143	-	-	108
L11_Office_peri_NW	137	-	-	179
L11_Office_peri_S	138	-	-	262
L11_Office_peri_W	134	-	-	139
L11_refuge	95	-	-	12
L11_refuge	95	-	-	14
L11_stairs	-	95	-	54
L11_stairs	-	95	-	47
L11_stairs	-	95	-	52
L11_stairs	-	95	-	52
L11_WC	-	95	-	46
L11_WC	-	95	-	79
L11_WC	-	95	-	125
L12_circ	-	95	-	25
L12_Office2_peri_E	167	-	-	102
L12_Office2_peri_S5	151	-	-	100
L12_Office2_peri_SW	142	-	-	154
L12_Office_int	123	-	-	2316
L12_Office_Peri E	168	-	-	93
L12_Office_Peri W	123	-	-	418
L12_Office_peri_E	140	-	-	139
L12_Office_peri_E	157	-	-	114
L12_Office_peri_N	125	-	-	1566
L12_Office_peri_NW	137	-	-	179
L12_Office_peri_S	129	-	-	412
L12_Office_peri_S	131	-	-	241
L12_Office_peri_SE	133	-	-	274
L12_Office_peri_SW	143	-	-	112
L12_Office_peri_W	134	-	-	139
L12_refuge	95	-	-	10

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L12_Stairs	-	95	-	19
L12_stairs	-	95	-	47
L12_stairs	-	95	-	52
L12_WC	-	95	-	104
L12_WC	-	95	-	79
L12_WC	-	95	-	46
L13_circ	-	95	-	31
L13_Circ	-	95	-	59
L13_Office2_peri_E	146	-	-	102
L13_Office2_peri_S5	146	-	-	100
L13_Office2_peri_SW	140	-	-	154
L13_Office_int	125	-	-	1789
L13_Office_int	146	-	-	193
L13_Office_Peir_W2	123	-	-	411
L13_Office_peri_E	138	-	-	139
L13_Office_peri_E	157	-	-	114
L13_Office_Peri_E2	147	-	-	97
L13_Office_peri_N	124	-	-	1566
L13_Office_peri_NW	131	-	-	179
L13_Office_peri_S	129	-	-	412
L13_Office_peri_SE	132	-	-	274
L13_Office_peri_SW	145	-	-	112
L13_Office_peri_W	132	-	-	139
L13_R	-	95	-	15
L13_Stairs	-	95	-	45
L13_stairs	-	95	-	41
L13_WC	-	95	-	79
L13_WC	-	95	-	47
L13_WC_01	-	95	-	63
L13_WC_02	-	95	-	45
L14_circ_01	-	95	-	31
L14_circ_02	-	95	-	32
L14_Office	125	-	-	1952
L14_Office_peri_E_01	124	-	-	359
L14_Office_peri_E_02	148	-	-	154
L14_Office_peri_E_03	148	-	-	106
L14_Office_peri_N	128	-	-	434
L14_Office_peri_NW	142	-	-	108
L14_Office_peri_N_02	124	-	-	950
L14_Office_peri_SW	141	-	-	157
L14_Office_peri_S_01	129	-	-	864
L14_Office_peri_S_02	146	-	-	104
L14_Office_peri_W_01	133	-	-	221

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L14_Office_peri_W_02	123	-	-	440
L14_Stairs	-	95	-	46
L14_stairs	-	95	-	42
L14_WC	-	95	-	44
L14_WC	-	95	-	61
L14_WC	-	95	-	81
L15_circ_01	-	95	-	30
L15_circ_02	-	95	-	15
L15_Office2_peri_E_04	145	-	-	102
L15_Office2_peri_SW	136	-	-	194
L15_Office2_peri_S_02	144	-	-	102
L15_Office_Internal	124	-	-	1691
L15_Office_peri_E_01	146	-	-	97
L15_Office_peri_E_02	150	-	-	100
L15_Office_peri_E_03	145	-	-	155
L15_Office_peri_NW	138	-	-	107
L15_Office_peri_N_01	127	-	-	434
L15_Office_peri_N_02	128	-	-	425
L15_Office_peri_N_03	141	-	-	111
L15_Office_peri_S_01	128	-	-	864
L15_Office_peri_W_01	123	-	-	412
L15_Office_peri_W_02	132	-	-	221
L15_stairs	-	95	-	41
L15_stairs	-	95	-	44
L15_WC	-	95	-	79
L15_WC	-	95	-	46
L16_circ_01	-	95	-	32
L16_circ_02	-	95	-	11
L16_Office2_peri_E_04	149	-	-	102
L16_Office2_peri_SW	138	-	-	194
L16_Office2_peri_S_02	148	-	-	102
L16_Office_Internal	123	-	-	1896
L16_Office_peri_E_01	126	-	-	97
L16_Office_peri_E_02	128	-	-	100
L16_Office_peri_E_03	129	-	-	155
L16_Office_peri_N_02	124	-	-	1035
L16_Office_peri_N_02	135	-	-	138
L16_Office_peri_N_02	138	-	-	181
L16_Office_peri_N_03	124	-	-	111
L16_Office_peri_S_01	126	-	-	864
L16_Office_peri_W_01	123	-	-	412
L16_stairs	-	95	-	43
L16_stairs	-	95	-	36

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L16_WC	-	95	-	81
L16_WC	-	95	-	48
L17_circ	-	95	-	30
L17_Office2_peri_E4	145	-	-	102
L17_Office2_peri_S2	144	-	-	102
L17_Office2_peri_SW	136	-	-	191
L17_Office_Internal	137	-	-	657
L17_Office_peri_E	145	-	-	97
L17_Office_peri_E2	153	-	-	92
L17_Office_peri_E3	138	-	-	172
L17_Office_peri_N	129	-	-	396
L17_Office_peri_N2	138	-	-	130
L17_Office_peri_S	138	-	-	363
L17_Office_peri_W	123	-	-	412
L17_Office_peri_W2	131	-	-	138
L17_Office_peri_W3	135	-	-	181
L17_stairs	-	95	-	48
L17_stairs	-	95	-	41
L17_WC	-	95	-	79
L17_WC	-	95	-	47
L18_Circ	-	95	-	16
L18_circ	-	95	-	22
L18_Office_Internal	228	-	-	169
L18_Office_peri_E	134	-	-	101
L18_Office_peri_N	127	-	-	396
L18_Office_peri_W	125	-	-	440
L18_Office_peri_W2	136	-	-	138
L18_Office_peri_W3	135	-	-	181
L18_Plant_01	95	-	-	216
L18_Plant_02	95	-	-	215
L18_Plant_03	95	-	-	370
L18_Stairs	-	95	-	40
L18_stairs	-	95	-	44
L18_stairs	-	95	-	41
L18_WC	-	95	-	26
L18_WC	-	95	-	34
L18_WC	-	95	-	71
L19_Plant	95	-	-	888
L00_Retail 01_I01	-	89	35	532
L00_Retail 01_peri_S	-	89	35	684
L00_Retail 01_peri_W	-	95	35	502
L00_Retail 01_Stairs	-	5	-	662
L00-Mezz_Seminar_peri_S	123	-	-	373

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00-Mezz_Seminar_peri_S	133	-	-	184
L00-Mezz_Seminar_peri_S	146	-	-	61
L00-Mezz_Seminar_peri_W	130	-	-	311
L00-Mezz_Seminar_peri_W	121	-	-	283
L00-Mezz_Seminar_I01	124	-	-	123
L00-Mezz_Seminar_I01	178	-	-	56
L00-Mezz_Seminar_I01	123	-	-	59
L00-Mezz_Seminar_peri_E	376	-	-	54
L00-Mezz_Seminar_peri_E	127	-	-	230
L00_Retail 01_Storage	95	-	-	9

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?
B01 Lobby	N/A	N/A
B01 Lobby 02	N/A	N/A
B01 Security Office	N/A	N/A
B01 Workspace I01	NO (-60.1%)	YES
B01 Workspace N P02	NO (-83.2%)	NO
B01 Workspace NW P01	NO (-99.5%)	NO
B01 Workspace SW P03	NO (-99.6%)	NO
B01-Mezz Lift Lobby 01	N/A	N/A
B01-Mezz Lobby 01	NO (-99.1%)	NO
B01-Mezz Workspace	NO (-98.9%)	NO
B02 Lobby	N/A	N/A
L00-Mezz_lift Lobby	NO (-99.9%)	NO
L00-Mezz_lift Lobby_peri_S	NO (-62.7%)	YES
L00-Mezz_Workspace_I01	NO (-97.2%)	NO
L00-Mezz_Workspace_peri_E	NO (-60.3%)	YES
L00-Mezz_Workspace_peri_N	NO (-68.1%)	YES
L00-Mezz_Workspace_peri_S	NO (-77.4%)	YES
L00-Mezz_Workspace_peri_W	NO (-76.4%)	YES
L00_lift Lobby	N/A	N/A
L00_lift Lobby	N/A	N/A
L00_lift Lobby_peri_S	NO (-77%)	YES
L00_Lobby_I01	NO (-92.9%)	NO
L00_Lobby_I02	NO (-89.7%)	NO
L00_Lobby_peri_E	NO (-76.5%)	YES
L00_Lobby_peri_N_01	NO (-54.6%)	YES
L00_Lobby_peri_W_01	NO (-56.7%)	YES
L00_Lobby_peri_W_02	NO (-46%)	YES
L00_Lobby_peri_W_03	NO (-63.4%)	YES
L00_Lobby_peri_W_04	NO (-41.5%)	NO
L00_Retail 02_I01	NO (-81.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00_Retail 02_peri_E	NO (-40.5%)	YES
L00_Retail 02_peri_E	NO (-80.4%)	YES
L00_Retail 02_peri_N_01	NO (-26.1%)	NO
L00_Retail 02_peri_N_03	NO (-23.9%)	NO
L00_Retail 02_peri_S	NO (-52.7%)	YES
L01_lift lobby	NO (-98.9%)	NO
L01_lift lobby_peri_S	NO (-51.9%)	YES
L01_Research_int_01	NO (-97.7%)	NO
L01_Research_int_02	NO (-88.3%)	NO
L01_Research_peri_E	NO (-48.1%)	NO
L01_Research_peri_E2	NO (-57%)	NO
L01_Research_peri_E2	NO (-45.7%)	NO
L01_Research_peri_N	NO (-59.9%)	YES
L01_Research_peri_N2	NO (-63.6%)	NO
L01_Research_peri_S	NO (-30.9%)	NO
L01_Research_peri_S1	NO (-69.5%)	YES
L01_Research_peri_S2	NO (-41.6%)	YES
L01_Research_peri_SW	NO (-60%)	YES
L01_Research_peri_W_01	NO (-63.6%)	YES
L01_Research_peri_W_02	NO (-72.4%)	YES
L02_lift lobby	NO (-99%)	NO
L02_lift lobby_peri_S	NO (-50.3%)	YES
L02_Research_int	NO (-89.7%)	NO
L02_Research_int	NO (-97.1%)	NO
L02_Research_peri_E	NO (-50.7%)	NO
L02_Research_peri_N	NO (-64.2%)	YES
L02_Research_peri_N	NO (-66.4%)	NO
L02_Research_peri_NE	NO (-54.8%)	NO
L02_Research_peri_S	NO (-52.9%)	YES
L02_Research_peri_S	NO (-40.4%)	YES
L02_Research_peri_S	NO (-51%)	NO
L02_Research_peri_SE	NO (-47%)	YES
L02_Research_peri_SE	NO (-56.9%)	YES
L02_Research_peri_SE	NO (-59.3%)	YES
L02_Research_peri_SW	NO (-47.7%)	YES
L02_Research_peri_W	NO (-77.9%)	YES
L02_Research_peri_W	NO (-78.9%)	YES
L03_lift lobby_int	NO (-99.2%)	NO
L03_lift lobby_peri_S	NO (-46.1%)	YES
L03_Research_I01	NO (-91.1%)	NO
L03_Research_I02	NO (-81.4%)	NO
L03_Research_peri_N	NO (-65%)	NO
L03_Research_peri_NW	NO (-68.2%)	NO
L03_Research_peri_S	NO (-49%)	YES
L03_Research_peri_SW	NO (-57.8%)	YES
L03_Research_peri_W_01	NO (-92.3%)	NO
L03_Research_peri_W_02	NO (-66.2%)	YES
L04_lift lobby	NO (-99.1%)	NO
L04_lift lobby_peri_S	NO (-55.7%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04_Research3_peri_E	NO (-58.7%)	YES
L04_Research3_peri_S3	NO (-44.9%)	YES
L04_Research3_peri_SE	NO (-62.1%)	NO
L04_Research_int	NO (-87.8%)	NO
L04_Research_peri_E	NO (-48.4%)	NO
L04_Research_peri_N	NO (-67.8%)	NO
L04_Research_peri_NE	NO (-54%)	NO
L04_Research_peri_NW	NO (-68%)	NO
L04_Research_peri_S	NO (-49.7%)	NO
L04_Research_peri_S04	NO (-61.1%)	YES
L04_Research_peri_W	NO (-56.3%)	YES
L04_Research_peri_W	NO (-59.5%)	YES
L05_lift lobby	NO (-99%)	NO
L05_lift lobby_peri_S	NO (-55.9%)	YES
L05_Research3_peri_E	NO (-59.4%)	YES
L05_Research3_peri_S3	NO (-45%)	YES
L05_Research3_peri_SE	NO (-62.3%)	NO
L05_Research_int	NO (-89.1%)	NO
L05_Research_peri_E	NO (-50.7%)	NO
L05_Research_peri_N	NO (-65.4%)	NO
L05_Research_peri_NE	NO (-54.4%)	NO
L05_Research_peri_NW	NO (-70.2%)	NO
L05_Research_peri_S	NO (-49.2%)	NO
L05_Research_peri_S04	NO (-61.1%)	YES
L05_Research_peri_W	NO (-55.8%)	YES
L05_Research_peri_W	NO (-60.2%)	YES
L06_lift lobby	NO (-99.2%)	NO
L06_lift lobby_peri_S	NO (-55.9%)	YES
L06_Research3_peri_E	NO (-58.5%)	YES
L06_Research3_peri_S2	NO (-54.3%)	NO
L06_Research3_peri_S3	NO (-43.6%)	YES
L06_Research3_peri_SE	NO (-69.5%)	NO
L06_Research_int	NO (-92.8%)	NO
L06_Research_peri_E	NO (-50.1%)	NO
L06_Research_peri_N1	NO (-62.8%)	YES
L06_Research_peri_N2	NO (-67.4%)	NO
L06_Research_peri_N3	NO (-64.6%)	YES
L06_Research_peri_N4	NO (-63.3%)	NO
L06_Research_peri_NE	NO (-50.1%)	NO
L06_Research_peri_NE1	NO (-53.1%)	YES
L06_Research_peri_NW1	NO (-59.3%)	YES
L06_Research_peri_NW2	NO (-59.3%)	YES
L06_Research_peri_S	NO (-47.4%)	NO
L06_Research_peri_S04	NO (-63.6%)	YES
L06_Research_peri_SW	NO (-61.6%)	YES
L06_Research_peri_W	NO (-65.4%)	YES
L07_lift lobby	NO (-99.2%)	NO
L07_lift lobby_peri_S	NO (-55.5%)	YES
L07_Research3_peri_E	NO (-57.9%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L07_Research3_peri_S2	NO (-44.5%)	YES
L07_Research3_peri_S3	NO (-49.7%)	YES
L07_Research3_peri_SE	NO (-50.3%)	YES
L07_Research_int	NO (-94%)	NO
L07_Research_peri_E	NO (-52%)	NO
L07_Research_peri_N1	NO (-68.3%)	YES
L07_Research_peri_N2	NO (-70.5%)	NO
L07_Research_peri_N3	NO (-69.8%)	YES
L07_Research_peri_N4	NO (-63.5%)	NO
L07_Research_peri_NE	NO (-49.7%)	NO
L07_Research_peri_NE1	NO (-60.2%)	YES
L07_Research_peri_NW1	NO (-65.4%)	YES
L07_Research_peri_NW2	NO (-60.8%)	YES
L07_Research_peri_S	NO (-48.4%)	NO
L07_Research_peri_S04	NO (-62.8%)	YES
L07_Research_peri_SW	NO (-55.3%)	YES
L07_Research_peri_W	NO (-67.1%)	YES
L08_lift lobby	NO (-99.2%)	NO
L08_lift lobby_peri_S	NO (-46.9%)	YES
L08_Research_l02	NO (-80.3%)	NO
L08_Research_Internal	NO (-93.2%)	NO
L08_Research_peri_N	NO (-66.7%)	NO
L08_Research_peri_NW	NO (-68%)	NO
L08_Research_peri_S	NO (-67.6%)	YES
L08_Research_peri_SE	NO (-67%)	YES
L08_Research_peri_SW	NO (-55.6%)	YES
L08_Research_peri_W	NO (-61.6%)	YES
L09_lift lobby	NO (-99.1%)	NO
L09_lift lobby_peri_S	NO (-53%)	YES
L09_Research2_peri_E	NO (-58.3%)	YES
L09_Research2_peri_S4	NO (-63%)	YES
L09_Research2_peri_SW	NO (-56.1%)	YES
L09_Research_Internal	NO (-89%)	NO
L09_Research_peri_N	NO (-71.3%)	NO
L09_Research_peri_NE	NO (-57.2%)	NO
L09_Research_peri_NW	NO (-68.5%)	NO
L09_Research_peri_S	NO (-45.3%)	NO
L09_Research_peri_S	NO (-67.8%)	NO
L09_Research_peri_SE	NO (-62.1%)	YES
L09_Research_peri_SE	NO (-42.7%)	YES
L09_Research_peri_W	NO (-60.7%)	YES
L10_lift lobby	NO (-99.2%)	NO
L10_lift lobby_peri_S	NO (-57.5%)	YES
L10_Research2_peri_E	NO (-62%)	YES
L10_Research2_peri_S4	NO (-63.6%)	YES
L10_Research2_peri_SW	NO (-55.2%)	YES
L10_Research3_peri_S2	NO (-60.3%)	NO
L10_Research3_peri_S3	NO (-47.6%)	YES
L10_Research3_peri_SE	NO (-53.5%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L10_Research_int	NO (-94.3%)	NO
L10_Research_peri_E	NO (-60.3%)	NO
L10_Research_peri_E2	NO (-20.8%)	NO
L10_Research_peri_N	NO (-67.8%)	NO
L10_Research_peri_N2	NO (-71.3%)	YES
L10_Research_peri_N3	NO (-72.7%)	NO
L10_Research_peri_NE	NO (-66.1%)	YES
L10_Research_peri_NE	NO (-64.1%)	NO
L10_Research_peri_NW	NO (-73.8%)	YES
L10_Research_peri_NW	NO (-69.9%)	NO
L10_Research_peri_S	NO (-48.5%)	NO
L10_Research_peri_W	NO (-62.1%)	YES
L11_Office2_peri_E	NO (-62.8%)	YES
L11_Office2_peri_S5	NO (-64.1%)	YES
L11_Office2_peri_SW	NO (-55.4%)	YES
L11_Office3_peri_S2	NO (-59.7%)	YES
L11_Office3_peri_S4	NO (-68.6%)	YES
L11_Office3_peri_SE	NO (-53.6%)	YES
L11_Office_int	NO (-93.7%)	NO
L11_Office_peri_E	NO (-65.4%)	NO
L11_Office_peri_N	NO (-72%)	NO
L11_Office_peri_N2	NO (-75.6%)	YES
L11_Office_peri_N3	NO (-73.6%)	NO
L11_Office_peri_NE	NO (-69.5%)	YES
L11_Office_peri_NW	NO (-75%)	YES
L11_Office_peri_NW	NO (-73.9%)	NO
L11_Office_peri_S	NO (-47.8%)	NO
L11_Office_peri_W	NO (-64.4%)	YES
L12_Office2_peri_E	NO (-61.5%)	YES
L12_Office2_peri_S5	NO (-64%)	YES
L12_Office2_peri_SW	NO (-55.3%)	YES
L12_Office_int	NO (-92%)	NO
L12_Office_Peri E	NO (-77.2%)	YES
L12_Office_Peri W	NO (-93.4%)	NO
L12_Office_peri_E	NO (-63.4%)	NO
L12_Office_peri_E	NO (-43.6%)	YES
L12_Office_peri_N	NO (-70.6%)	NO
L12_Office_peri_NW	NO (-74%)	NO
L12_Office_peri_S	NO (-62.6%)	YES
L12_Office_peri_S	NO (-49.1%)	NO
L12_Office_peri_SE	NO (-65%)	YES
L12_Office_peri_SW	NO (-63.6%)	YES
L12_Office_peri_W	NO (-64.9%)	YES
L13_Office2_peri_E	NO (-60.1%)	YES
L13_Office2_peri_S5	NO (-61.9%)	YES
L13_Office2_peri_SW	NO (-55.3%)	YES
L13_Office_int	NO (-92.2%)	NO
L13_Office_int	NO (-49.5%)	NO
L13_Office_Peir_W2	NO (-93.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L13_Office_peri_E	NO (-58.3%)	NO
L13_Office_peri_E	NO (-36.3%)	YES
L13_Office_Peri_E2	NO (-80.5%)	YES
L13_Office_peri_N	NO (-70.8%)	NO
L13_Office_peri_NW	NO (-74.8%)	NO
L13_Office_peri_S	NO (-75.7%)	YES
L13_Office_peri_SE	NO (-65%)	YES
L13_Office_peri_SW	NO (-68.2%)	YES
L13_Office_peri_W	NO (-58.7%)	YES
L14_Office	NO (-90.8%)	NO
L14_Office_peri_E_01	NO (-61.7%)	NO
L14_Office_peri_E_02	NO (-39.6%)	YES
L14_Office_peri_E_03	NO (-59.9%)	YES
L14_Office_peri_N	NO (-68.4%)	YES
L14_Office_peri_NW	NO (-66.3%)	YES
L14_Office_peri_N_02	NO (-69.2%)	NO
L14_Office_peri_SW	NO (-56.2%)	YES
L14_Office_peri_S_01	NO (-64.9%)	NO
L14_Office_peri_S_02	NO (-62.4%)	YES
L14_Office_peri_W_01	NO (-58.8%)	YES
L14_Office_peri_W_02	NO (-93.5%)	NO
L15_Office2_peri_E_04	NO (-58.9%)	YES
L15_Office2_peri_SW	NO (-54.2%)	YES
L15_Office2_peri_S_02	NO (-61.5%)	YES
L15_Office_Internal	NO (-90.7%)	NO
L15_Office_peri_E_01	NO (-65.8%)	NO
L15_Office_peri_E_02	NO (-58.1%)	NO
L15_Office_peri_E_03	NO (-37.8%)	YES
L15_Office_peri_NW	NO (-68.4%)	YES
L15_Office_peri_N_01	NO (-72.7%)	YES
L15_Office_peri_N_02	NO (-70.7%)	NO
L15_Office_peri_N_03	NO (-65%)	NO
L15_Office_peri_S_01	NO (-65%)	NO
L15_Office_peri_W_01	NO (-94%)	NO
L15_Office_peri_W_02	NO (-59.9%)	YES
L16_Office2_peri_E_04	NO (-57.6%)	YES
L16_Office2_peri_SW	NO (-54%)	YES
L16_Office2_peri_S_02	NO (-61.1%)	YES
L16_Office_Internal	NO (-88%)	NO
L16_Office_peri_E_01	NO (-66.3%)	NO
L16_Office_peri_E_02	NO (-59.5%)	NO
L16_Office_peri_E_03	NO (-37.8%)	YES
L16_Office_peri_N_02	NO (-71.4%)	NO
L16_Office_peri_N_02	NO (-55.5%)	YES
L16_Office_peri_N_02	NO (-71.5%)	NO
L16_Office_peri_N_03	NO (-66.2%)	NO
L16_Office_peri_S_01	NO (-64.8%)	NO
L16_Office_peri_W_01	NO (-92.4%)	NO
L17_Office2_peri_E4	NO (-55.8%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L17_Office2_peri_S2	NO (-61.1%)	YES
L17_Office2_peri_SW	NO (-54.2%)	YES
L17_Office_Internal	NO (-81.5%)	NO
L17_Office_peri_E	NO (-66.2%)	NO
L17_Office_peri_E2	NO (-76.2%)	NO
L17_Office_peri_E3	NO (-54.2%)	NO
L17_Office_peri_N	NO (-76.1%)	NO
L17_Office_peri_N2	NO (-62.3%)	NO
L17_Office_peri_S	NO (-57.9%)	NO
L17_Office_peri_W	NO (-92.2%)	NO
L17_Office_peri_W2	NO (-54.7%)	YES
L17_Office_peri_W3	NO (-66.8%)	NO
L18_Office_Internal	NO (-88.8%)	NO
L18_Office_peri_E	NO (-59.3%)	NO
L18_Office_peri_N	NO (-69%)	NO
L18_Office_peri_W	NO (-94.8%)	NO
L18_Office_peri_W2	NO (-56.6%)	YES
L18_Office_peri_W3	NO (-72%)	NO
L00_Retail 01_I01	NO (-96.5%)	NO
L00_Retail 01_peri_S	NO (-53.5%)	YES
L00_Retail 01_peri_W	NO (-75.1%)	YES
L00-Mezz_Seminar_peri_S	NO (-82.1%)	YES
L00-Mezz_Seminar_peri_S	NO (-67.7%)	YES
L00-Mezz_Seminar_peri_S	N/A	N/A
L00-Mezz_Seminar_peri_W	NO (-86.9%)	YES
L00-Mezz_Seminar_peri_W	NO (-97%)	NO
L00-Mezz_Seminar_I01	NO (-98%)	NO
L00-Mezz_Seminar_I01	NO (-53.1%)	YES
L00-Mezz_Seminar_I01	NO (-99.9%)	NO
L00-Mezz_Seminar_peri_E	NO (-98.2%)	YES
L00-Mezz_Seminar_peri_E	NO (-98.9%)	YES

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Class B1(b) - LEAN

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	27988.7	28000.6
External area [m²]	26382	26382
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	16772.2	13793.4
Average U-value [W/m²K]	0.64	0.52
Alpha value* [%]	7.61	10

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

Building Use

% Area	Building Type
2	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
98	**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	6.13	3.34
Cooling	2.75	6.53
Auxiliary	6.69	9.67
Lighting	7.67	18.71
Hot water	8.3	6.85
Equipment*	58.25	58.31
TOTAL**	**31.54**	**45.09**

* 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]	74.47	77.21
Primary energy* [kWh/m²]	68.81	116.91
Total emissions [kg/m²]	11.8	19.9

* 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	22.4	71.7	6.8	3.6	9.5	0.91	5.5	0.91	5.5
	Notional	9.9	100.4	3.2	9.8	13.1	0.86	2.84	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	56.5	0	17.3	0	1	0.91	0	0.91	0
	Notional	30.7	0	9.9	0	1	0.86	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	19	77.8	5.8	3.9	8.6	0.91	5.5	0.91	5.5
	Notional	11.2	83.9	3.6	8.2	13.1	0.86	2.84	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	29	0	8.8	0	2.6	0.91	0	0.91	0
	Notional	12.7	0	4.1	0	2.5	0.86	0	----	----
[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	0.1	L000018F:Surf[2]
Floor	0.2	0.15	B0000010:Surf[0]
Roof	0.15	0.1	B0000049:Surf[2]
Windows, roof windows, and rooflights	1.5	1.2	GL000000:Surf[3]
Personnel doors	1.5	1.2	L00001E0:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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

Class B1(b) - GREEN

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Vinegar Yard- B1b

As designed

Date: Mon Oct 25 13:56:37 2021

Administrative information

Building Details

Address: Southwark, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Kartik Amrania

Telephone number: 44(0)1628623423

Address: Sweco UK, 1 Bath Road, London, SL6 4AQ

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	19.6
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	19.6
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	10.1
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	0.23	0.25	L000001C:Surf[1]
Floor	0.25	0.15	0.15	B0000010:Surf[0]
Roof	0.25	0.1	0.1	B0000049:Surf[2]
Windows***, roof windows, and rooflights	2.2	1.2	2	B000005D:Surf[1]
Personnel doors	2.2	1.2	1.2	L00001E0:Surf[0]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

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

Building services

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

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

1- 01c FCU system - ASHP_heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.96	-	0.2	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

2- 02a Extract system_Elec_WC&Changing only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- 01a FCU system - ASHP_office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.96	3.44	0	1.3	0.85
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.

4- 01b FCU system - ASHP_Clinical/Outpatients Reduced SFP and HRE

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.96	3.44	0	1.8	0.75
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.

"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
B01 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Lobby 02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Security Office	-	-	-	-	-	-	-	0.3	-	-	N/A
B01 Workspace I01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace N P02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace NW P01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace SW P03	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Lift Lobby 01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Lobby 01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Workspace	-	-	-	-	-	-	-	0.2	-	-	N/A
B02 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_lift Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_lift Lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_int_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_int_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_S1	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Research_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Research_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L04_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research3_peri_S2	-	-	-	-	-	-	-	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
L07_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research2_peri_E	-	-	-	-	-	-	-	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
L10_Research2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Research_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_E	-	-	-	-	-	-	-	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
L12_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L13_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peir_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L14_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_02	-	-	-	-	-	-	-	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
L15_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_E4	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E3	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_I01	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_Retail 01_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_Retail 01_peri_W	-	-	-	-	-	-	-	0.3	-	-	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
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
B01 Circ 01	-	95	-	25
B01 Circ 02	-	95	-	25
B01 Circ 03	-	95	-	68
B01 Circ 04	-	95	-	20
B01 Circ 05	-	95	-	13
B01 DIS. Showers	-	95	-	35
B01 Lobby	-	141	-	356
B01 Lobby 02	-	99	-	701
B01 Lockers	-	95	-	102
B01 Security Office	135	-	-	269
B01 Showers	-	95	-	143
B01 Stairs 01	-	95	-	25
B01 Stairs 02	-	95	-	56
B01 Stairs 03	-	95	-	47
B01 Stairs 04	-	95	-	41
B01 Substation & Switchroom	95	-	-	255
B01 Switchroom	95	-	-	57
B01 Water Meter Room	95	-	-	72
B01 WC 01	-	95	-	49
B01 WC 02	-	95	-	33
B01 WC 03	-	95	-	28
B01 Workspace I01	125	-	-	2334
B01 Workspace N P02	126	-	-	1812
B01 Workspace NW P01	131	-	-	562
B01 Workspace SW P03	129	-	-	824
B01-Mezz Circ 01	-	95	-	30
B01-Mezz Circ 02	-	95	-	31
B01-Mezz Circ 03	-	95	-	71
B01-Mezz Circ 04	-	95	-	25

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B01-Mezz Cycle Store	95	-	-	149
B01-Mezz Gas Meter Room	95	-	-	73
B01-Mezz Lift Lobby 01	-	95	-	41
B01-Mezz Lobby 01	-	131	-	276
B01-Mezz Stairs 01	-	95	-	27
B01-Mezz Stairs 02	-	95	-	61
B01-Mezz Stairs 03	-	95	-	49
B01-Mezz Stairs 04	-	95	-	46
B01-Mezz Switchroom	95	-	-	62
B01-Mezz WC 01	-	95	-	58
B01-Mezz WC 02	-	95	-	42
B01-Mezz Workspace	124	-	-	2877
B02 Bin Store	95	-	-	56
B02 BOH	-	95	-	83
B02 Circ 01	-	95	-	45
B02 Circ 02	-	95	-	31
B02 Corridor	-	95	-	453
B02 Generator 01	95	-	-	1706
B02 Generator 02	95	-	-	240
B02 Landlord HV/LV Substation	95	-	-	539
B02 Lobby	-	178	-	160
B02 Stairs 01	-	95	-	75
B02 Stairs 02	-	95	-	73
B02 Substation	95	-	-	646
B02 Switchroom 01	95	-	-	183
B02 Switchroom 02	95	-	-	251
B02 Switchroom 03	95	-	-	121
B02 Ventilation Plant	95	-	-	195
B02 Waste Store	95	-	-	47
B03 AWS Ventilation Plant	95	-	-	339
B03 BOH	-	95	-	150
B03 Circ 01	-	95	-	47
B03 Circ 02	-	95	-	49
B03 Circ 03	-	95	-	37
B03 Corridor	-	95	-	369
B03 CWS Tank	95	-	-	86
B03 Diesel Storage	95	-	-	126
B03 Grey Water Tanks and Pumps	95	-	-	195
B03 Heating Plant	95	-	-	246
B03 Plant	95	-	-	830
B03 Retail Plant	95	-	-	245
B03 Stairs 01	-	95	-	66
B03 Stairs 02	-	95	-	71

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B03 Tanks and Pumps	95	-	-	721
B03 Ventilation Plant	95	-	-	218
B03 Water Storage	95	-	-	248
L00-Mezz_Circ_01	-	95	-	54
L00-Mezz_Circ_02	-	95	-	22
L00-Mezz_Gas Storage	95	-	-	27
L00-Mezz_lift Lobby	-	95	-	40
L00-Mezz_lift Lobby_peri_S	-	95	-	39
L00-Mezz_refuge	95	-	-	11
L00-Mezz_refuge	95	-	-	12
L00-Mezz_stairs	-	95	-	51
L00-Mezz_Stairs_01	-	95	-	33
L00-Mezz_stairs_peri_S	-	95	-	52
L00-Mezz_WC	-	95	-	40
L00-Mezz_WC_01	-	95	-	63
L00-Mezz_WC_02	-	95	-	71
L00-Mezz_WC_03	-	95	-	34
L00-Mezz_Workspace_I01	127	-	-	593
L00-Mezz_Workspace_peri_E	141	-	-	183
L00-Mezz_Workspace_peri_N	123	-	-	1867
L00-Mezz_Workspace_peri_S	134	-	-	469
L00-Mezz_Workspace_peri_W	129	-	-	552
L00_circ_01	-	95	-	60
L00_circ_02	-	95	-	14
L00_lift Lobby	-	95	-	44
L00_lift Lobby	-	95	-	40
L00_lift Lobby_peri_S	-	95	-	39
L00_Loading Bay	95	-	-	313
L00_Lobby_I01	-	125	-	291
L00_Lobby_I02	-	98	-	565
L00_Lobby_peri_E	-	109	-	269
L00_Lobby_peri_N_01	-	104	-	988
L00_Lobby_peri_W_01	-	280	-	95
L00_Lobby_peri_W_02	-	215	-	169
L00_Lobby_peri_W_03	-	117	-	517
L00_Lobby_peri_W_04	-	105	-	390
L00_refuge	95	-	-	15
L00_refuge	95	-	-	14
L00_Retail 02_I01	-	89	35	1192
L00_Retail 02_peri_E	-	102	35	326
L00_Retail 02_peri_E	-	94	35	648
L00_Retail 02_peri_N_01	-	96	35	954
L00_Retail 02_peri_N_03	-	108	35	195

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00_Retail 02_peri_S	-	99	35	735
L00_stairs	-	95	-	54
L00_stairs	-	95	-	97
L00_Stairs_01	-	95	-	40
L00_stairs_peri_S	-	95	-	55
L00_WC	-	95	-	45
L01_lift lobby	-	95	-	44
L01_lift lobby_peri_S	-	95	-	43
L01_refuge	95	-	-	17
L01_refuge	95	-	-	15
L01_Research_int_01	140	-	-	221
L01_Research_int_02	125	-	-	1714
L01_Research_peri_E	156	-	-	117
L01_Research_peri_E2	142	-	-	139
L01_Research_peri_E2	159	-	-	154
L01_Research_peri_N	128	-	-	930
L01_Research_peri_N2	128	-	-	1003
L01_Research_peri_S	129	-	-	585
L01_Research_peri_S1	150	-	-	154
L01_Research_peri_S2	129	-	-	542
L01_Research_peri_SW	160	-	-	90
L01_Research_peri_W_01	125	-	-	411
L01_Research_peri_W_02	136	-	-	241
L01_stairs	-	95	-	59
L01_stairs_peri_S	-	95	-	61
L01_storage	95	-	-	21
L02_lift lobby	-	95	-	42
L02_lift lobby_peri_S	-	95	-	41
L02_refuge	95	-	-	14
L02_refuge	95	-	-	15
L02_Research_int	124	-	-	2109
L02_Research_int	129	-	-	488
L02_Research_peri_E	152	-	-	117
L02_Research_peri_N	132	-	-	313
L02_Research_peri_N	127	-	-	1619
L02_Research_peri_NE	158	-	-	101
L02_Research_peri_S	149	-	-	166
L02_Research_peri_S	160	-	-	93
L02_Research_peri_S	133	-	-	304
L02_Research_peri_SE	131	-	-	341
L02_Research_peri_SE	153	-	-	108
L02_Research_peri_SE	159	-	-	88
L02_Research_peri_SW	160	-	-	90

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L02_Research_peri_W	139	-	-	118
L02_Research_peri_W	140	-	-	241
L02_stairs	-	95	-	56
L02_stairs	-	95	-	60
L02_storage	95	-	-	20
L03_lift lobby_int	-	95	-	51
L03_lift lobby_peri_S	-	95	-	49
L03_Plant	95	-	-	1694
L03_Plant3	95	-	-	372
L03_refuge	95	-	-	18
L03_refuge	95	-	-	16
L03_Research_I01	132	-	-	762
L03_Research_I02	157	-	-	284
L03_Research_peri_N	132	-	-	1127
L03_Research_peri_NW	158	-	-	179
L03_Research_peri_S	151	-	-	148
L03_Research_peri_SW	138	-	-	95
L03_Research_peri_W_01	123	-	-	418
L03_Research_peri_W_02	154	-	-	139
L03_stairs	-	95	-	68
L03_stairs	-	95	-	65
L03_storage	95	-	-	24
L04_lift lobby	-	95	-	42
L04_lift lobby_peri_S	-	95	-	41
L04_refuge	95	-	-	14
L04_refuge	95	-	-	15
L04_Research3_peri_E	158	-	-	102
L04_Research3_peri_S3	131	-	-	542
L04_Research3_peri_SE	153	-	-	112
L04_Research_int	123	-	-	3266
L04_Research_peri_E	152	-	-	117
L04_Research_peri_N	126	-	-	2101
L04_Research_peri_NE	158	-	-	101
L04_Research_peri_NW	141	-	-	179
L04_Research_peri_S	134	-	-	277
L04_Research_peri_S04	155	-	-	100
L04_Research_peri_W	145	-	-	152
L04_Research_peri_W	137	-	-	139
L04_stairs	-	95	-	60
L04_stairs	-	95	-	56
L04_storage	95	-	-	20
L05_lift lobby	-	95	-	42
L05_lift lobby_peri_S	-	95	-	41

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L05_refuge	95	-	-	15
L05_refuge	95	-	-	14
L05_Research3_peri_E	158	-	-	102
L05_Research3_peri_S3	131	-	-	542
L05_Research3_peri_SE	153	-	-	112
L05_Research_int	123	-	-	3266
L05_Research_peri_E	152	-	-	117
L05_Research_peri_N	125	-	-	2101
L05_Research_peri_NE	158	-	-	101
L05_Research_peri_NW	134	-	-	179
L05_Research_peri_S	134	-	-	277
L05_Research_peri_S04	155	-	-	100
L05_Research_peri_W	145	-	-	152
L05_Research_peri_W	137	-	-	139
L05_stairs	-	95	-	56
L05_stairs	-	95	-	59
L05_storage	95	-	-	20
L06_lift lobby	-	95	-	43
L06_lift lobby_peri_S	-	95	-	41
L06_refuge	95	-	-	15
L06_refuge	95	-	-	14
L06_Research3_peri_E	162	-	-	99
L06_Research3_peri_S2	134	-	-	119
L06_Research3_peri_S3	128	-	-	429
L06_Research3_peri_SE	144	-	-	117
L06_Research_int	124	-	-	2670
L06_Research_peri_E	153	-	-	117
L06_Research_peri_N1	130	-	-	474
L06_Research_peri_N2	134	-	-	372
L06_Research_peri_N3	128	-	-	505
L06_Research_peri_N4	133	-	-	383
L06_Research_peri_NE	155	-	-	154
L06_Research_peri_NE1	149	-	-	108
L06_Research_peri_NW1	149	-	-	108
L06_Research_peri_NW2	149	-	-	109
L06_Research_peri_S	134	-	-	277
L06_Research_peri_S04	160	-	-	98
L06_Research_peri_SW	142	-	-	194
L06_Research_peri_W	137	-	-	221
L06_stairs	-	95	-	56
L06_stairs	-	95	-	20
L06_stairs_peri_S	-	95	-	47
L06_storage	95	-	-	20

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L07_lift lobby	-	95	-	43
L07_lift lobby_peri_S	-	95	-	41
L07_refuge	95	-	-	15
L07_refuge	95	-	-	14
L07_Research3_peri_E	162	-	-	99
L07_Research3_peri_S2	130	-	-	257
L07_Research3_peri_S3	145	-	-	180
L07_Research3_peri_SE	141	-	-	175
L07_Research_int	125	-	-	2494
L07_Research_peri_E	136	-	-	117
L07_Research_peri_N1	130	-	-	474
L07_Research_peri_N2	132	-	-	401
L07_Research_peri_N3	128	-	-	505
L07_Research_peri_N4	131	-	-	383
L07_Research_peri_NE	155	-	-	154
L07_Research_peri_NE1	149	-	-	108
L07_Research_peri_NW1	149	-	-	108
L07_Research_peri_NW2	149	-	-	109
L07_Research_peri_S	134	-	-	277
L07_Research_peri_S04	160	-	-	98
L07_Research_peri_SW	142	-	-	195
L07_Research_peri_W	137	-	-	221
L07_stairs	-	95	-	56
L07_stairs	-	95	-	20
L07_stairs_peri_S	-	95	-	47
L07_storage	95	-	-	20
L08_lift lobby	-	95	-	51
L08_lift lobby_peri_S	-	95	-	49
L08_Plant	95	-	-	1458
L08_Plant3	95	-	-	372
L08_refuge	95	-	-	16
L08_refuge	95	-	-	18
L08_Research_I02	163	-	-	374
L08_Research_Internal	129	-	-	1189
L08_Research_peri_N	131	-	-	1424
L08_Research_peri_NW	158	-	-	179
L08_Research_peri_S	186	-	-	100
L08_Research_peri_SE	191	-	-	102
L08_Research_peri_SW	155	-	-	210
L08_Research_peri_W	154	-	-	139
L08_stairs	-	95	-	68
L08_stairs	-	95	-	65
L08_storage	95	-	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L09_lift lobby	-	95	-	43
L09_lift lobby_peri_S	-	95	-	42
L09_Plant	95	-	-	79
L09_refuge	95	-	-	14
L09_refuge	95	-	-	16
L09_Research2_peri_E	163	-	-	102
L09_Research2_peri_S4	161	-	-	100
L09_Research2_peri_SW	149	-	-	154
L09_Research_Internal	124	-	-	3130
L09_Research_peri_N	124	-	-	2039
L09_Research_peri_NE	129	-	-	235
L09_Research_peri_NW	144	-	-	179
L09_Research_peri_S	134	-	-	320
L09_Research_peri_S	131	-	-	399
L09_Research_peri_SE	152	-	-	146
L09_Research_peri_SE	145	-	-	167
L09_Research_peri_W	140	-	-	139
L09_stairs	-	95	-	61
L09_stairs	-	95	-	58
L09_storage	95	-	-	21
L10_lift lobby	-	95	-	42
L10_lift lobby_peri_S	-	95	-	41
L10_refuge	95	-	-	15
L10_refuge	95	-	-	13
L10_Research2_peri_E	163	-	-	99
L10_Research2_peri_S4	161	-	-	98
L10_Research2_peri_SW	142	-	-	194
L10_Research3_peri_S2	153	-	-	119
L10_Research3_peri_S3	131	-	-	428
L10_Research3_peri_SE	155	-	-	117
L10_Research_int	124	-	-	2436
L10_Research_peri_E	133	-	-	309
L10_Research_peri_E2	182	-	-	129
L10_Research_peri_N	131	-	-	437
L10_Research_peri_N2	128	-	-	458
L10_Research_peri_N3	131	-	-	323
L10_Research_peri_NE	150	-	-	108
L10_Research_peri_NE	240	-	-	77
L10_Research_peri_NW	150	-	-	108
L10_Research_peri_NW	142	-	-	179
L10_Research_peri_S	134	-	-	277
L10_Research_peri_W	138	-	-	139
L10_stairs	-	95	-	56

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L10_stairs	-	95	-	57
L10_storage	95	-	-	20
L11_Office2_peri_E	154	-	-	99
L11_Office2_peri_S5	151	-	-	98
L11_Office2_peri_SW	141	-	-	160
L11_Office3_peri_S2	128	-	-	561
L11_Office3_peri_S4	165	-	-	103
L11_Office3_peri_SE	144	-	-	112
L11_Office_int	124	-	-	2733
L11_Office_peri_E	140	-	-	139
L11_Office_peri_N	129	-	-	437
L11_Office_peri_N2	126	-	-	458
L11_Office_peri_N3	129	-	-	431
L11_Office_peri_NE	143	-	-	108
L11_Office_peri_NW	143	-	-	108
L11_Office_peri_NW	137	-	-	179
L11_Office_peri_S	138	-	-	262
L11_Office_peri_W	134	-	-	139
L11_refuge	95	-	-	12
L11_refuge	95	-	-	14
L11_stairs	-	95	-	54
L11_stairs	-	95	-	47
L11_stairs	-	95	-	52
L11_stairs	-	95	-	52
L11_WC	-	95	-	46
L11_WC	-	95	-	79
L11_WC	-	95	-	125
L12_circ	-	95	-	25
L12_Office2_peri_E	167	-	-	102
L12_Office2_peri_S5	151	-	-	100
L12_Office2_peri_SW	142	-	-	154
L12_Office_int	123	-	-	2316
L12_Office_Peri E	168	-	-	93
L12_Office_Peri W	123	-	-	418
L12_Office_peri_E	140	-	-	139
L12_Office_peri_E	157	-	-	114
L12_Office_peri_N	125	-	-	1566
L12_Office_peri_NW	137	-	-	179
L12_Office_peri_S	129	-	-	412
L12_Office_peri_S	131	-	-	241
L12_Office_peri_SE	133	-	-	274
L12_Office_peri_SW	143	-	-	112
L12_Office_peri_W	134	-	-	139
L12_refuge	95	-	-	10

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L12_Stairs	-	95	-	19
L12_stairs	-	95	-	47
L12_stairs	-	95	-	52
L12_WC	-	95	-	104
L12_WC	-	95	-	79
L12_WC	-	95	-	46
L13_circ	-	95	-	31
L13_Circ	-	95	-	59
L13_Office2_peri_E	146	-	-	102
L13_Office2_peri_S5	146	-	-	100
L13_Office2_peri_SW	139	-	-	154
L13_Office_int	125	-	-	1789
L13_Office_int	146	-	-	193
L13_Office_Peir_W2	123	-	-	411
L13_Office_peri_E	138	-	-	139
L13_Office_peri_E	157	-	-	114
L13_Office_Peri_E2	147	-	-	97
L13_Office_peri_N	124	-	-	1566
L13_Office_peri_NW	131	-	-	179
L13_Office_peri_S	129	-	-	412
L13_Office_peri_SE	132	-	-	274
L13_Office_peri_SW	145	-	-	112
L13_Office_peri_W	132	-	-	139
L13_R	-	95	-	15
L13_Stairs	-	95	-	45
L13_stairs	-	95	-	41
L13_WC	-	95	-	79
L13_WC	-	95	-	47
L13_WC_01	-	95	-	63
L13_WC_02	-	95	-	45
L14_circ_01	-	95	-	31
L14_circ_02	-	95	-	32
L14_Office	125	-	-	1952
L14_Office_peri_E_01	124	-	-	359
L14_Office_peri_E_02	148	-	-	154
L14_Office_peri_E_03	148	-	-	106
L14_Office_peri_N	128	-	-	434
L14_Office_peri_NW	142	-	-	108
L14_Office_peri_N_02	124	-	-	950
L14_Office_peri_SW	141	-	-	157
L14_Office_peri_S_01	129	-	-	864
L14_Office_peri_S_02	146	-	-	104
L14_Office_peri_W_01	133	-	-	221

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L14_Office_peri_W_02	123	-	-	440
L14_Stairs	-	95	-	46
L14_stairs	-	95	-	42
L14_WC	-	95	-	44
L14_WC	-	95	-	61
L14_WC	-	95	-	81
L15_circ_01	-	95	-	30
L15_circ_02	-	95	-	15
L15_Office2_peri_E_04	145	-	-	102
L15_Office2_peri_SW	136	-	-	194
L15_Office2_peri_S_02	144	-	-	102
L15_Office_Internal	124	-	-	1691
L15_Office_peri_E_01	146	-	-	97
L15_Office_peri_E_02	150	-	-	100
L15_Office_peri_E_03	145	-	-	155
L15_Office_peri_NW	138	-	-	107
L15_Office_peri_N_01	127	-	-	434
L15_Office_peri_N_02	128	-	-	425
L15_Office_peri_N_03	141	-	-	111
L15_Office_peri_S_01	128	-	-	864
L15_Office_peri_W_01	123	-	-	412
L15_Office_peri_W_02	132	-	-	221
L15_stairs	-	95	-	41
L15_stairs	-	95	-	44
L15_WC	-	95	-	79
L15_WC	-	95	-	46
L16_circ_01	-	95	-	32
L16_circ_02	-	95	-	11
L16_Office2_peri_E_04	149	-	-	102
L16_Office2_peri_SW	138	-	-	194
L16_Office2_peri_S_02	148	-	-	102
L16_Office_Internal	123	-	-	1896
L16_Office_peri_E_01	126	-	-	97
L16_Office_peri_E_02	128	-	-	100
L16_Office_peri_E_03	129	-	-	155
L16_Office_peri_N_02	124	-	-	1035
L16_Office_peri_N_02	135	-	-	138
L16_Office_peri_N_02	138	-	-	181
L16_Office_peri_N_03	124	-	-	111
L16_Office_peri_S_01	126	-	-	864
L16_Office_peri_W_01	123	-	-	412
L16_stairs	-	95	-	43
L16_stairs	-	95	-	36

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L16_WC	-	95	-	81
L16_WC	-	95	-	48
L17_circ	-	95	-	30
L17_Office2_peri_E4	145	-	-	102
L17_Office2_peri_S2	144	-	-	102
L17_Office2_peri_SW	136	-	-	191
L17_Office_Internal	137	-	-	657
L17_Office_peri_E	145	-	-	97
L17_Office_peri_E2	153	-	-	92
L17_Office_peri_E3	138	-	-	172
L17_Office_peri_N	129	-	-	396
L17_Office_peri_N2	138	-	-	130
L17_Office_peri_S	138	-	-	363
L17_Office_peri_W	123	-	-	412
L17_Office_peri_W2	131	-	-	138
L17_Office_peri_W3	135	-	-	181
L17_stairs	-	95	-	48
L17_stairs	-	95	-	41
L17_WC	-	95	-	79
L17_WC	-	95	-	47
L18_Circ	-	95	-	16
L18_circ	-	95	-	22
L18_Office_Internal	228	-	-	169
L18_Office_peri_E	134	-	-	101
L18_Office_peri_N	127	-	-	396
L18_Office_peri_W	125	-	-	440
L18_Office_peri_W2	136	-	-	138
L18_Office_peri_W3	135	-	-	181
L18_Plant_01	95	-	-	216
L18_Plant_02	95	-	-	215
L18_Plant_03	95	-	-	370
L18_Stairs	-	95	-	40
L18_stairs	-	95	-	44
L18_stairs	-	95	-	41
L18_WC	-	95	-	26
L18_WC	-	95	-	34
L18_WC	-	95	-	71
L19_Plant	95	-	-	888
L00_Retail 01_I01	-	91	35	532
L00_Retail 01_peri_S	-	94	35	684
L00_Retail 01_peri_W	-	95	35	502
L00_Retail 01_Stairs	-	5	-	737
L00-Mezz_Seminar_peri_S	129	-	-	373

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00-Mezz_Seminar_peri_S	133	-	-	184
L00-Mezz_Seminar_peri_S	146	-	-	61
L00-Mezz_Seminar_peri_W	130	-	-	311
L00-Mezz_Seminar_peri_W	121	-	-	283
L00-Mezz_Seminar_I01	129	-	-	123
L00-Mezz_Seminar_I01	178	-	-	56
L00-Mezz_Seminar_I01	123	-	-	59
L00-Mezz_Seminar_peri_E	376	-	-	0
L00-Mezz_Seminar_peri_E	141	-	-	230
L00_Retail 01_Storage	95	-	-	10

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?
B01 Lobby	N/A	N/A
B01 Lobby 02	N/A	N/A
B01 Security Office	N/A	N/A
B01 Workspace I01	NO (-60.1%)	YES
B01 Workspace N P02	NO (-83.2%)	NO
B01 Workspace NW P01	NO (-99.5%)	NO
B01 Workspace SW P03	NO (-99.6%)	NO
B01-Mezz Lift Lobby 01	N/A	N/A
B01-Mezz Lobby 01	NO (-99.1%)	NO
B01-Mezz Workspace	NO (-98.9%)	NO
B02 Lobby	N/A	N/A
L00-Mezz_lift Lobby	NO (-99.9%)	NO
L00-Mezz_lift Lobby_peri_S	NO (-62.7%)	YES
L00-Mezz_Workspace_I01	NO (-97.2%)	NO
L00-Mezz_Workspace_peri_E	NO (-60.3%)	YES
L00-Mezz_Workspace_peri_N	NO (-68.1%)	YES
L00-Mezz_Workspace_peri_S	NO (-77.4%)	YES
L00-Mezz_Workspace_peri_W	NO (-76.4%)	YES
L00_lift Lobby	N/A	N/A
L00_lift Lobby	N/A	N/A
L00_lift Lobby_peri_S	NO (-77%)	YES
L00_Lobby_I01	NO (-92.9%)	NO
L00_Lobby_I02	NO (-89.6%)	NO
L00_Lobby_peri_E	NO (-76.5%)	YES
L00_Lobby_peri_N_01	NO (-54.6%)	YES
L00_Lobby_peri_W_01	NO (-57%)	YES
L00_Lobby_peri_W_02	NO (-46.1%)	YES
L00_Lobby_peri_W_03	NO (-63.5%)	YES
L00_Lobby_peri_W_04	NO (-41.6%)	NO
L00_Retail 02_I01	NO (-81.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00_Retail 02_peri_E	NO (-40.5%)	YES
L00_Retail 02_peri_E	NO (-80.4%)	YES
L00_Retail 02_peri_N_01	NO (-26%)	NO
L00_Retail 02_peri_N_03	NO (-23.9%)	NO
L00_Retail 02_peri_S	NO (-52.7%)	YES
L01_lift lobby	NO (-98.9%)	NO
L01_lift lobby_peri_S	NO (-52%)	YES
L01_Research_int_01	NO (-97.7%)	NO
L01_Research_int_02	NO (-88.3%)	NO
L01_Research_peri_E	NO (-48.1%)	NO
L01_Research_peri_E2	NO (-57%)	NO
L01_Research_peri_E2	NO (-45.7%)	NO
L01_Research_peri_N	NO (-59.9%)	YES
L01_Research_peri_N2	NO (-63.6%)	NO
L01_Research_peri_S	NO (-30.9%)	NO
L01_Research_peri_S1	NO (-69.5%)	YES
L01_Research_peri_S2	NO (-41.6%)	YES
L01_Research_peri_SW	NO (-60%)	YES
L01_Research_peri_W_01	NO (-63.7%)	YES
L01_Research_peri_W_02	NO (-72.4%)	YES
L02_lift lobby	NO (-99%)	NO
L02_lift lobby_peri_S	NO (-50.3%)	YES
L02_Research_int	NO (-89.7%)	NO
L02_Research_int	NO (-97.1%)	NO
L02_Research_peri_E	NO (-50.7%)	NO
L02_Research_peri_N	NO (-64.2%)	YES
L02_Research_peri_N	NO (-66.4%)	NO
L02_Research_peri_NE	NO (-54.8%)	NO
L02_Research_peri_S	NO (-52.9%)	YES
L02_Research_peri_S	NO (-40.4%)	YES
L02_Research_peri_S	NO (-51%)	NO
L02_Research_peri_SE	NO (-47%)	YES
L02_Research_peri_SE	NO (-56.9%)	YES
L02_Research_peri_SE	NO (-59.3%)	YES
L02_Research_peri_SW	NO (-47.7%)	YES
L02_Research_peri_W	NO (-78%)	YES
L02_Research_peri_W	NO (-78.9%)	YES
L03_lift lobby_int	NO (-99.2%)	NO
L03_lift lobby_peri_S	NO (-46.1%)	YES
L03_Research_I01	NO (-91.3%)	NO
L03_Research_I02	NO (-81.5%)	NO
L03_Research_peri_N	NO (-65.1%)	NO
L03_Research_peri_NW	NO (-68.3%)	NO
L03_Research_peri_S	NO (-49.2%)	YES
L03_Research_peri_SW	NO (-57.5%)	YES
L03_Research_peri_W_01	NO (-92.2%)	NO
L03_Research_peri_W_02	NO (-66.2%)	YES
L04_lift lobby	NO (-99.1%)	NO
L04_lift lobby_peri_S	NO (-55.7%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04_Research3_peri_E	NO (-58.7%)	YES
L04_Research3_peri_S3	NO (-44.9%)	YES
L04_Research3_peri_SE	NO (-62.1%)	NO
L04_Research_int	NO (-87.5%)	NO
L04_Research_peri_E	NO (-48.4%)	NO
L04_Research_peri_N	NO (-67.8%)	NO
L04_Research_peri_NE	NO (-54%)	NO
L04_Research_peri_NW	NO (-68%)	NO
L04_Research_peri_S	NO (-49.7%)	NO
L04_Research_peri_S04	NO (-61.1%)	YES
L04_Research_peri_W	NO (-56.3%)	YES
L04_Research_peri_W	NO (-59.5%)	YES
L05_lift lobby	NO (-99%)	NO
L05_lift lobby_peri_S	NO (-55.9%)	YES
L05_Research3_peri_E	NO (-59.4%)	YES
L05_Research3_peri_S3	NO (-45%)	YES
L05_Research3_peri_SE	NO (-62.3%)	NO
L05_Research_int	NO (-89.1%)	NO
L05_Research_peri_E	NO (-50.7%)	NO
L05_Research_peri_N	NO (-65.4%)	NO
L05_Research_peri_NE	NO (-54.4%)	NO
L05_Research_peri_NW	NO (-70.2%)	NO
L05_Research_peri_S	NO (-49.2%)	NO
L05_Research_peri_S04	NO (-61.1%)	YES
L05_Research_peri_W	NO (-55.8%)	YES
L05_Research_peri_W	NO (-60.2%)	YES
L06_lift lobby	NO (-99.2%)	NO
L06_lift lobby_peri_S	NO (-55.9%)	YES
L06_Research3_peri_E	NO (-58.5%)	YES
L06_Research3_peri_S2	NO (-54.3%)	NO
L06_Research3_peri_S3	NO (-43.6%)	YES
L06_Research3_peri_SE	NO (-69.5%)	NO
L06_Research_int	NO (-92.8%)	NO
L06_Research_peri_E	NO (-50.1%)	NO
L06_Research_peri_N1	NO (-62.8%)	YES
L06_Research_peri_N2	NO (-67.4%)	NO
L06_Research_peri_N3	NO (-64.6%)	YES
L06_Research_peri_N4	NO (-63.3%)	NO
L06_Research_peri_NE	NO (-50.1%)	NO
L06_Research_peri_NE1	NO (-53.1%)	YES
L06_Research_peri_NW1	NO (-59.3%)	YES
L06_Research_peri_NW2	NO (-59.3%)	YES
L06_Research_peri_S	NO (-47.4%)	NO
L06_Research_peri_S04	NO (-63.6%)	YES
L06_Research_peri_SW	NO (-61.6%)	YES
L06_Research_peri_W	NO (-65.4%)	YES
L07_lift lobby	NO (-99.2%)	NO
L07_lift lobby_peri_S	NO (-55.5%)	YES
L07_Research3_peri_E	NO (-57.9%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L07_Research3_peri_S2	NO (-44.5%)	YES
L07_Research3_peri_S3	NO (-49.7%)	YES
L07_Research3_peri_SE	NO (-50.3%)	YES
L07_Research_int	NO (-94%)	NO
L07_Research_peri_E	NO (-52%)	NO
L07_Research_peri_N1	NO (-68.3%)	YES
L07_Research_peri_N2	NO (-70.5%)	NO
L07_Research_peri_N3	NO (-69.8%)	YES
L07_Research_peri_N4	NO (-63.5%)	NO
L07_Research_peri_NE	NO (-49.7%)	NO
L07_Research_peri_NE1	NO (-60.2%)	YES
L07_Research_peri_NW1	NO (-65.4%)	YES
L07_Research_peri_NW2	NO (-60.8%)	YES
L07_Research_peri_S	NO (-48.4%)	NO
L07_Research_peri_S04	NO (-62.8%)	YES
L07_Research_peri_SW	NO (-55.3%)	YES
L07_Research_peri_W	NO (-67.1%)	YES
L08_lift lobby	NO (-99.2%)	NO
L08_lift lobby_peri_S	NO (-46.9%)	YES
L08_Research_l02	NO (-80.3%)	NO
L08_Research_Internal	NO (-93.2%)	NO
L08_Research_peri_N	NO (-66.7%)	NO
L08_Research_peri_NW	NO (-68%)	NO
L08_Research_peri_S	NO (-67.6%)	YES
L08_Research_peri_SE	NO (-67%)	YES
L08_Research_peri_SW	NO (-55.7%)	YES
L08_Research_peri_W	NO (-61.6%)	YES
L09_lift lobby	NO (-99.1%)	NO
L09_lift lobby_peri_S	NO (-53%)	YES
L09_Research2_peri_E	NO (-58.3%)	YES
L09_Research2_peri_S4	NO (-63%)	YES
L09_Research2_peri_SW	NO (-56.1%)	YES
L09_Research_Internal	NO (-89%)	NO
L09_Research_peri_N	NO (-71.3%)	NO
L09_Research_peri_NE	NO (-57.2%)	NO
L09_Research_peri_NW	NO (-68.5%)	NO
L09_Research_peri_S	NO (-45.3%)	NO
L09_Research_peri_S	NO (-67.8%)	NO
L09_Research_peri_SE	NO (-62.1%)	YES
L09_Research_peri_SE	NO (-42.7%)	YES
L09_Research_peri_W	NO (-60.7%)	YES
L10_lift lobby	NO (-99.2%)	NO
L10_lift lobby_peri_S	NO (-57.5%)	YES
L10_Research2_peri_E	NO (-62%)	YES
L10_Research2_peri_S4	NO (-63.6%)	YES
L10_Research2_peri_SW	NO (-55.2%)	YES
L10_Research3_peri_S2	NO (-60.3%)	NO
L10_Research3_peri_S3	NO (-47.6%)	YES
L10_Research3_peri_SE	NO (-53.5%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L10_Research_int	NO (-94.3%)	NO
L10_Research_peri_E	NO (-60.3%)	NO
L10_Research_peri_E2	NO (-20.8%)	NO
L10_Research_peri_N	NO (-67.8%)	NO
L10_Research_peri_N2	NO (-71.3%)	YES
L10_Research_peri_N3	NO (-72.7%)	NO
L10_Research_peri_NE	NO (-66.1%)	YES
L10_Research_peri_NE	NO (-64.1%)	NO
L10_Research_peri_NW	NO (-73.8%)	YES
L10_Research_peri_NW	NO (-69.9%)	NO
L10_Research_peri_S	NO (-48.5%)	NO
L10_Research_peri_W	NO (-62.1%)	YES
L11_Office2_peri_E	NO (-62.8%)	YES
L11_Office2_peri_S5	NO (-64.1%)	YES
L11_Office2_peri_SW	NO (-55.4%)	YES
L11_Office3_peri_S2	NO (-59.7%)	YES
L11_Office3_peri_S4	NO (-68.6%)	YES
L11_Office3_peri_SE	NO (-53.6%)	YES
L11_Office_int	NO (-93.8%)	NO
L11_Office_peri_E	NO (-65.4%)	NO
L11_Office_peri_N	NO (-72%)	NO
L11_Office_peri_N2	NO (-75.6%)	YES
L11_Office_peri_N3	NO (-73.6%)	NO
L11_Office_peri_NE	NO (-69.5%)	YES
L11_Office_peri_NW	NO (-75%)	YES
L11_Office_peri_NW	NO (-73.9%)	NO
L11_Office_peri_S	NO (-47.8%)	NO
L11_Office_peri_W	NO (-64.4%)	YES
L12_Office2_peri_E	NO (-61.5%)	YES
L12_Office2_peri_S5	NO (-64%)	YES
L12_Office2_peri_SW	NO (-55.3%)	YES
L12_Office_int	NO (-92%)	NO
L12_Office_Peri E	NO (-77.2%)	YES
L12_Office_Peri W	NO (-93.4%)	NO
L12_Office_peri_E	NO (-63.4%)	NO
L12_Office_peri_E	NO (-43.6%)	YES
L12_Office_peri_N	NO (-70.6%)	NO
L12_Office_peri_NW	NO (-74%)	NO
L12_Office_peri_S	NO (-62.6%)	YES
L12_Office_peri_S	NO (-49.1%)	NO
L12_Office_peri_SE	NO (-65%)	YES
L12_Office_peri_SW	NO (-63.6%)	YES
L12_Office_peri_W	NO (-64.9%)	YES
L13_Office2_peri_E	NO (-60.1%)	YES
L13_Office2_peri_S5	NO (-61.9%)	YES
L13_Office2_peri_SW	NO (-55.3%)	YES
L13_Office_int	NO (-92.2%)	NO
L13_Office_int	NO (-49.5%)	NO
L13_Office_Peir_W2	NO (-93.5%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L13_Office_peri_E	NO (-58.3%)	NO
L13_Office_peri_E	NO (-36.3%)	YES
L13_Office_Peri_E2	NO (-80.5%)	YES
L13_Office_peri_N	NO (-70.8%)	NO
L13_Office_peri_NW	NO (-74.8%)	NO
L13_Office_peri_S	NO (-75.7%)	YES
L13_Office_peri_SE	NO (-65%)	YES
L13_Office_peri_SW	NO (-68.2%)	YES
L13_Office_peri_W	NO (-58.7%)	YES
L14_Office	NO (-90.8%)	NO
L14_Office_peri_E_01	NO (-61.7%)	NO
L14_Office_peri_E_02	NO (-39.6%)	YES
L14_Office_peri_E_03	NO (-59.9%)	YES
L14_Office_peri_N	NO (-68.4%)	YES
L14_Office_peri_NW	NO (-66.3%)	YES
L14_Office_peri_N_02	NO (-69.2%)	NO
L14_Office_peri_SW	NO (-56.2%)	YES
L14_Office_peri_S_01	NO (-64.9%)	NO
L14_Office_peri_S_02	NO (-62.4%)	YES
L14_Office_peri_W_01	NO (-58.8%)	YES
L14_Office_peri_W_02	NO (-93.5%)	NO
L15_Office2_peri_E_04	NO (-58.9%)	YES
L15_Office2_peri_SW	NO (-54.2%)	YES
L15_Office2_peri_S_02	NO (-61.5%)	YES
L15_Office_Internal	NO (-90.7%)	NO
L15_Office_peri_E_01	NO (-65.8%)	NO
L15_Office_peri_E_02	NO (-58.1%)	NO
L15_Office_peri_E_03	NO (-37.8%)	YES
L15_Office_peri_NW	NO (-68.4%)	YES
L15_Office_peri_N_01	NO (-72.7%)	YES
L15_Office_peri_N_02	NO (-70.7%)	NO
L15_Office_peri_N_03	NO (-65%)	NO
L15_Office_peri_S_01	NO (-65%)	NO
L15_Office_peri_W_01	NO (-94.1%)	NO
L15_Office_peri_W_02	NO (-59.9%)	YES
L16_Office2_peri_E_04	NO (-57.6%)	YES
L16_Office2_peri_SW	NO (-54%)	YES
L16_Office2_peri_S_02	NO (-61.1%)	YES
L16_Office_Internal	NO (-88%)	NO
L16_Office_peri_E_01	NO (-66.3%)	NO
L16_Office_peri_E_02	NO (-59.5%)	NO
L16_Office_peri_E_03	NO (-37.8%)	YES
L16_Office_peri_N_02	NO (-71.4%)	NO
L16_Office_peri_N_02	NO (-55.5%)	YES
L16_Office_peri_N_02	NO (-71.5%)	NO
L16_Office_peri_N_03	NO (-66.2%)	NO
L16_Office_peri_S_01	NO (-64.8%)	NO
L16_Office_peri_W_01	NO (-92.4%)	NO
L17_Office2_peri_E4	NO (-55.8%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L17_Office2_peri_S2	NO (-61.1%)	YES
L17_Office2_peri_SW	NO (-54.2%)	YES
L17_Office_Internal	NO (-81.5%)	NO
L17_Office_peri_E	NO (-66.2%)	NO
L17_Office_peri_E2	NO (-76.2%)	NO
L17_Office_peri_E3	NO (-54.2%)	NO
L17_Office_peri_N	NO (-76.1%)	NO
L17_Office_peri_N2	NO (-62.3%)	NO
L17_Office_peri_S	NO (-57.9%)	NO
L17_Office_peri_W	NO (-92.2%)	NO
L17_Office_peri_W2	NO (-54.7%)	YES
L17_Office_peri_W3	NO (-66.8%)	NO
L18_Office_Internal	NO (-88.8%)	NO
L18_Office_peri_E	NO (-59.3%)	NO
L18_Office_peri_N	NO (-69%)	NO
L18_Office_peri_W	NO (-94.9%)	NO
L18_Office_peri_W2	NO (-56.6%)	YES
L18_Office_peri_W3	NO (-72%)	NO
L00_Retail 01_I01	NO (-96.7%)	NO
L00_Retail 01_peri_S	NO (-53.3%)	YES
L00_Retail 01_peri_W	NO (-75.1%)	YES
L00-Mezz_Seminar_peri_S	NO (-82%)	YES
L00-Mezz_Seminar_peri_S	NO (-67.7%)	YES
L00-Mezz_Seminar_peri_S	N/A	N/A
L00-Mezz_Seminar_peri_W	NO (-86.9%)	YES
L00-Mezz_Seminar_peri_W	NO (-97%)	NO
L00-Mezz_Seminar_I01	NO (-98.1%)	NO
L00-Mezz_Seminar_I01	NO (-53.1%)	YES
L00-Mezz_Seminar_I01	NO (-99.9%)	NO
L00-Mezz_Seminar_peri_E	NO (-74.8%)	YES
L00-Mezz_Seminar_peri_E	NO (-99%)	YES

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

Class B1(b) - GREEN

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	27979.3	27991.6
External area [m²]	26446.3	26446.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	16784	13812.6
Average U-value [W/m²K]	0.63	0.52
Alpha value* [%]	7.62	10

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

Building Use

% Area	Building Type
2	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
98	**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	1.53	1.19
Cooling	2.74	6.54
Auxiliary	6.69	9.67
Lighting	7.65	18.71
Hot water	2.63	2.97
Equipment*	58.25	58.31
TOTAL**	**21.24**	**39.09**

* 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	1.29	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]	74.61	77.45
Primary energy* [kWh/m²]	63.57	114.97
Total emissions [kg/m²]	10.1	19.6

* 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	22.6	71.3	1.6	3.6	9.5	3.96	5.5	3.96	5.5
	Notional	9.9	100.4	1.1	9.8	13.1	2.56	2.84	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	56.6	0	4	0	1	3.96	0	3.96	0
	Notional	30.7	0	3.3	0	1	2.56	0	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	19.5	77.9	1.4	3.9	8.6	3.96	5.5	3.96	5.5
	Notional	11.6	84.1	1.3	8.2	13.2	2.56	2.84	----	----
[ST] Central heating using water: radiators, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	29	0	8.1	0	2.6	1	0	1	0
	Notional	12.7	0	4.1	0	2.5	0.86	0	----	----
[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	0.2	L0000006:Surf[1]
Floor	0.2	0.15	B0000010:Surf[0]
Roof	0.15	0.1	B0000049:Surf[2]
Windows, roof windows, and rooflights	1.5	1.2	GL000000:Surf[3]
Personnel doors	1.5	1.2	L00001E0:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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

Class D1 - LEAN

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Vinegar Yard D1 - Lean

As designed

Date: Mon Oct 25 17:06:26 2021

Administrative information

Building Details

Address: Southwark, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Kartik Amrania

Telephone number: 44(0)1628623423

Address: Sweco UK, 1 Bath Road, London, SL6 4AQ

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	21.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	21.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	12.1
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	0.23	0.25	L000001C:Surf[1]
Floor	0.25	0.15	0.15	B0000010:Surf[0]
Roof	0.25	0.1	0.1	B0000049:Surf[2]
Windows***, roof windows, and rooflights	2.2	1.2	2	B000005D:Surf[1]
Personnel doors	2.2	1.2	1.2	L00001E0:Surf[0]
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	3

Building services

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

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

1- 01c FCU system - ASHP_heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

2- 02a Extract system_Elec_WC&Changing only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	-	0.2	0	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

3- 01a FCU system - ASHP_office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.44	0	1.3	0.85
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.

4- 01b FCU system - ASHP_Clinical/Outpatients Reduced SFP and HRE

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.91	3.44	0	1.8	0.75
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.

"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
B01 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Lobby 02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Security Office	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace I01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace N P02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace NW P01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace SW P03	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Lift Lobby 01	-	-	-	-	-	-	-	0.3	-	-	N/A
B01-Mezz Lobby 01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Workspace	-	-	-	-	-	-	-	0.2	-	-	N/A
B02 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_lift Lobby	-	-	-	-	-	-	-	0.3	-	-	N/A
L00-Mezz_lift Lobby_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L00-Mezz_Workspace_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_lift Lobby_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_Lobby_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_int_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_int_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_Medical_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_S1	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_E	-	-	-	-	-	-	-	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
L04_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_W	-	-	-	-	-	-	-	0.3	-	-	N/A
L05_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_W	-	-	-	-	-	-	-	0.3	-	-	N/A
L06_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L07_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_Internal	-	-	-	-	-	-	-	0.3	-	-	N/A
L09_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L09_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_SE	-	-	-	-	-	-	-	0.3	-	-	N/A
L09_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L10_Medical2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_E	-	-	-	-	-	-	-	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
L12_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L13_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peir_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L14_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_01	-	-	-	-	-	-	-	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
L15_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_E4	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E3	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
B01 Circ 01	-	95	-	25
B01 Circ 02	-	95	-	25
B01 Circ 03	-	95	-	68
B01 Circ 04	-	95	-	20
B01 Circ 05	-	95	-	13
B01 DIS. Showers	-	95	-	35
B01 Lobby	-	141	-	356
B01 Lobby 02	-	99	-	701
B01 Lockers	-	95	-	102
B01 Security Office	135	-	-	269
B01 Showers	-	95	-	143
B01 Stairs 01	-	95	-	25
B01 Stairs 02	-	95	-	56
B01 Stairs 03	-	95	-	47
B01 Stairs 04	-	95	-	41
B01 Substation & Switchroom	95	-	-	255
B01 Switchroom	95	-	-	57
B01 Water Meter Room	95	-	-	72
B01 WC 01	-	95	-	49
B01 WC 02	-	95	-	33
B01 WC 03	-	95	-	28
B01 Workspace I01	125	-	-	2334
B01 Workspace N P02	126	-	-	1812
B01 Workspace NW P01	131	-	-	562
B01 Workspace SW P03	129	-	-	824
B01-Mezz Circ 01	-	95	-	30
B01-Mezz Circ 02	-	95	-	31
B01-Mezz Circ 03	-	95	-	71
B01-Mezz Circ 04	-	95	-	25
B01-Mezz Cycle Store	95	-	-	149
B01-Mezz Gas Meter Room	95	-	-	73

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B01-Mezz Lift Lobby 01	-	95	-	41
B01-Mezz Lobby 01	-	131	-	276
B01-Mezz Stairs 01	-	95	-	27
B01-Mezz Stairs 02	-	95	-	61
B01-Mezz Stairs 03	-	95	-	49
B01-Mezz Stairs 04	-	95	-	46
B01-Mezz Switchroom	95	-	-	62
B01-Mezz WC 01	-	95	-	58
B01-Mezz WC 02	-	95	-	42
B01-Mezz Workspace	124	-	-	2877
B02 Bin Store	95	-	-	56
B02 BOH	-	95	-	83
B02 Circ 01	-	95	-	45
B02 Circ 02	-	95	-	31
B02 Corridor	-	95	-	453
B02 Generator 01	95	-	-	1706
B02 Generator 02	95	-	-	240
B02 Landlord HV/LV Substation	95	-	-	539
B02 Lobby	-	178	-	160
B02 Stairs 01	-	95	-	75
B02 Stairs 02	-	95	-	73
B02 Substation	95	-	-	646
B02 Switchroom 01	95	-	-	183
B02 Switchroom 02	95	-	-	251
B02 Switchroom 03	95	-	-	121
B02 Ventilation Plant	95	-	-	195
B02 Waste Store	95	-	-	47
B03 AWS Ventilation Plant	95	-	-	339
B03 BOH	-	95	-	150
B03 Circ 01	-	95	-	47
B03 Circ 02	-	95	-	49
B03 Circ 03	-	95	-	37
B03 Corridor	-	95	-	369
B03 CWS Tank	95	-	-	86
B03 Diesel Storage	95	-	-	126
B03 Grey Water Tanks and Pumps	95	-	-	195
B03 Heating Plant	95	-	-	246
B03 Plant	95	-	-	830
B03 Retail Plant	95	-	-	245
B03 Stairs 01	-	95	-	66
B03 Stairs 02	-	95	-	71
B03 Tanks and Pumps	95	-	-	721
B03 Ventilation Plant	95	-	-	218

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B03 Water Storage	95	-	-	248
L00-Mezz_Circ_01	-	95	-	54
L00-Mezz_Circ_02	-	95	-	22
L00-Mezz_Gas Storage	95	-	-	27
L00-Mezz_lift Lobby	-	95	-	40
L00-Mezz_lift Lobby_peri_S	-	95	-	39
L00-Mezz_refuge	95	-	-	12
L00-Mezz_refuge	95	-	-	11
L00-Mezz_stairs	-	95	-	51
L00-Mezz_Stairs_01	-	95	-	33
L00-Mezz_stairs_peri_S	-	95	-	52
L00-Mezz_WC	-	95	-	40
L00-Mezz_WC_01	-	95	-	63
L00-Mezz_WC_02	-	95	-	71
L00-Mezz_WC_03	-	95	-	34
L00-Mezz_Workspace_I01	127	-	-	593
L00-Mezz_Workspace_peri_E	141	-	-	183
L00-Mezz_Workspace_peri_N	123	-	-	1867
L00-Mezz_Workspace_peri_S	134	-	-	469
L00-Mezz_Workspace_peri_W	129	-	-	552
L00_circ_01	-	95	-	61
L00_circ_02	-	95	-	14
L00_Gas Storage	95	-	-	30
L00_lift Lobby	-	95	-	40
L00_lift Lobby	-	95	-	44
L00_lift Lobby_peri_S	-	95	-	39
L00_Loading Bay	95	-	-	313
L00_Lobby_I01	-	125	-	291
L00_Lobby_I02	-	98	-	565
L00_Lobby_peri_E	-	109	-	269
L00_Lobby_peri_N_01	-	104	-	988
L00_Lobby_peri_W_01	-	280	-	95
L00_Lobby_peri_W_02	-	215	-	169
L00_Lobby_peri_W_03	-	117	-	517
L00_Lobby_peri_W_04	-	105	-	394
L00_refuge	95	-	-	15
L00_refuge	95	-	-	14
L00_Retail 01_I01	-	89	35	532
L00_Retail 01_peri_S	-	89	35	684
L00_Retail 01_peri_W	-	95	35	502
L00_Retail 02_I01	-	89	35	1192
L00_Retail 02_peri_E	-	102	35	320
L00_Retail 02_peri_N_01	-	96	35	954

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00_Retail 02_peri_N_02	-	110	35	367
L00_Retail 02_peri_N_03	-	108	35	195
L00_Retail 02_peri_S	-	99	35	735
L00_stairs	-	95	-	54
L00_stairs	-	95	-	97
L00_Stairs_01	-	95	-	40
L00_stairs_peri_S	-	95	-	55
L00_WC	-	95	-	45
L01_lift lobby	-	95	-	44
L01_lift lobby_peri_S	-	95	-	43
L01_Medical_int_01	140	-	-	221
L01_Medical_int_02	125	-	-	1714
L01_Medical_peri_E	156	-	-	117
L01_Medical_peri_E2	159	-	-	154
L01_Medical_peri_E2	142	-	-	139
L01_Medical_peri_N	128	-	-	930
L01_Medical_peri_N2	128	-	-	1003
L01_Medical_peri_S	129	-	-	585
L01_Medical_peri_S1	150	-	-	154
L01_Medical_peri_S2	129	-	-	542
L01_Medical_peri_SW	160	-	-	90
L01_Medical_peri_W_01	125	-	-	411
L01_Medical_peri_W_02	136	-	-	241
L01_refuge	95	-	-	17
L01_refuge	95	-	-	15
L01_stairs	-	95	-	59
L01_stairs_peri_S	-	95	-	61
L01_storage	95	-	-	21
L02_lift lobby	-	95	-	42
L02_lift lobby_peri_S	-	95	-	41
L02_Medical_int	124	-	-	2109
L02_Medical_int	129	-	-	488
L02_Medical_peri_E	152	-	-	117
L02_Medical_peri_N	132	-	-	313
L02_Medical_peri_N	127	-	-	1619
L02_Medical_peri_NE	158	-	-	101
L02_Medical_peri_S	133	-	-	304
L02_Medical_peri_S	160	-	-	93
L02_Medical_peri_S	149	-	-	166
L02_Medical_peri_SE	159	-	-	88
L02_Medical_peri_SE	131	-	-	341
L02_Medical_peri_SE	153	-	-	108
L02_Medical_peri_SW	160	-	-	90

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L02_Medical_peri_W	140	-	-	241
L02_Medical_peri_W	139	-	-	118
L02_refuge	95	-	-	14
L02_refuge	95	-	-	15
L02_stairs	-	95	-	60
L02_stairs	-	95	-	56
L02_storage	95	-	-	20
L03_lift lobby_int	-	95	-	51
L03_lift lobby_peri_S	-	95	-	49
L03_Medical_I01	136	-	-	762
L03_Medical_peri_N	137	-	-	621
L03_Medical_peri_NW	158	-	-	179
L03_Medical_peri_S	151	-	-	148
L03_Medical_peri_SW	159	-	-	95
L03_Medical_peri_W_01	129	-	-	418
L03_Medical_peri_W_02	154	-	-	139
L03_Plant	95	-	-	2068
L03_Plant3	95	-	-	372
L03_refuge	95	-	-	18
L03_refuge	95	-	-	16
L03_stairs	-	95	-	65
L03_stairs	-	95	-	68
L03_storage	95	-	-	24
L04_lift lobby	-	95	-	42
L04_lift lobby_peri_S	-	95	-	41
L04_Medical3_peri_E	158	-	-	102
L04_Medical3_peri_S3	131	-	-	542
L04_Medical3_peri_SE	153	-	-	112
L04_Medical_int	123	-	-	3266
L04_Medical_peri_E	152	-	-	117
L04_Medical_peri_N	126	-	-	2101
L04_Medical_peri_NE	158	-	-	101
L04_Medical_peri_NW	141	-	-	179
L04_Medical_peri_S	134	-	-	277
L04_Medical_peri_S04	155	-	-	100
L04_Medical_peri_W	137	-	-	139
L04_Medical_peri_W	145	-	-	152
L04_refuge	95	-	-	14
L04_refuge	95	-	-	15
L04_stairs	-	95	-	60
L04_stairs	-	95	-	56
L04_storage	95	-	-	20
L05_lift lobby	-	95	-	42

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L05_lift lobby_peri_S	-	95	-	41
L05_Medical3_peri_E	158	-	-	102
L05_Medical3_peri_S3	131	-	-	542
L05_Medical3_peri_SE	153	-	-	112
L05_Medical_int	123	-	-	3266
L05_Medical_peri_E	152	-	-	117
L05_Medical_peri_N	125	-	-	2101
L05_Medical_peri_NE	158	-	-	101
L05_Medical_peri_NW	134	-	-	179
L05_Medical_peri_S	134	-	-	277
L05_Medical_peri_S04	155	-	-	100
L05_Medical_peri_W	137	-	-	139
L05_Medical_peri_W	145	-	-	152
L05_refuge	95	-	-	15
L05_refuge	95	-	-	14
L05_stairs	-	95	-	59
L05_stairs	-	95	-	56
L05_storage	95	-	-	20
L06_lift lobby	-	95	-	43
L06_lift lobby_peri_S	-	95	-	41
L06_Medical3_peri_E	162	-	-	99
L06_Medical3_peri_S2	134	-	-	119
L06_Medical3_peri_S3	128	-	-	429
L06_Medical3_peri_SE	144	-	-	117
L06_Medical_int	124	-	-	2670
L06_Medical_peri_E	153	-	-	117
L06_Medical_peri_N1	130	-	-	474
L06_Medical_peri_N2	134	-	-	372
L06_Medical_peri_N3	128	-	-	505
L06_Medical_peri_N4	133	-	-	383
L06_Medical_peri_NE	155	-	-	154
L06_Medical_peri_NE1	149	-	-	108
L06_Medical_peri_NW1	149	-	-	108
L06_Medical_peri_NW2	149	-	-	109
L06_Medical_peri_S	134	-	-	277
L06_Medical_peri_S04	160	-	-	98
L06_Medical_peri_SW	142	-	-	194
L06_Medical_peri_W	137	-	-	221
L06_refuge	95	-	-	14
L06_refuge	95	-	-	15
L06_stairs	-	95	-	56
L06_stairs	-	95	-	20
L06_stairs_peri_S	-	95	-	47

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L06_storage	95	-	-	20
L07_lift lobby	-	95	-	43
L07_lift lobby_peri_S	-	95	-	41
L07_Medical3_peri_E	162	-	-	99
L07_Medical3_peri_S2	130	-	-	257
L07_Medical3_peri_S3	145	-	-	180
L07_Medical3_peri_SE	141	-	-	175
L07_Medical_int	125	-	-	2494
L07_Medical_peri_E	136	-	-	117
L07_Medical_peri_N1	130	-	-	474
L07_Medical_peri_N2	132	-	-	401
L07_Medical_peri_N3	128	-	-	505
L07_Medical_peri_N4	131	-	-	383
L07_Medical_peri_NE	155	-	-	154
L07_Medical_peri_NE1	149	-	-	108
L07_Medical_peri_NW1	149	-	-	108
L07_Medical_peri_NW2	149	-	-	109
L07_Medical_peri_S	134	-	-	277
L07_Medical_peri_S04	160	-	-	98
L07_Medical_peri_SW	142	-	-	195
L07_Medical_peri_W	137	-	-	221
L07_refuge	95	-	-	15
L07_refuge	95	-	-	14
L07_stairs	-	95	-	56
L07_stairs	-	95	-	20
L07_stairs_peri_S	-	95	-	47
L07_storage	95	-	-	20
L08_lift lobby	-	95	-	51
L08_lift lobby_peri_S	-	95	-	49
L08_Medical_Internal	129	-	-	1189
L08_Medical_peri_N	136	-	-	657
L08_Medical_peri_NW	158	-	-	179
L08_Medical_peri_S	186	-	-	100
L08_Medical_peri_SE	191	-	-	102
L08_Medical_peri_SW	155	-	-	210
L08_Medical_peri_W	154	-	-	139
L08_Plant	95	-	-	2018
L08_Plant3	95	-	-	372
L08_refuge	95	-	-	16
L08_refuge	95	-	-	18
L08_stairs	-	95	-	65
L08_stairs	-	95	-	68
L08_storage	95	-	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L09_lift lobby	-	95	-	43
L09_lift lobby_peri_S	-	95	-	42
L09_Medical2_peri_E	163	-	-	102
L09_Medical2_peri_S4	161	-	-	100
L09_Medical2_peri_SW	149	-	-	154
L09_Medical_Internal	124	-	-	3130
L09_Medical_peri_N	124	-	-	2039
L09_Medical_peri_NE	129	-	-	235
L09_Medical_peri_NW	144	-	-	179
L09_Medical_peri_S	131	-	-	399
L09_Medical_peri_S	134	-	-	320
L09_Medical_peri_SE	145	-	-	167
L09_Medical_peri_SE	152	-	-	146
L09_Medical_peri_W	140	-	-	139
L09_Plant	95	-	-	79
L09_refuge	95	-	-	14
L09_refuge	95	-	-	16
L09_stairs	-	95	-	58
L09_stairs	-	95	-	61
L09_storage	95	-	-	21
L10_lift lobby	-	95	-	42
L10_lift lobby_peri_S	-	95	-	41
L10_Medical2_peri_E	163	-	-	99
L10_Medical2_peri_S4	161	-	-	98
L10_Medical2_peri_SW	142	-	-	194
L10_Medical3_peri_S2	153	-	-	119
L10_Medical3_peri_S3	131	-	-	428
L10_Medical3_peri_SE	155	-	-	117
L10_Medical_int	124	-	-	2436
L10_Medical_peri_E	133	-	-	309
L10_Medical_peri_E2	182	-	-	129
L10_Medical_peri_N	131	-	-	437
L10_Medical_peri_N2	128	-	-	458
L10_Medical_peri_N3	131	-	-	323
L10_Medical_peri_NE	240	-	-	77
L10_Medical_peri_NE	150	-	-	108
L10_Medical_peri_NW	150	-	-	108
L10_Medical_peri_NW	142	-	-	179
L10_Medical_peri_S	134	-	-	277
L10_Medical_peri_W	138	-	-	139
L10_refuge	95	-	-	13
L10_refuge	95	-	-	15
L10_stairs	-	95	-	56

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L10_stairs	-	95	-	57
L10_storage	95	-	-	20
L11_Office2_peri_E	154	-	-	99
L11_Office2_peri_S5	151	-	-	98
L11_Office2_peri_SW	141	-	-	160
L11_Office3_peri_S2	128	-	-	561
L11_Office3_peri_S4	165	-	-	103
L11_Office3_peri_SE	144	-	-	112
L11_Office_int	124	-	-	2733
L11_Office_peri_E	140	-	-	139
L11_Office_peri_N	129	-	-	437
L11_Office_peri_N2	126	-	-	458
L11_Office_peri_N3	129	-	-	431
L11_Office_peri_NE	143	-	-	108
L11_Office_peri_NW	137	-	-	179
L11_Office_peri_NW	143	-	-	108
L11_Office_peri_S	138	-	-	262
L11_Office_peri_W	134	-	-	139
L11_refuge	95	-	-	14
L11_refuge	95	-	-	12
L11_stairs	-	95	-	52
L11_stairs	-	95	-	47
L11_stairs	-	95	-	54
L11_stairs	-	95	-	47
L11_stairs	-	95	-	54
L11_WC	-	95	-	125
L11_WC	-	95	-	46
L11_WC	-	95	-	79
L12_circ	-	95	-	25
L12_Office2_peri_E	167	-	-	102
L12_Office2_peri_S5	151	-	-	100
L12_Office2_peri_SW	142	-	-	154
L12_Office_int	123	-	-	2316
L12_Office_Peri E	168	-	-	93
L12_Office_Peri W	123	-	-	418
L12_Office_peri_E	157	-	-	114
L12_Office_peri_E	140	-	-	139
L12_Office_peri_N	125	-	-	1566
L12_Office_peri_NW	137	-	-	179
L12_Office_peri_S	129	-	-	412
L12_Office_peri_S	131	-	-	241
L12_Office_peri_SE	133	-	-	274
L12_Office_peri_SW	143	-	-	112
L12_Office_peri_W	134	-	-	139
L12_refuge	95	-	-	10

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L12_Stairs	-	95	-	19
L12_stairs	-	95	-	47
L12_stairs	-	95	-	52
L12_WC	-	95	-	46
L12_WC	-	95	-	104
L12_WC	-	95	-	79
L13_Circ	-	95	-	59
L13_circ	-	95	-	31
L13_Office2_peri_E	146	-	-	102
L13_Office2_peri_S5	146	-	-	100
L13_Office2_peri_SW	140	-	-	154
L13_Office_int	125	-	-	1789
L13_Office_int	146	-	-	193
L13_Office_Peir_W2	123	-	-	411
L13_Office_peri_E	157	-	-	114
L13_Office_peri_E	138	-	-	139
L13_Office_Peri_E2	147	-	-	97
L13_Office_peri_N	124	-	-	1566
L13_Office_peri_NW	131	-	-	179
L13_Office_peri_S	129	-	-	412
L13_Office_peri_SE	132	-	-	274
L13_Office_peri_SW	145	-	-	112
L13_Office_peri_W	132	-	-	139
L13_R	-	95	-	15
L13_stairs	-	95	-	41
L13_Stairs	-	95	-	45
L13_WC	-	95	-	79
L13_WC	-	95	-	47
L13_WC_01	-	95	-	63
L13_WC_02	-	95	-	45
L14_circ_01	-	95	-	31
L14_circ_02	-	95	-	32
L14_Office	125	-	-	1952
L14_Office_peri_E_01	124	-	-	359
L14_Office_peri_E_02	148	-	-	154
L14_Office_peri_E_03	148	-	-	106
L14_Office_peri_N	128	-	-	434
L14_Office_peri_NW	142	-	-	108
L14_Office_peri_N_02	124	-	-	950
L14_Office_peri_SW	141	-	-	157
L14_Office_peri_S_01	129	-	-	864
L14_Office_peri_S_02	146	-	-	104
L14_Office_peri_W_01	133	-	-	221

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L14_Office_peri_W_02	123	-	-	440
L14_stairs	-	95	-	42
L14_Stairs	-	95	-	46
L14_WC	-	95	-	61
L14_WC	-	95	-	44
L14_WC	-	95	-	81
L15_circ_01	-	95	-	30
L15_circ_02	-	95	-	15
L15_Office2_peri_E_04	145	-	-	102
L15_Office2_peri_SW	136	-	-	194
L15_Office2_peri_S_02	144	-	-	102
L15_Office_Internal	124	-	-	1691
L15_Office_peri_E_01	146	-	-	97
L15_Office_peri_E_02	150	-	-	100
L15_Office_peri_E_03	145	-	-	155
L15_Office_peri_NW	138	-	-	107
L15_Office_peri_N_01	127	-	-	434
L15_Office_peri_N_02	128	-	-	425
L15_Office_peri_N_03	141	-	-	111
L15_Office_peri_S_01	128	-	-	864
L15_Office_peri_W_01	123	-	-	412
L15_Office_peri_W_02	132	-	-	221
L15_stairs	-	95	-	41
L15_stairs	-	95	-	44
L15_WC	-	95	-	79
L15_WC	-	95	-	46
L16_circ_01	-	95	-	32
L16_circ_02	-	95	-	11
L16_Office2_peri_E_04	149	-	-	102
L16_Office2_peri_SW	138	-	-	194
L16_Office2_peri_S_02	148	-	-	102
L16_Office_Internal	123	-	-	1896
L16_Office_peri_E_01	126	-	-	97
L16_Office_peri_E_02	128	-	-	100
L16_Office_peri_E_03	129	-	-	155
L16_Office_peri_N_02	138	-	-	181
L16_Office_peri_N_02	124	-	-	1035
L16_Office_peri_N_02	135	-	-	138
L16_Office_peri_N_03	124	-	-	111
L16_Office_peri_S_01	126	-	-	864
L16_Office_peri_W_01	123	-	-	412
L16_stairs	-	95	-	43
L16_stairs	-	95	-	36

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L16_WC	-	95	-	81
L16_WC	-	95	-	48
L17_circ	-	95	-	30
L17_Office2_peri_E4	145	-	-	102
L17_Office2_peri_S2	144	-	-	102
L17_Office2_peri_SW	136	-	-	191
L17_Office_Internal	137	-	-	657
L17_Office_peri_E	145	-	-	97
L17_Office_peri_E2	153	-	-	92
L17_Office_peri_E3	138	-	-	172
L17_Office_peri_N	129	-	-	396
L17_Office_peri_N2	138	-	-	130
L17_Office_peri_S	138	-	-	363
L17_Office_peri_W	123	-	-	412
L17_Office_peri_W2	131	-	-	138
L17_Office_peri_W3	135	-	-	181
L17_stairs	-	95	-	41
L17_stairs	-	95	-	48
L17_WC	-	95	-	47
L17_WC	-	95	-	79
L18_Circ	-	95	-	16
L18_circ	-	95	-	22
L18_Office_Internal	228	-	-	169
L18_Office_peri_E	134	-	-	101
L18_Office_peri_N	127	-	-	396
L18_Office_peri_W	125	-	-	440
L18_Office_peri_W2	136	-	-	138
L18_Office_peri_W3	135	-	-	181
L18_Plant_01	95	-	-	216
L18_Plant_02	95	-	-	215
L18_Plant_03	95	-	-	370
L18_Stairs	-	95	-	40
L18_stairs	-	95	-	44
L18_stairs	-	95	-	41
L18_WC	-	95	-	26
L18_WC	-	95	-	34
L18_WC	-	95	-	71
L19_Plant	95	-	-	888
L00_Retail 01_Stairs	-	95	-	28
L00-Mezz_Seminar_peri_S	129	-	-	373
L00-Mezz_Seminar_peri_S	133	-	-	184
L00-Mezz_Seminar_peri_S	146	-	-	61
L00-Mezz_Seminar_peri_W	130	-	-	311

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00-Mezz_Seminar_peri_W	121	-	-	283
L00-Mezz_Seminar_I01	129	-	-	123
L00-Mezz_Seminar_I01	178	-	-	56
L00-Mezz_Seminar_I01	123	-	-	59
L00-Mezz_Seminar_peri_E	376	-	-	0
L00-Mezz_Seminar_peri_E	127	-	-	230
L00_Retail 01_Storage	95	-	-	8

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?
B01 Lobby	N/A	N/A
B01 Lobby 02	N/A	N/A
B01 Security Office	N/A	N/A
B01 Workspace I01	NO (-59.8%)	YES
B01 Workspace N P02	NO (-83%)	NO
B01 Workspace NW P01	NO (-99.5%)	NO
B01 Workspace SW P03	NO (-99.6%)	NO
B01-Mezz Lift Lobby 01	N/A	N/A
B01-Mezz Lobby 01	NO (-99.1%)	NO
B01-Mezz Workspace	NO (-98.9%)	NO
B02 Lobby	N/A	N/A
L00-Mezz_lift Lobby	NO (-99.9%)	NO
L00-Mezz_lift Lobby_peri_S	NO (-62.6%)	YES
L00-Mezz_Workspace_I01	NO (-97.2%)	NO
L00-Mezz_Workspace_peri_E	NO (-60.3%)	YES
L00-Mezz_Workspace_peri_N	NO (-68.1%)	YES
L00-Mezz_Workspace_peri_S	NO (-77.4%)	YES
L00-Mezz_Workspace_peri_W	NO (-76.4%)	YES
L00_lift Lobby	N/A	N/A
L00_lift Lobby	N/A	N/A
L00_lift Lobby_peri_S	NO (-77%)	YES
L00_Lobby_I01	NO (-92.9%)	NO
L00_Lobby_I02	NO (-89.7%)	NO
L00_Lobby_peri_E	NO (-75.9%)	YES
L00_Lobby_peri_N_01	NO (-54.6%)	YES
L00_Lobby_peri_W_01	NO (-48.5%)	YES
L00_Lobby_peri_W_02	NO (-46%)	YES
L00_Lobby_peri_W_03	NO (-63.5%)	YES
L00_Lobby_peri_W_04	NO (-41.5%)	NO
L00_Retail 01_I01	NO (-81.3%)	NO
L00_Retail 01_peri_S	NO (-48.1%)	YES
L00_Retail 01_peri_W	NO (-65.5%)	YES
L00_Retail 02_I01	NO (-81.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00_Retail 02_peri_E	NO (-39.9%)	YES
L00_Retail 02_peri_N_01	NO (-26%)	NO
L00_Retail 02_peri_N_02	NO (-82%)	YES
L00_Retail 02_peri_N_03	NO (-23.8%)	NO
L00_Retail 02_peri_S	NO (-52.7%)	YES
L01_lift lobby	NO (-98.9%)	NO
L01_lift lobby_peri_S	NO (-52%)	YES
L01_Medical_int_01	NO (-97.7%)	NO
L01_Medical_int_02	NO (-88.3%)	NO
L01_Medical_peri_E	NO (-48.1%)	NO
L01_Medical_peri_E2	NO (-45.7%)	NO
L01_Medical_peri_E2	NO (-57%)	NO
L01_Medical_peri_N	NO (-59.9%)	YES
L01_Medical_peri_N2	NO (-63.6%)	NO
L01_Medical_peri_S	NO (-30.9%)	NO
L01_Medical_peri_S1	NO (-69.5%)	YES
L01_Medical_peri_S2	NO (-41.6%)	YES
L01_Medical_peri_SW	NO (-60%)	YES
L01_Medical_peri_W_01	NO (-63.7%)	YES
L01_Medical_peri_W_02	NO (-72.4%)	YES
L02_lift lobby	NO (-99%)	NO
L02_lift lobby_peri_S	NO (-50.3%)	YES
L02_Medical_int	NO (-89.7%)	NO
L02_Medical_int	NO (-97.1%)	NO
L02_Medical_peri_E	NO (-50.7%)	NO
L02_Medical_peri_N	NO (-64.2%)	YES
L02_Medical_peri_N	NO (-66.4%)	NO
L02_Medical_peri_NE	NO (-54.8%)	NO
L02_Medical_peri_S	NO (-51%)	NO
L02_Medical_peri_S	NO (-40.4%)	YES
L02_Medical_peri_S	NO (-52.9%)	YES
L02_Medical_peri_SE	NO (-59.3%)	YES
L02_Medical_peri_SE	NO (-47%)	YES
L02_Medical_peri_SE	NO (-56.9%)	YES
L02_Medical_peri_SW	NO (-47.7%)	YES
L02_Medical_peri_W	NO (-78.9%)	YES
L02_Medical_peri_W	NO (-77.9%)	YES
L03_lift lobby_int	NO (-99.2%)	NO
L03_lift lobby_peri_S	NO (-46.1%)	YES
L03_Medical_l01	NO (-93.4%)	NO
L03_Medical_peri_N	NO (-68.8%)	NO
L03_Medical_peri_NW	NO (-70%)	NO
L03_Medical_peri_S	NO (-48.9%)	YES
L03_Medical_peri_SW	NO (-56.3%)	YES
L03_Medical_peri_W_01	NO (-93.9%)	NO
L03_Medical_peri_W_02	NO (-67.5%)	YES
L04_lift lobby	NO (-99.1%)	NO
L04_lift lobby_peri_S	NO (-55.7%)	YES
L04_Medical3_peri_E	NO (-59%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04_Medical3_peri_S3	NO (-45.2%)	YES
L04_Medical3_peri_SE	NO (-62.4%)	NO
L04_Medical_int	NO (-89.4%)	NO
L04_Medical_peri_E	NO (-50.4%)	NO
L04_Medical_peri_N	NO (-65.1%)	NO
L04_Medical_peri_NE	NO (-54.7%)	NO
L04_Medical_peri_NW	NO (-69.7%)	NO
L04_Medical_peri_S	NO (-50.2%)	NO
L04_Medical_peri_S04	NO (-61.2%)	YES
L04_Medical_peri_W	NO (-60.6%)	YES
L04_Medical_peri_W	NO (-56.4%)	YES
L05_lift lobby	NO (-99%)	NO
L05_lift lobby_peri_S	NO (-55.9%)	YES
L05_Medical3_peri_E	NO (-59.4%)	YES
L05_Medical3_peri_S3	NO (-45%)	YES
L05_Medical3_peri_SE	NO (-62.3%)	NO
L05_Medical_int	NO (-89.1%)	NO
L05_Medical_peri_E	NO (-50.7%)	NO
L05_Medical_peri_N	NO (-65.4%)	NO
L05_Medical_peri_NE	NO (-54.4%)	NO
L05_Medical_peri_NW	NO (-70.2%)	NO
L05_Medical_peri_S	NO (-49.2%)	NO
L05_Medical_peri_S04	NO (-61.1%)	YES
L05_Medical_peri_W	NO (-60.2%)	YES
L05_Medical_peri_W	NO (-55.8%)	YES
L06_lift lobby	NO (-99.2%)	NO
L06_lift lobby_peri_S	NO (-55.9%)	YES
L06_Medical3_peri_E	NO (-58.5%)	YES
L06_Medical3_peri_S2	NO (-54.3%)	NO
L06_Medical3_peri_S3	NO (-43.6%)	YES
L06_Medical3_peri_SE	NO (-69.5%)	NO
L06_Medical_int	NO (-92.8%)	NO
L06_Medical_peri_E	NO (-50.1%)	NO
L06_Medical_peri_N1	NO (-62.8%)	YES
L06_Medical_peri_N2	NO (-67.4%)	NO
L06_Medical_peri_N3	NO (-64.6%)	YES
L06_Medical_peri_N4	NO (-63.3%)	NO
L06_Medical_peri_NE	NO (-50.1%)	NO
L06_Medical_peri_NE1	NO (-53.1%)	YES
L06_Medical_peri_NW1	NO (-59.3%)	YES
L06_Medical_peri_NW2	NO (-59.3%)	YES
L06_Medical_peri_S	NO (-47.4%)	NO
L06_Medical_peri_S04	NO (-63.6%)	YES
L06_Medical_peri_SW	NO (-61.6%)	YES
L06_Medical_peri_W	NO (-65.4%)	YES
L07_lift lobby	NO (-99.2%)	NO
L07_lift lobby_peri_S	NO (-55.5%)	YES
L07_Medical3_peri_E	NO (-57.9%)	YES
L07_Medical3_peri_S2	NO (-44.5%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L07_Medical3_peri_S3	NO (-49.7%)	YES
L07_Medical3_peri_SE	NO (-50.3%)	YES
L07_Medical_int	NO (-94%)	NO
L07_Medical_peri_E	NO (-52%)	NO
L07_Medical_peri_N1	NO (-68.3%)	YES
L07_Medical_peri_N2	NO (-70.5%)	NO
L07_Medical_peri_N3	NO (-69.8%)	YES
L07_Medical_peri_N4	NO (-63.5%)	NO
L07_Medical_peri_NE	NO (-49.7%)	NO
L07_Medical_peri_NE1	NO (-60%)	YES
L07_Medical_peri_NW1	NO (-65.4%)	YES
L07_Medical_peri_NW2	NO (-60.9%)	YES
L07_Medical_peri_S	NO (-48.4%)	NO
L07_Medical_peri_S04	NO (-62.8%)	YES
L07_Medical_peri_SW	NO (-55.3%)	YES
L07_Medical_peri_W	NO (-67.1%)	YES
L08_lift lobby	NO (-99.2%)	NO
L08_lift lobby_peri_S	NO (-46.7%)	YES
L08_Medical_Internal	NO (-94.5%)	NO
L08_Medical_peri_N	NO (-68.9%)	NO
L08_Medical_peri_NW	NO (-69.3%)	NO
L08_Medical_peri_S	NO (-67.7%)	YES
L08_Medical_peri_SE	NO (-67.1%)	YES
L08_Medical_peri_SW	NO (-55.8%)	YES
L08_Medical_peri_W	NO (-62.3%)	YES
L09_lift lobby	NO (-99.1%)	NO
L09_lift lobby_peri_S	NO (-53%)	YES
L09_Medical2_peri_E	NO (-58.7%)	YES
L09_Medical2_peri_S4	NO (-63.1%)	YES
L09_Medical2_peri_SW	NO (-56.3%)	YES
L09_Medical_Internal	NO (-91.4%)	NO
L09_Medical_peri_N	NO (-67%)	NO
L09_Medical_peri_NE	NO (-58.6%)	NO
L09_Medical_peri_NW	NO (-71%)	NO
L09_Medical_peri_S	NO (-68.1%)	NO
L09_Medical_peri_S	NO (-46.1%)	NO
L09_Medical_peri_SE	NO (-43.1%)	YES
L09_Medical_peri_SE	NO (-62.2%)	YES
L09_Medical_peri_W	NO (-62.3%)	YES
L10_lift lobby	NO (-99.2%)	NO
L10_lift lobby_peri_S	NO (-57.5%)	YES
L10_Medical2_peri_E	NO (-62%)	YES
L10_Medical2_peri_S4	NO (-63.6%)	YES
L10_Medical2_peri_SW	NO (-55.2%)	YES
L10_Medical3_peri_S2	NO (-60.3%)	NO
L10_Medical3_peri_S3	NO (-47.6%)	YES
L10_Medical3_peri_SE	NO (-53.5%)	YES
L10_Medical_int	NO (-94.3%)	NO
L10_Medical_peri_E	NO (-60.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L10_Medical_peri_E2	NO (-20.8%)	NO
L10_Medical_peri_N	NO (-67.8%)	NO
L10_Medical_peri_N2	NO (-71.3%)	YES
L10_Medical_peri_N3	NO (-72.7%)	NO
L10_Medical_peri_NE	NO (-64.1%)	NO
L10_Medical_peri_NE	NO (-66.1%)	YES
L10_Medical_peri_NW	NO (-73.8%)	YES
L10_Medical_peri_NW	NO (-69.9%)	NO
L10_Medical_peri_S	NO (-48.5%)	NO
L10_Medical_peri_W	NO (-62.1%)	YES
L11_Office2_peri_E	NO (-62.8%)	YES
L11_Office2_peri_S5	NO (-64.1%)	YES
L11_Office2_peri_SW	NO (-55.4%)	YES
L11_Office3_peri_S2	NO (-59.7%)	YES
L11_Office3_peri_S4	NO (-68.6%)	YES
L11_Office3_peri_SE	NO (-53.6%)	YES
L11_Office_int	NO (-93.8%)	NO
L11_Office_peri_E	NO (-65.4%)	NO
L11_Office_peri_N	NO (-72%)	NO
L11_Office_peri_N2	NO (-75.6%)	YES
L11_Office_peri_N3	NO (-73.6%)	NO
L11_Office_peri_NE	NO (-69.5%)	YES
L11_Office_peri_NW	NO (-73.9%)	NO
L11_Office_peri_NW	NO (-75%)	YES
L11_Office_peri_S	NO (-47.8%)	NO
L11_Office_peri_W	NO (-64.4%)	YES
L12_Office2_peri_E	NO (-61.5%)	YES
L12_Office2_peri_S5	NO (-64%)	YES
L12_Office2_peri_SW	NO (-55.3%)	YES
L12_Office_int	NO (-92%)	NO
L12_Office_Peri E	NO (-77.2%)	YES
L12_Office_Peri W	NO (-93.4%)	NO
L12_Office_peri_E	NO (-43.6%)	YES
L12_Office_peri_E	NO (-63.4%)	NO
L12_Office_peri_N	NO (-70.6%)	NO
L12_Office_peri_NW	NO (-74%)	NO
L12_Office_peri_S	NO (-62.6%)	YES
L12_Office_peri_S	NO (-49.1%)	NO
L12_Office_peri_SE	NO (-65%)	YES
L12_Office_peri_SW	NO (-63.6%)	YES
L12_Office_peri_W	NO (-64.9%)	YES
L13_Office2_peri_E	NO (-60.1%)	YES
L13_Office2_peri_S5	NO (-61.9%)	YES
L13_Office2_peri_SW	NO (-55.3%)	YES
L13_Office_int	NO (-92.2%)	NO
L13_Office_int	NO (-49.5%)	NO
L13_Office_Peir_W2	NO (-93.4%)	NO
L13_Office_peri_E	NO (-36.3%)	YES
L13_Office_peri_E	NO (-58.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L13_Office_Peri_E2	NO (-80.5%)	YES
L13_Office_peri_N	NO (-70.8%)	NO
L13_Office_peri_NW	NO (-74.8%)	NO
L13_Office_peri_S	NO (-75.7%)	YES
L13_Office_peri_SE	NO (-65%)	YES
L13_Office_peri_SW	NO (-68.2%)	YES
L13_Office_peri_W	NO (-58.7%)	YES
L14_Office	NO (-90.8%)	NO
L14_Office_peri_E_01	NO (-61.7%)	NO
L14_Office_peri_E_02	NO (-39.6%)	YES
L14_Office_peri_E_03	NO (-59.9%)	YES
L14_Office_peri_N	NO (-68.4%)	YES
L14_Office_peri_NW	NO (-66.3%)	YES
L14_Office_peri_N_02	NO (-69.2%)	NO
L14_Office_peri_SW	NO (-56.2%)	YES
L14_Office_peri_S_01	NO (-64.9%)	NO
L14_Office_peri_S_02	NO (-62.4%)	YES
L14_Office_peri_W_01	NO (-58.8%)	YES
L14_Office_peri_W_02	NO (-93.5%)	NO
L15_Office2_peri_E_04	NO (-58.9%)	YES
L15_Office2_peri_SW	NO (-54.2%)	YES
L15_Office2_peri_S_02	NO (-61.5%)	YES
L15_Office_Internal	NO (-90.7%)	NO
L15_Office_peri_E_01	NO (-65.8%)	NO
L15_Office_peri_E_02	NO (-58.1%)	NO
L15_Office_peri_E_03	NO (-37.8%)	YES
L15_Office_peri_NW	NO (-68.4%)	YES
L15_Office_peri_E_03	NO (-37.8%)	YES
L15_Office_peri_NW	NO (-68.4%)	YES
L15_Office_peri_N_01	NO (-72.7%)	YES
L15_Office_peri_N_02	NO (-70.7%)	NO
L15_Office_peri_N_03	NO (-65%)	NO
L15_Office_peri_S_01	NO (-65%)	NO
L15_Office_peri_W_01	NO (-94%)	NO
L15_Office_peri_W_02	NO (-59.9%)	YES
L16_Office2_peri_E_04	NO (-57.6%)	YES
L16_Office2_peri_SW	NO (-54%)	YES
L16_Office2_peri_S_02	NO (-61.1%)	YES
L16_Office_Internal	NO (-88%)	NO
L16_Office_peri_E_01	NO (-66.3%)	NO
L16_Office_peri_E_02	NO (-59.5%)	NO
L16_Office_peri_E_03	NO (-37.8%)	YES
L16_Office_peri_N_02	NO (-71.5%)	NO
L16_Office_peri_N_02	NO (-71.4%)	NO
L16_Office_peri_N_02	NO (-55.5%)	YES
L16_Office_peri_N_03	NO (-66.2%)	NO
L16_Office_peri_S_01	NO (-64.8%)	NO
L16_Office_peri_W_01	NO (-92.4%)	NO
L17_Office2_peri_E4	NO (-55.8%)	YES
L17_Office2_peri_S2	NO (-61.1%)	YES
L17_Office2_peri_SW	NO (-54.2%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L17_Office_Internal	NO (-81.5%)	NO
L17_Office_peri_E	NO (-66.2%)	NO
L17_Office_peri_E2	NO (-76.2%)	NO
L17_Office_peri_E3	NO (-54.2%)	NO
L17_Office_peri_N	NO (-76.1%)	NO
L17_Office_peri_N2	NO (-62.3%)	NO
L17_Office_peri_S	NO (-57.9%)	NO
L17_Office_peri_W	NO (-92.2%)	NO
L17_Office_peri_W2	NO (-54.7%)	YES
L17_Office_peri_W3	NO (-66.8%)	NO
L18_Office_Internal	NO (-88.8%)	NO
L18_Office_peri_E	NO (-59.3%)	NO
L18_Office_peri_N	NO (-69%)	NO
L18_Office_peri_W	NO (-94.8%)	NO
L18_Office_peri_W2	NO (-56.6%)	YES
L18_Office_peri_W3	NO (-72%)	NO
L00-Mezz_Seminar_peri_S	NO (-82%)	YES
L00-Mezz_Seminar_peri_S	NO (-67.7%)	YES
L00-Mezz_Seminar_peri_S	N/A	N/A
L00-Mezz_Seminar_peri_W	NO (-86.9%)	YES
L00-Mezz_Seminar_peri_W	NO (-97%)	NO
L00-Mezz_Seminar_I01	NO (-98.1%)	NO
L00-Mezz_Seminar_I01	NO (-53.1%)	YES
L00-Mezz_Seminar_I01	NO (-99.9%)	NO
L00-Mezz_Seminar_peri_E	NO (-70.6%)	YES
L00-Mezz_Seminar_peri_E	NO (-99%)	YES

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	27979.5	27991.4
External area [m²]	26446.3	26446.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	16929	13913.9
Average U-value [W/m²K]	0.64	0.53
Alpha value* [%]	7.55	10

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

Building Use

% Area	Building Type
2	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
64	**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
35	**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	6.54	3.16
Cooling	2.78	7.03
Auxiliary	6.77	9.94
Lighting	7.99	21.12
Hot water	8.5	7.04
Equipment*	58.07	58.12
TOTAL**	**32.58**	**48.28**

* 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]	76.55	81.72
Primary energy* [kWh/m²]	70.86	126.45
Total emissions [kg/m²]	12.1	21.5

* 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] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	26.7	77.2	8.2	3.9	10.2	0.91	5.5	0.91	5.5
	Notional	9.3	118.9	3	11.6	14.4	0.86	2.84	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	57.5	0	17.6	0	1	0.91	0	0.91	0
	Notional	28.7	0	9.2	0	1	0.86	0	----	----
[ST] Fan coil systems, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	19.2	77.1	5.8	3.9	8.5	0.91	5.5	0.91	5.5
	Notional	11.1	83.6	3.6	8.2	13.1	0.86	2.84	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	28.3	0	8.6	0	2.6	0.91	0	0.91	0
	Notional	12	0	3.9	0	2.5	0.86	0	----	----
[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	0.2	L00001A8:Surf[1]
Floor	0.2	0.15	B0000010:Surf[0]
Roof	0.15	0.1	B0000049:Surf[2]
Windows, roof windows, and rooflights	1.5	1.2	GL000000:Surf[3]
Personnel doors	1.5	1.2	L00001E0:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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

Class D1 - GREEN

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

Vinegar Yard D1

As designed

Date: Mon Oct 25 16:31:59 2021

Administrative information

Building Details

Address: Southwark, London,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.13

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.13

BRUKL compliance check version: v5.6.b.0

Certifier details

Name: Kartik Amrania

Telephone number: 44(0)1628623423

Address: Sweco UK, 1 Bath Road, London, SL6 4AQ

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/m².annum	21.2
Target CO_2 emission rate (TER), kgCO_2/m².annum	21.2
Building CO_2 emission rate (BER), kgCO_2/m².annum	10.4
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	0.23	0.25	L000001C:Surf[1]
Floor	0.25	0.15	0.15	B0000010:Surf[0]
Roof	0.25	0.1	0.1	B0000049:Surf[2]
Windows***, roof windows, and rooflights	2.2	1.2	2	B000005D:Surf[1]
Personnel doors	2.2	1.2	1.2	L00001E0:Surf[0]
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
m³/(h.m²) at 50 Pa	10	3

Building services

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

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

1- 01c FCU system - ASHP_heating only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.96	-	0.2	0	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

2- 02a Extract system_Elec_WC&Changing only

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	1	-	0.2	0	-
Standard value	N/A	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

3- 01a FCU system - ASHP_office

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.96	3.44	0	1.3	0.85
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.

4- 01b FCU system - ASHP_Clinical/Outpatients Reduced SFP and HRE

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3.96	3.44	0	1.8	0.75
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.

"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
B01 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Lobby 02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Security Office	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace I01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace N P02	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace NW P01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01 Workspace SW P03	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Lift Lobby 01	-	-	-	-	-	-	-	0.3	-	-	N/A
B01-Mezz Lobby 01	-	-	-	-	-	-	-	0.2	-	-	N/A
B01-Mezz Workspace	-	-	-	-	-	-	-	0.2	-	-	N/A
B02 Lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_lift Lobby	-	-	-	-	-	-	-	0.3	-	-	N/A
L00-Mezz_lift Lobby_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L00-Mezz_Workspace_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Workspace_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_lift Lobby	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_lift Lobby_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L00_Lobby_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_I02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Lobby_peri_W_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 01_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L00_Retail 02_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_int_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_int_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L01_Medical_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_S1	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L01_Medical_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L02_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L03_Medical_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_E	-	-	-	-	-	-	-	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
L04_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L04_Medical_peri_W	-	-	-	-	-	-	-	0.3	-	-	N/A
L05_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L05_Medical_peri_W	-	-	-	-	-	-	-	0.3	-	-	N/A
L06_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L06_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L07_Medical3_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_N4	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NE1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NW1	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_NW2	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_S04	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L07_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L08_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_Internal	-	-	-	-	-	-	-	0.3	-	-	N/A
L09_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_S	-	-	-	-	-	-	-	0.3	-	-	N/A
L09_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L09_Medical_peri_SE	-	-	-	-	-	-	-	0.3	-	-	N/A
L09_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_lift lobby_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L10_Medical2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical2_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical3_peri_S3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L10_Medical_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_S4	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office3_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_N3	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NE	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L11_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_Peri W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_E	-	-	-	-	-	-	-	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
L12_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L12_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L13_Office2_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_S5	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_int	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peir_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_Peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SE	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L13_WC	-	-	0.5	-	-	-	-	-	-	-	N/A
L14_Office	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L14_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_01	-	-	-	-	-	-	-	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
L15_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_NW	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L15_Office_peri_W_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_E_04	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office2_peri_S_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_E_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_02	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_N_03	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_S_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L16_Office_peri_W_01	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_E4	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_S2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office2_peri_SW	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_E3	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_N2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L17_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_Internal	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_N	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W2	-	-	-	-	-	-	-	0.2	-	-	N/A
L18_Office_peri_W3	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
L00-Mezz_Seminar_peri_S	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_W	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_I01	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A
L00-Mezz_Seminar_peri_E	-	-	-	-	-	-	-	0.2	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
B01 Circ 01	-	95	-	25
B01 Circ 02	-	95	-	25
B01 Circ 03	-	95	-	68
B01 Circ 04	-	95	-	20
B01 Circ 05	-	95	-	13
B01 DIS. Showers	-	95	-	35
B01 Lobby	-	141	-	356
B01 Lobby 02	-	99	-	701
B01 Lockers	-	95	-	102
B01 Security Office	135	-	-	269
B01 Showers	-	95	-	143
B01 Stairs 01	-	95	-	25
B01 Stairs 02	-	95	-	56
B01 Stairs 03	-	95	-	47
B01 Stairs 04	-	95	-	41
B01 Substation & Switchroom	95	-	-	255
B01 Switchroom	95	-	-	57
B01 Water Meter Room	95	-	-	72
B01 WC 01	-	95	-	49
B01 WC 02	-	95	-	33
B01 WC 03	-	95	-	28
B01 Workspace I01	125	-	-	2334
B01 Workspace N P02	126	-	-	1812
B01 Workspace NW P01	131	-	-	562
B01 Workspace SW P03	129	-	-	824
B01-Mezz Circ 01	-	95	-	30
B01-Mezz Circ 02	-	95	-	31
B01-Mezz Circ 03	-	95	-	71
B01-Mezz Circ 04	-	95	-	25
B01-Mezz Cycle Store	95	-	-	149
B01-Mezz Gas Meter Room	95	-	-	73

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B01-Mezz Lift Lobby 01	-	95	-	41
B01-Mezz Lobby 01	-	131	-	276
B01-Mezz Stairs 01	-	95	-	27
B01-Mezz Stairs 02	-	95	-	61
B01-Mezz Stairs 03	-	95	-	49
B01-Mezz Stairs 04	-	95	-	46
B01-Mezz Switchroom	95	-	-	62
B01-Mezz WC 01	-	95	-	58
B01-Mezz WC 02	-	95	-	42
B01-Mezz Workspace	124	-	-	2877
B02 Bin Store	95	-	-	56
B02 BOH	-	95	-	83
B02 Circ 01	-	95	-	45
B02 Circ 02	-	95	-	31
B02 Corridor	-	95	-	453
B02 Generator 01	95	-	-	1706
B02 Generator 02	95	-	-	240
B02 Landlord HV/LV Substation	95	-	-	539
B02 Lobby	-	178	-	160
B02 Stairs 01	-	95	-	75
B02 Stairs 02	-	95	-	73
B02 Substation	95	-	-	646
B02 Switchroom 01	95	-	-	183
B02 Switchroom 02	95	-	-	251
B02 Switchroom 03	95	-	-	121
B02 Ventilation Plant	95	-	-	195
B02 Waste Store	95	-	-	47
B03 AWS Ventilation Plant	95	-	-	339
B03 BOH	-	95	-	150
B03 Circ 01	-	95	-	47
B03 Circ 02	-	95	-	49
B03 Circ 03	-	95	-	37
B03 Corridor	-	95	-	369
B03 CWS Tank	95	-	-	86
B03 Diesel Storage	95	-	-	126
B03 Grey Water Tanks and Pumps	95	-	-	195
B03 Heating Plant	95	-	-	246
B03 Plant	95	-	-	830
B03 Retail Plant	95	-	-	245
B03 Stairs 01	-	95	-	66
B03 Stairs 02	-	95	-	71
B03 Tanks and Pumps	95	-	-	721
B03 Ventilation Plant	95	-	-	218

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
B03 Water Storage	95	-	-	248
L00-Mezz_Circ_01	-	95	-	54
L00-Mezz_Circ_02	-	95	-	22
L00-Mezz_Gas Storage	95	-	-	27
L00-Mezz_lift Lobby	-	95	-	40
L00-Mezz_lift Lobby_peri_S	-	95	-	39
L00-Mezz_refuge	95	-	-	12
L00-Mezz_refuge	95	-	-	11
L00-Mezz_stairs	-	95	-	51
L00-Mezz_Stairs_01	-	95	-	33
L00-Mezz_stairs_peri_S	-	95	-	52
L00-Mezz_WC	-	95	-	40
L00-Mezz_WC_01	-	95	-	63
L00-Mezz_WC_02	-	95	-	71
L00-Mezz_WC_03	-	95	-	34
L00-Mezz_Workspace_I01	127	-	-	593
L00-Mezz_Workspace_peri_E	141	-	-	183
L00-Mezz_Workspace_peri_N	123	-	-	1867
L00-Mezz_Workspace_peri_S	134	-	-	469
L00-Mezz_Workspace_peri_W	129	-	-	552
L00_circ_01	-	95	-	61
L00_circ_02	-	95	-	14
L00_Gas Storage	95	-	-	30
L00_lift Lobby	-	95	-	40
L00_lift Lobby	-	95	-	44
L00_lift Lobby_peri_S	-	95	-	39
L00_Loading Bay	95	-	-	313
L00_Lobby_I01	-	125	-	291
L00_Lobby_I02	-	98	-	565
L00_Lobby_peri_E	-	109	-	269
L00_Lobby_peri_N_01	-	104	-	988
L00_Lobby_peri_W_01	-	280	-	95
L00_Lobby_peri_W_02	-	215	-	169
L00_Lobby_peri_W_03	-	117	-	517
L00_Lobby_peri_W_04	-	105	-	394
L00_refuge	95	-	-	15
L00_refuge	95	-	-	14
L00_Retail 01_I01	-	89	35	532
L00_Retail 01_peri_S	-	89	35	684
L00_Retail 01_peri_W	-	95	35	502
L00_Retail 02_I01	-	89	35	1192
L00_Retail 02_peri_E	-	102	35	320
L00_Retail 02_peri_N_01	-	96	35	954

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00_Retail 02_peri_N_02	-	110	35	367
L00_Retail 02_peri_N_03	-	108	35	195
L00_Retail 02_peri_S	-	99	35	735
L00_stairs	-	95	-	54
L00_stairs	-	95	-	97
L00_Stairs_01	-	95	-	40
L00_stairs_peri_S	-	95	-	55
L00_WC	-	95	-	45
L01_lift lobby	-	95	-	44
L01_lift lobby_peri_S	-	95	-	43
L01_Medical_int_01	140	-	-	221
L01_Medical_int_02	125	-	-	1714
L01_Medical_peri_E	156	-	-	117
L01_Medical_peri_E2	159	-	-	154
L01_Medical_peri_E2	142	-	-	139
L01_Medical_peri_N	128	-	-	930
L01_Medical_peri_N2	128	-	-	1003
L01_Medical_peri_S	129	-	-	585
L01_Medical_peri_S1	150	-	-	154
L01_Medical_peri_S2	129	-	-	542
L01_Medical_peri_SW	160	-	-	90
L01_Medical_peri_W_01	125	-	-	411
L01_Medical_peri_W_02	136	-	-	241
L01_refuge	95	-	-	17
L01_refuge	95	-	-	15
L01_stairs	-	95	-	59
L01_stairs_peri_S	-	95	-	61
L01_storage	95	-	-	21
L02_lift lobby	-	95	-	42
L02_lift lobby_peri_S	-	95	-	41
L02_Medical_int	124	-	-	2109
L02_Medical_int	129	-	-	488
L02_Medical_peri_E	152	-	-	117
L02_Medical_peri_N	132	-	-	313
L02_Medical_peri_N	127	-	-	1619
L02_Medical_peri_NE	158	-	-	101
L02_Medical_peri_S	133	-	-	304
L02_Medical_peri_S	160	-	-	93
L02_Medical_peri_S	149	-	-	166
L02_Medical_peri_SE	159	-	-	88
L02_Medical_peri_SE	131	-	-	341
L02_Medical_peri_SE	153	-	-	108
L02_Medical_peri_SW	160	-	-	90

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L02_Medical_peri_W	140	-	-	241
L02_Medical_peri_W	139	-	-	118
L02_refuge	95	-	-	14
L02_refuge	95	-	-	15
L02_stairs	-	95	-	60
L02_stairs	-	95	-	56
L02_storage	95	-	-	20
L03_lift lobby_int	-	95	-	51
L03_lift lobby_peri_S	-	95	-	49
L03_Medical_I01	136	-	-	762
L03_Medical_peri_N	137	-	-	621
L03_Medical_peri_NW	158	-	-	179
L03_Medical_peri_S	151	-	-	148
L03_Medical_peri_SW	159	-	-	95
L03_Medical_peri_W_01	129	-	-	418
L03_Medical_peri_W_02	154	-	-	139
L03_Plant	95	-	-	2068
L03_Plant3	95	-	-	372
L03_refuge	95	-	-	18
L03_refuge	95	-	-	16
L03_stairs	-	95	-	65
L03_stairs	-	95	-	68
L03_storage	95	-	-	24
L04_lift lobby	-	95	-	42
L04_lift lobby_peri_S	-	95	-	41
L04_Medical3_peri_E	158	-	-	102
L04_Medical3_peri_S3	131	-	-	542
L04_Medical3_peri_SE	153	-	-	112
L04_Medical_int	123	-	-	3266
L04_Medical_peri_E	152	-	-	117
L04_Medical_peri_N	126	-	-	2101
L04_Medical_peri_NE	158	-	-	101
L04_Medical_peri_NW	141	-	-	179
L04_Medical_peri_S	134	-	-	277
L04_Medical_peri_S04	155	-	-	100
L04_Medical_peri_W	137	-	-	139
L04_Medical_peri_W	145	-	-	152
L04_refuge	95	-	-	14
L04_refuge	95	-	-	15
L04_stairs	-	95	-	60
L04_stairs	-	95	-	56
L04_storage	95	-	-	20
L05_lift lobby	-	95	-	42

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L05_lift lobby_peri_S	-	95	-	41
L05_Medical3_peri_E	158	-	-	102
L05_Medical3_peri_S3	131	-	-	542
L05_Medical3_peri_SE	153	-	-	112
L05_Medical_int	123	-	-	3266
L05_Medical_peri_E	152	-	-	117
L05_Medical_peri_N	125	-	-	2101
L05_Medical_peri_NE	158	-	-	101
L05_Medical_peri_NW	134	-	-	179
L05_Medical_peri_S	134	-	-	277
L05_Medical_peri_S04	155	-	-	100
L05_Medical_peri_W	137	-	-	139
L05_Medical_peri_W	145	-	-	152
L05_refuge	95	-	-	15
L05_refuge	95	-	-	14
L05_stairs	-	95	-	59
L05_stairs	-	95	-	56
L05_storage	95	-	-	20
L06_lift lobby	-	95	-	43
L06_lift lobby_peri_S	-	95	-	41
L06_Medical3_peri_E	162	-	-	99
L06_Medical3_peri_S2	134	-	-	119
L06_Medical3_peri_S3	128	-	-	429
L06_Medical3_peri_SE	144	-	-	117
L06_Medical_int	124	-	-	2670
L06_Medical_peri_E	153	-	-	117
L06_Medical_peri_N1	130	-	-	474
L06_Medical_peri_N2	134	-	-	372
L06_Medical_peri_N3	128	-	-	505
L06_Medical_peri_N4	133	-	-	383
L06_Medical_peri_NE	155	-	-	154
L06_Medical_peri_NE1	149	-	-	108
L06_Medical_peri_NW1	149	-	-	108
L06_Medical_peri_NW2	149	-	-	109
L06_Medical_peri_S	134	-	-	277
L06_Medical_peri_S04	160	-	-	98
L06_Medical_peri_SW	142	-	-	194
L06_Medical_peri_W	137	-	-	221
L06_refuge	95	-	-	14
L06_refuge	95	-	-	15
L06_stairs	-	95	-	56
L06_stairs	-	95	-	20
L06_stairs_peri_S	-	95	-	47

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L06_storage	95	-	-	20
L07_lift lobby	-	95	-	43
L07_lift lobby_peri_S	-	95	-	41
L07_Medical3_peri_E	162	-	-	99
L07_Medical3_peri_S2	130	-	-	257
L07_Medical3_peri_S3	145	-	-	180
L07_Medical3_peri_SE	141	-	-	175
L07_Medical_int	125	-	-	2494
L07_Medical_peri_E	136	-	-	117
L07_Medical_peri_N1	130	-	-	474
L07_Medical_peri_N2	132	-	-	401
L07_Medical_peri_N3	128	-	-	505
L07_Medical_peri_N4	131	-	-	383
L07_Medical_peri_NE	155	-	-	154
L07_Medical_peri_NE1	149	-	-	108
L07_Medical_peri_NW1	149	-	-	108
L07_Medical_peri_NW2	149	-	-	109
L07_Medical_peri_S	134	-	-	277
L07_Medical_peri_S04	160	-	-	98
L07_Medical_peri_SW	142	-	-	195
L07_Medical_peri_W	137	-	-	221
L07_refuge	95	-	-	15
L07_refuge	95	-	-	14
L07_stairs	-	95	-	56
L07_stairs	-	95	-	20
L07_stairs_peri_S	-	95	-	47
L07_storage	95	-	-	20
L08_lift lobby	-	95	-	51
L08_lift lobby_peri_S	-	95	-	49
L08_Medical_Internal	129	-	-	1189
L08_Medical_peri_N	136	-	-	657
L08_Medical_peri_NW	158	-	-	179
L08_Medical_peri_S	186	-	-	100
L08_Medical_peri_SE	191	-	-	102
L08_Medical_peri_SW	155	-	-	210
L08_Medical_peri_W	154	-	-	139
L08_Plant	95	-	-	2018
L08_Plant3	95	-	-	372
L08_refuge	95	-	-	16
L08_refuge	95	-	-	18
L08_stairs	-	95	-	65
L08_stairs	-	95	-	68
L08_storage	95	-	-	24

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L09_lift lobby	-	95	-	43
L09_lift lobby_peri_S	-	95	-	42
L09_Medical2_peri_E	163	-	-	102
L09_Medical2_peri_S4	161	-	-	100
L09_Medical2_peri_SW	149	-	-	154
L09_Medical_Internal	124	-	-	3130
L09_Medical_peri_N	124	-	-	2039
L09_Medical_peri_NE	129	-	-	235
L09_Medical_peri_NW	144	-	-	179
L09_Medical_peri_S	131	-	-	399
L09_Medical_peri_S	134	-	-	320
L09_Medical_peri_SE	145	-	-	167
L09_Medical_peri_SE	152	-	-	146
L09_Medical_peri_W	140	-	-	139
L09_Plant	95	-	-	79
L09_refuge	95	-	-	14
L09_refuge	95	-	-	16
L09_stairs	-	95	-	58
L09_stairs	-	95	-	61
L09_storage	95	-	-	21
L10_lift lobby	-	95	-	42
L10_lift lobby_peri_S	-	95	-	41
L10_Medical2_peri_E	163	-	-	99
L10_Medical2_peri_S4	161	-	-	98
L10_Medical2_peri_SW	142	-	-	194
L10_Medical3_peri_S2	153	-	-	119
L10_Medical3_peri_S3	131	-	-	428
L10_Medical3_peri_SE	155	-	-	117
L10_Medical_int	124	-	-	2436
L10_Medical_peri_E	133	-	-	309
L10_Medical_peri_E2	182	-	-	129
L10_Medical_peri_N	131	-	-	437
L10_Medical_peri_N2	128	-	-	458
L10_Medical_peri_N3	131	-	-	323
L10_Medical_peri_NE	240	-	-	77
L10_Medical_peri_NE	150	-	-	108
L10_Medical_peri_NW	150	-	-	108
L10_Medical_peri_NW	142	-	-	179
L10_Medical_peri_S	134	-	-	277
L10_Medical_peri_W	138	-	-	139
L10_refuge	95	-	-	13
L10_refuge	95	-	-	15
L10_stairs	-	95	-	56

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L10_stairs	-	95	-	57
L10_storage	95	-	-	20
L11_Office2_peri_E	154	-	-	99
L11_Office2_peri_S5	151	-	-	98
L11_Office2_peri_SW	141	-	-	160
L11_Office3_peri_S2	128	-	-	561
L11_Office3_peri_S4	165	-	-	103
L11_Office3_peri_SE	144	-	-	112
L11_Office_int	124	-	-	2733
L11_Office_peri_E	140	-	-	139
L11_Office_peri_N	129	-	-	437
L11_Office_peri_N2	126	-	-	458
L11_Office_peri_N3	129	-	-	431
L11_Office_peri_NE	143	-	-	108
L11_Office_peri_NW	137	-	-	179
L11_Office_peri_NW	143	-	-	108
L11_Office_peri_S	138	-	-	262
L11_Office_peri_W	134	-	-	139
L11_refuge	95	-	-	14
L11_refuge	95	-	-	12
L11_stairs	-	95	-	52
L11_stairs	-	95	-	47
L11_stairs	-	95	-	54
L11_stairs	-	95	-	47
L11_stairs	-	95	-	54
L11_WC	-	95	-	125
L11_WC	-	95	-	46
L11_WC	-	95	-	79
L12_circ	-	95	-	25
L12_Office2_peri_E	167	-	-	102
L12_Office2_peri_S5	151	-	-	100
L12_Office2_peri_SW	142	-	-	154
L12_Office_int	123	-	-	2316
L12_Office_Peri E	168	-	-	93
L12_Office_Peri W	123	-	-	418
L12_Office_peri_E	157	-	-	114
L12_Office_peri_E	140	-	-	139
L12_Office_peri_N	125	-	-	1566
L12_Office_peri_NW	137	-	-	179
L12_Office_peri_S	129	-	-	412
L12_Office_peri_S	131	-	-	241
L12_Office_peri_SE	133	-	-	274
L12_Office_peri_SW	143	-	-	112
L12_Office_peri_W	134	-	-	139
L12_refuge	95	-	-	10

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L12_Stairs	-	95	-	19
L12_stairs	-	95	-	47
L12_stairs	-	95	-	52
L12_WC	-	95	-	46
L12_WC	-	95	-	104
L12_WC	-	95	-	79
L13_Circ	-	95	-	59
L13_circ	-	95	-	31
L13_Office2_peri_E	146	-	-	102
L13_Office2_peri_S5	146	-	-	100
L13_Office2_peri_SW	140	-	-	154
L13_Office_int	125	-	-	1789
L13_Office_int	146	-	-	193
L13_Office_Peir_W2	123	-	-	411
L13_Office_peri_E	157	-	-	114
L13_Office_peri_E	138	-	-	139
L13_Office_Peri_E2	147	-	-	97
L13_Office_peri_N	124	-	-	1566
L13_Office_peri_NW	131	-	-	179
L13_Office_peri_S	129	-	-	412
L13_Office_peri_SE	132	-	-	274
L13_Office_peri_SW	145	-	-	112
L13_Office_peri_W	132	-	-	139
L13_R	-	95	-	15
L13_stairs	-	95	-	41
L13_Stairs	-	95	-	45
L13_WC	-	95	-	79
L13_WC	-	95	-	47
L13_WC_01	-	95	-	63
L13_WC_02	-	95	-	45
L14_circ_01	-	95	-	31
L14_circ_02	-	95	-	32
L14_Office	125	-	-	1952
L14_Office_peri_E_01	124	-	-	359
L14_Office_peri_E_02	148	-	-	154
L14_Office_peri_E_03	148	-	-	106
L14_Office_peri_N	128	-	-	434
L14_Office_peri_NW	142	-	-	108
L14_Office_peri_N_02	124	-	-	950
L14_Office_peri_SW	141	-	-	157
L14_Office_peri_S_01	129	-	-	864
L14_Office_peri_S_02	146	-	-	104
L14_Office_peri_W_01	133	-	-	221

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L14_Office_peri_W_02	123	-	-	440
L14_stairs	-	95	-	42
L14_Stairs	-	95	-	46
L14_WC	-	95	-	61
L14_WC	-	95	-	44
L14_WC	-	95	-	81
L15_circ_01	-	95	-	30
L15_circ_02	-	95	-	15
L15_Office2_peri_E_04	145	-	-	102
L15_Office2_peri_SW	136	-	-	194
L15_Office2_peri_S_02	144	-	-	102
L15_Office_Internal	124	-	-	1691
L15_Office_peri_E_01	146	-	-	97
L15_Office_peri_E_02	150	-	-	100
L15_Office_peri_E_03	145	-	-	155
L15_Office_peri_NW	138	-	-	107
L15_Office_peri_N_01	127	-	-	434
L15_Office_peri_N_02	128	-	-	425
L15_Office_peri_N_03	141	-	-	111
L15_Office_peri_S_01	128	-	-	864
L15_Office_peri_W_01	123	-	-	412
L15_Office_peri_W_02	132	-	-	221
L15_stairs	-	95	-	41
L15_stairs	-	95	-	44
L15_WC	-	95	-	79
L15_WC	-	95	-	46
L16_circ_01	-	95	-	32
L16_circ_02	-	95	-	11
L16_Office2_peri_E_04	149	-	-	102
L16_Office2_peri_SW	138	-	-	194
L16_Office2_peri_S_02	148	-	-	102
L16_Office_Internal	123	-	-	1896
L16_Office_peri_E_01	126	-	-	97
L16_Office_peri_E_02	128	-	-	100
L16_Office_peri_E_03	129	-	-	155
L16_Office_peri_N_02	138	-	-	181
L16_Office_peri_N_02	124	-	-	1035
L16_Office_peri_N_02	135	-	-	138
L16_Office_peri_N_03	124	-	-	111
L16_Office_peri_S_01	126	-	-	864
L16_Office_peri_W_01	123	-	-	412
L16_stairs	-	95	-	43
L16_stairs	-	95	-	36

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L16_WC	-	95	-	81
L16_WC	-	95	-	48
L17_circ	-	95	-	30
L17_Office2_peri_E4	145	-	-	102
L17_Office2_peri_S2	144	-	-	102
L17_Office2_peri_SW	136	-	-	191
L17_Office_Internal	137	-	-	657
L17_Office_peri_E	145	-	-	97
L17_Office_peri_E2	153	-	-	92
L17_Office_peri_E3	138	-	-	172
L17_Office_peri_N	129	-	-	396
L17_Office_peri_N2	138	-	-	130
L17_Office_peri_S	138	-	-	363
L17_Office_peri_W	123	-	-	412
L17_Office_peri_W2	131	-	-	138
L17_Office_peri_W3	135	-	-	181
L17_stairs	-	95	-	41
L17_stairs	-	95	-	48
L17_WC	-	95	-	47
L17_WC	-	95	-	79
L18_Circ	-	95	-	16
L18_circ	-	95	-	22
L18_Office_Internal	228	-	-	169
L18_Office_peri_E	134	-	-	101
L18_Office_peri_N	127	-	-	396
L18_Office_peri_W	125	-	-	440
L18_Office_peri_W2	136	-	-	138
L18_Office_peri_W3	135	-	-	181
L18_Plant_01	95	-	-	216
L18_Plant_02	95	-	-	215
L18_Plant_03	95	-	-	370
L18_Stairs	-	95	-	40
L18_stairs	-	95	-	44
L18_stairs	-	95	-	41
L18_WC	-	95	-	26
L18_WC	-	95	-	34
L18_WC	-	95	-	71
L19_Plant	95	-	-	888
L00_Retail 01_Stairs	-	95	-	28
L00-Mezz_Seminar_peri_S	129	-	-	373
L00-Mezz_Seminar_peri_S	133	-	-	184
L00-Mezz_Seminar_peri_S	146	-	-	61
L00-Mezz_Seminar_peri_W	130	-	-	311

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name Standard value	Luminaire 60	Lamp 60	Display lamp 22	General lighting [W]
L00-Mezz_Seminar_peri_W	121	-	-	283
L00-Mezz_Seminar_I01	129	-	-	123
L00-Mezz_Seminar_I01	178	-	-	56
L00-Mezz_Seminar_I01	123	-	-	59
L00-Mezz_Seminar_peri_E	376	-	-	0
L00-Mezz_Seminar_peri_E	127	-	-	230
L00_Retail 01_Storage	95	-	-	8

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?
B01 Lobby	N/A	N/A
B01 Lobby 02	N/A	N/A
B01 Security Office	N/A	N/A
B01 Workspace I01	NO (-59.8%)	YES
B01 Workspace N P02	NO (-83%)	NO
B01 Workspace NW P01	NO (-99.5%)	NO
B01 Workspace SW P03	NO (-99.6%)	NO
B01-Mezz Lift Lobby 01	N/A	N/A
B01-Mezz Lobby 01	NO (-99.1%)	NO
B01-Mezz Workspace	NO (-98.9%)	NO
B02 Lobby	N/A	N/A
L00-Mezz_lift Lobby	NO (-99.9%)	NO
L00-Mezz_lift Lobby_peri_S	NO (-62.6%)	YES
L00-Mezz_Workspace_I01	NO (-97.2%)	NO
L00-Mezz_Workspace_peri_E	NO (-60.3%)	YES
L00-Mezz_Workspace_peri_N	NO (-68.1%)	YES
L00-Mezz_Workspace_peri_S	NO (-77.4%)	YES
L00-Mezz_Workspace_peri_W	NO (-76.4%)	YES
L00_lift Lobby	N/A	N/A
L00_lift Lobby	N/A	N/A
L00_lift Lobby_peri_S	NO (-77%)	YES
L00_Lobby_I01	NO (-92.9%)	NO
L00_Lobby_I02	NO (-89.7%)	NO
L00_Lobby_peri_E	NO (-75.9%)	YES
L00_Lobby_peri_N_01	NO (-54.6%)	YES
L00_Lobby_peri_W_01	NO (-48.5%)	YES
L00_Lobby_peri_W_02	NO (-46%)	YES
L00_Lobby_peri_W_03	NO (-63.5%)	YES
L00_Lobby_peri_W_04	NO (-41.5%)	NO
L00_Retail 01_I01	NO (-81.3%)	NO
L00_Retail 01_peri_S	NO (-48.1%)	YES
L00_Retail 01_peri_W	NO (-65.5%)	YES
L00_Retail 02_I01	NO (-81.4%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L00_Retail 02_peri_E	NO (-39.9%)	YES
L00_Retail 02_peri_N_01	NO (-26%)	NO
L00_Retail 02_peri_N_02	NO (-82%)	YES
L00_Retail 02_peri_N_03	NO (-23.8%)	NO
L00_Retail 02_peri_S	NO (-52.7%)	YES
L01_lift lobby	NO (-98.9%)	NO
L01_lift lobby_peri_S	NO (-52%)	YES
L01_Medical_int_01	NO (-97.7%)	NO
L01_Medical_int_02	NO (-88.3%)	NO
L01_Medical_peri_E	NO (-48.1%)	NO
L01_Medical_peri_E2	NO (-45.7%)	NO
L01_Medical_peri_E2	NO (-57%)	NO
L01_Medical_peri_N	NO (-59.9%)	YES
L01_Medical_peri_N2	NO (-63.6%)	NO
L01_Medical_peri_S	NO (-30.9%)	NO
L01_Medical_peri_S1	NO (-69.5%)	YES
L01_Medical_peri_S2	NO (-41.6%)	YES
L01_Medical_peri_SW	NO (-60%)	YES
L01_Medical_peri_W_01	NO (-63.7%)	YES
L01_Medical_peri_W_02	NO (-72.4%)	YES
L02_lift lobby	NO (-99%)	NO
L02_lift lobby_peri_S	NO (-50.3%)	YES
L02_Medical_int	NO (-89.7%)	NO
L02_Medical_int	NO (-97.1%)	NO
L02_Medical_peri_E	NO (-50.7%)	NO
L02_Medical_peri_N	NO (-64.2%)	YES
L02_Medical_peri_N	NO (-66.4%)	NO
L02_Medical_peri_NE	NO (-54.8%)	NO
L02_Medical_peri_S	NO (-51%)	NO
L02_Medical_peri_S	NO (-40.4%)	YES
L02_Medical_peri_S	NO (-52.9%)	YES
L02_Medical_peri_SE	NO (-59.3%)	YES
L02_Medical_peri_SE	NO (-47%)	YES
L02_Medical_peri_SE	NO (-56.9%)	YES
L02_Medical_peri_SW	NO (-47.7%)	YES
L02_Medical_peri_W	NO (-78.9%)	YES
L02_Medical_peri_W	NO (-77.9%)	YES
L03_lift lobby_int	NO (-99.2%)	NO
L03_lift lobby_peri_S	NO (-46.1%)	YES
L03_Medical_l01	NO (-93.4%)	NO
L03_Medical_peri_N	NO (-68.8%)	NO
L03_Medical_peri_NW	NO (-70%)	NO
L03_Medical_peri_S	NO (-48.9%)	YES
L03_Medical_peri_SW	NO (-56.3%)	YES
L03_Medical_peri_W_01	NO (-93.9%)	NO
L03_Medical_peri_W_02	NO (-67.5%)	YES
L04_lift lobby	NO (-99.1%)	NO
L04_lift lobby_peri_S	NO (-55.7%)	YES
L04_Medical3_peri_E	NO (-59%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L04_Medical3_peri_S3	NO (-45.2%)	YES
L04_Medical3_peri_SE	NO (-62.4%)	NO
L04_Medical_int	NO (-89.4%)	NO
L04_Medical_peri_E	NO (-50.4%)	NO
L04_Medical_peri_N	NO (-65.1%)	NO
L04_Medical_peri_NE	NO (-54.7%)	NO
L04_Medical_peri_NW	NO (-69.7%)	NO
L04_Medical_peri_S	NO (-50.2%)	NO
L04_Medical_peri_S04	NO (-61.2%)	YES
L04_Medical_peri_W	NO (-60.6%)	YES
L04_Medical_peri_W	NO (-56.4%)	YES
L05_lift lobby	NO (-99%)	NO
L05_lift lobby_peri_S	NO (-55.9%)	YES
L05_Medical3_peri_E	NO (-59.4%)	YES
L05_Medical3_peri_S3	NO (-45%)	YES
L05_Medical3_peri_SE	NO (-62.3%)	NO
L05_Medical_int	NO (-89.1%)	NO
L05_Medical_peri_E	NO (-50.7%)	NO
L05_Medical_peri_N	NO (-65.4%)	NO
L05_Medical_peri_NE	NO (-54.4%)	NO
L05_Medical_peri_NW	NO (-70.2%)	NO
L05_Medical_peri_S	NO (-49.2%)	NO
L05_Medical_peri_S04	NO (-61.1%)	YES
L05_Medical_peri_W	NO (-60.2%)	YES
L05_Medical_peri_W	NO (-55.8%)	YES
L06_lift lobby	NO (-99.2%)	NO
L06_lift lobby_peri_S	NO (-55.9%)	YES
L06_Medical3_peri_E	NO (-58.5%)	YES
L06_Medical3_peri_S2	NO (-54.3%)	NO
L06_Medical3_peri_S3	NO (-43.6%)	YES
L06_Medical3_peri_SE	NO (-69.5%)	NO
L06_Medical_int	NO (-92.8%)	NO
L06_Medical_peri_E	NO (-50.1%)	NO
L06_Medical_peri_N1	NO (-62.8%)	YES
L06_Medical_peri_N2	NO (-67.4%)	NO
L06_Medical_peri_N3	NO (-64.6%)	YES
L06_Medical_peri_N4	NO (-63.3%)	NO
L06_Medical_peri_NE	NO (-50.1%)	NO
L06_Medical_peri_NE1	NO (-53.1%)	YES
L06_Medical_peri_NW1	NO (-59.3%)	YES
L06_Medical_peri_NW2	NO (-59.3%)	YES
L06_Medical_peri_S	NO (-47.4%)	NO
L06_Medical_peri_S04	NO (-63.6%)	YES
L06_Medical_peri_SW	NO (-61.6%)	YES
L06_Medical_peri_W	NO (-65.4%)	YES
L07_lift lobby	NO (-99.2%)	NO
L07_lift lobby_peri_S	NO (-55.5%)	YES
L07_Medical3_peri_E	NO (-57.9%)	YES
L07_Medical3_peri_S2	NO (-44.5%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L07_Medical3_peri_S3	NO (-49.7%)	YES
L07_Medical3_peri_SE	NO (-50.3%)	YES
L07_Medical_int	NO (-94%)	NO
L07_Medical_peri_E	NO (-52%)	NO
L07_Medical_peri_N1	NO (-68.3%)	YES
L07_Medical_peri_N2	NO (-70.5%)	NO
L07_Medical_peri_N3	NO (-69.8%)	YES
L07_Medical_peri_N4	NO (-63.5%)	NO
L07_Medical_peri_NE	NO (-49.7%)	NO
L07_Medical_peri_NE1	NO (-60%)	YES
L07_Medical_peri_NW1	NO (-65.4%)	YES
L07_Medical_peri_NW2	NO (-60.9%)	YES
L07_Medical_peri_S	NO (-48.4%)	NO
L07_Medical_peri_S04	NO (-62.8%)	YES
L07_Medical_peri_SW	NO (-55.3%)	YES
L07_Medical_peri_W	NO (-67.1%)	YES
L08_lift lobby	NO (-99.2%)	NO
L08_lift lobby_peri_S	NO (-46.7%)	YES
L08_Medical_Internal	NO (-94.5%)	NO
L08_Medical_peri_N	NO (-68.9%)	NO
L08_Medical_peri_NW	NO (-69.3%)	NO
L08_Medical_peri_S	NO (-67.7%)	YES
L08_Medical_peri_SE	NO (-67.1%)	YES
L08_Medical_peri_SW	NO (-55.8%)	YES
L08_Medical_peri_W	NO (-62.3%)	YES
L09_lift lobby	NO (-99.1%)	NO
L09_lift lobby_peri_S	NO (-53%)	YES
L09_Medical2_peri_E	NO (-58.7%)	YES
L09_Medical2_peri_S4	NO (-63.1%)	YES
L09_Medical2_peri_SW	NO (-56.3%)	YES
L09_Medical_Internal	NO (-91.4%)	NO
L09_Medical_peri_N	NO (-67%)	NO
L09_Medical_peri_NE	NO (-58.6%)	NO
L09_Medical_peri_NW	NO (-71%)	NO
L09_Medical_peri_S	NO (-68.1%)	NO
L09_Medical_peri_S	NO (-46.1%)	NO
L09_Medical_peri_SE	NO (-43.1%)	YES
L09_Medical_peri_SE	NO (-62.2%)	YES
L09_Medical_peri_W	NO (-62.3%)	YES
L10_lift lobby	NO (-99.2%)	NO
L10_lift lobby_peri_S	NO (-57.5%)	YES
L10_Medical2_peri_E	NO (-62%)	YES
L10_Medical2_peri_S4	NO (-63.6%)	YES
L10_Medical2_peri_SW	NO (-55.2%)	YES
L10_Medical3_peri_S2	NO (-60.3%)	NO
L10_Medical3_peri_S3	NO (-47.6%)	YES
L10_Medical3_peri_SE	NO (-53.5%)	YES
L10_Medical_int	NO (-94.3%)	NO
L10_Medical_peri_E	NO (-60.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L10_Medical_peri_E2	NO (-20.8%)	NO
L10_Medical_peri_N	NO (-67.8%)	NO
L10_Medical_peri_N2	NO (-71.3%)	YES
L10_Medical_peri_N3	NO (-72.7%)	NO
L10_Medical_peri_NE	NO (-64.1%)	NO
L10_Medical_peri_NE	NO (-66.1%)	YES
L10_Medical_peri_NW	NO (-73.8%)	YES
L10_Medical_peri_NW	NO (-69.9%)	NO
L10_Medical_peri_S	NO (-48.5%)	NO
L10_Medical_peri_W	NO (-62.1%)	YES
L11_Office2_peri_E	NO (-62.8%)	YES
L11_Office2_peri_S5	NO (-64.1%)	YES
L11_Office2_peri_SW	NO (-55.4%)	YES
L11_Office3_peri_S2	NO (-59.7%)	YES
L11_Office3_peri_S4	NO (-68.6%)	YES
L11_Office3_peri_SE	NO (-53.6%)	YES
L11_Office_int	NO (-93.8%)	NO
L11_Office_peri_E	NO (-65.4%)	NO
L11_Office_peri_N	NO (-72%)	NO
L11_Office_peri_N2	NO (-75.6%)	YES
L11_Office_peri_N3	NO (-73.6%)	NO
L11_Office_peri_NE	NO (-69.5%)	YES
L11_Office_peri_NW	NO (-73.9%)	NO
L11_Office_peri_NW	NO (-75%)	YES
L11_Office_peri_S	NO (-47.8%)	NO
L11_Office_peri_W	NO (-64.4%)	YES
L12_Office2_peri_E	NO (-61.5%)	YES
L12_Office2_peri_S5	NO (-64%)	YES
L12_Office2_peri_SW	NO (-55.3%)	YES
L12_Office_int	NO (-92%)	NO
L12_Office_Peri E	NO (-77.2%)	YES
L12_Office_Peri W	NO (-93.4%)	NO
L12_Office_peri_E	NO (-43.6%)	YES
L12_Office_peri_E	NO (-63.4%)	NO
L12_Office_peri_N	NO (-70.6%)	NO
L12_Office_peri_NW	NO (-74%)	NO
L12_Office_peri_S	NO (-62.6%)	YES
L12_Office_peri_S	NO (-49.1%)	NO
L12_Office_peri_SE	NO (-65%)	YES
L12_Office_peri_SW	NO (-63.6%)	YES
L12_Office_peri_W	NO (-64.9%)	YES
L13_Office2_peri_E	NO (-60.1%)	YES
L13_Office2_peri_S5	NO (-61.9%)	YES
L13_Office2_peri_SW	NO (-55.3%)	YES
L13_Office_int	NO (-92.2%)	NO
L13_Office_int	NO (-49.5%)	NO
L13_Office_Peir_W2	NO (-93.4%)	NO
L13_Office_peri_E	NO (-36.3%)	YES
L13_Office_peri_E	NO (-58.3%)	NO

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L13_Office_Peri_E2	NO (-80.5%)	YES
L13_Office_peri_N	NO (-70.8%)	NO
L13_Office_peri_NW	NO (-74.8%)	NO
L13_Office_peri_S	NO (-75.7%)	YES
L13_Office_peri_SE	NO (-65%)	YES
L13_Office_peri_SW	NO (-68.2%)	YES
L13_Office_peri_W	NO (-58.7%)	YES
L14_Office	NO (-90.8%)	NO
L14_Office_peri_E_01	NO (-61.7%)	NO
L14_Office_peri_E_02	NO (-39.6%)	YES
L14_Office_peri_E_03	NO (-59.9%)	YES
L14_Office_peri_N	NO (-68.4%)	YES
L14_Office_peri_NW	NO (-66.3%)	YES
L14_Office_peri_N_02	NO (-69.2%)	NO
L14_Office_peri_SW	NO (-56.2%)	YES
L14_Office_peri_S_01	NO (-64.9%)	NO
L14_Office_peri_S_02	NO (-62.4%)	YES
L14_Office_peri_W_01	NO (-58.8%)	YES
L14_Office_peri_W_02	NO (-93.5%)	NO
L15_Office2_peri_E_04	NO (-58.9%)	YES
L15_Office2_peri_SW	NO (-54.2%)	YES
L15_Office2_peri_S_02	NO (-61.5%)	YES
L15_Office_Internal	NO (-90.7%)	NO
L15_Office_peri_E_01	NO (-65.8%)	NO
L15_Office_peri_E_02	NO (-58.1%)	NO
L15_Office_peri_E_03	NO (-37.8%)	YES
L15_Office_peri_NW	NO (-68.4%)	YES
L15_Office_peri_E_03	NO (-37.8%)	YES
L15_Office_peri_NW	NO (-68.4%)	YES
L15_Office_peri_N_01	NO (-72.7%)	YES
L15_Office_peri_N_02	NO (-70.7%)	NO
L15_Office_peri_N_03	NO (-65%)	NO
L15_Office_peri_S_01	NO (-65%)	NO
L15_Office_peri_W_01	NO (-94%)	NO
L15_Office_peri_W_02	NO (-59.9%)	YES
L16_Office2_peri_E_04	NO (-57.6%)	YES
L16_Office2_peri_SW	NO (-54%)	YES
L16_Office2_peri_S_02	NO (-61.1%)	YES
L16_Office_Internal	NO (-88%)	NO
L16_Office_peri_E_01	NO (-66.3%)	NO
L16_Office_peri_E_02	NO (-59.5%)	NO
L16_Office_peri_E_03	NO (-37.8%)	YES
L16_Office_peri_N_02	NO (-71.5%)	NO
L16_Office_peri_N_02	NO (-71.4%)	NO
L16_Office_peri_N_02	NO (-55.5%)	YES
L16_Office_peri_N_03	NO (-66.2%)	NO
L16_Office_peri_S_01	NO (-64.8%)	NO
L16_Office_peri_W_01	NO (-92.4%)	NO
L17_Office2_peri_E4	NO (-55.8%)	YES
L17_Office2_peri_S2	NO (-61.1%)	YES
L17_Office2_peri_SW	NO (-54.2%)	YES

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
L17_Office_Internal	NO (-81.5%)	NO
L17_Office_peri_E	NO (-66.2%)	NO
L17_Office_peri_E2	NO (-76.2%)	NO
L17_Office_peri_E3	NO (-54.2%)	NO
L17_Office_peri_N	NO (-76.1%)	NO
L17_Office_peri_N2	NO (-62.3%)	NO
L17_Office_peri_S	NO (-57.9%)	NO
L17_Office_peri_W	NO (-92.2%)	NO
L17_Office_peri_W2	NO (-54.7%)	YES
L17_Office_peri_W3	NO (-66.8%)	NO
L18_Office_Internal	NO (-88.8%)	NO
L18_Office_peri_E	NO (-59.3%)	NO
L18_Office_peri_N	NO (-69%)	NO
L18_Office_peri_W	NO (-94.8%)	NO
L18_Office_peri_W2	NO (-56.6%)	YES
L18_Office_peri_W3	NO (-72%)	NO
L00-Mezz_Seminar_peri_S	NO (-82%)	YES
L00-Mezz_Seminar_peri_S	NO (-67.7%)	YES
L00-Mezz_Seminar_peri_S	N/A	N/A
L00-Mezz_Seminar_peri_W	NO (-86.9%)	YES
L00-Mezz_Seminar_peri_W	NO (-97%)	NO
L00-Mezz_Seminar_I01	NO (-98.1%)	NO
L00-Mezz_Seminar_I01	NO (-53.1%)	YES
L00-Mezz_Seminar_I01	NO (-99.9%)	NO
L00-Mezz_Seminar_peri_E	NO (-70.6%)	YES
L00-Mezz_Seminar_peri_E	NO (-99%)	YES

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]	27979.5	27991.4
External area [m²]	26446.3	26446.3
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	16929	13913.9
Average U-value [W/m²K]	0.64	0.53
Alpha value* [%]	7.55	10

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

Building Use

% Area	Building Type
2	**A1/A2 Retail/Financial and Professional services**
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
64	**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
35	**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	1.6	1.11
Cooling	2.78	7.03
Auxiliary	6.77	9.94
Lighting	7.99	21.12
Hot water	2.67	3.04
Equipment*	58.07	58.12
TOTAL**	**21.82**	**42.23**

* 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	1.29	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]	76.55	81.72
Primary energy* [kWh/m²]	65.31	124.39
Total emissions [kg/m²]	10.4	21.2

* 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	26.7	77.2	1.9	3.9	10.2	3.96	5.5	3.96	5.5
	Notional	9.3	118.9	1	11.6	14.4	2.56	2.84	----	----
[ST] Central heating using water: radiators, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	57.5	0	4	0	1	3.96	0	3.96	0
	Notional	28.7	0	3.1	0	1	2.56	0	----	----
[ST] Fan coil systems, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	19.2	77.1	1.3	3.9	8.5	3.96	5.5	3.96	5.5
	Notional	11.1	83.6	1.2	8.2	13.1	2.56	2.84	----	----
[ST] Central heating using water: radiators, [HS] Direct or storage electric heater, [HFT] Electricity, [CFT] Electricity										
	Actual	28.3	0	7.9	0	2.6	1	0	1	0
	Notional	12	0	3.9	0	2.5	0.86	0	----	----
[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	0.2	L00001A8:Surf[1]
Floor	0.2	0.15	B0000010:Surf[0]
Roof	0.15	0.1	B0000049:Surf[2]
Windows, roof windows, and rooflights	1.5	1.2	GL000000:Surf[3]
Personnel doors	1.5	1.2	L00001E0:Surf[0]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

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

Appendix B – **GLA Carbon Emission Reporting Spreadsheet**

Seprate Submission of Excel Sheets

Reg. Office Address:
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Reg. No.: 2888385
Reg. Office: Leeds

www.sweco.co.uk

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Appendix C – **Metering Strategy & ”GLAs Be Seen Strategy”**

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Report

Energy Metering, Monitoring and Billing Strategy

GLA “Be Seen” Reporting – Planning Overview

Vinegar Yard Development

Commercial Development

Sweco UK Limited
1 Bath Road
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November 2021
Project Reference119072
Document Reference: Planning Submission
Revision: 01
Prepared For: St Thomas Bermondsey Limited

Status / Revisions

Rev.	Date	Reason for issue	Prepared		Reviewed		Approved	
00	08.09.2021	Planning submission	LC	08.09.2021	RAB	08.09.2021	PDH	08.09.2021
01	02.11.2021	Planning submission	LC	02.11.2021	KA	02.11.2021	PDH	02.11.2021

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Appendices

Appendix I – GLA “Be Seen” Spreadsheet

1 Introduction

This report describes the proposed metering and billing strategy for electricity, water, ventilation, heating and cooling services for the Vinegar Yard Development.

The report sets out the methodology to be used for monitoring the energy consumption of the services within the building. It broadly follows the recommendations set out, for non-domestic buildings, in CIBSE TM39: 2009 Building Energy Metering, BREEAM 2018 NC, as well as the principles set out in NABERS-UK.

This report demonstrates that all these requirements and those of PartL2A of Building Regulations will be considered as part of the design process in addition to the new emerging policies from the GLA “Be Seen” Energy Monitoring Guidance – Draft April 2020.

The report has been structured to describe firstly the tariff meter requirements associated with utility suppliers to the landlord's services and then secondly the metering provided to the lettable areas. This includes metering of supplies to the retail and residential areas.

This information is intended to be a basis for ongoing discussion with “CIT Development” and their operational teams. In due course, this report will assist the Building Management Team to prepare appropriate documentation to seek competitive prices for the metering of these services and to assist them in operating the building effectively.

2 Reason for Metering

The guidelines contained within CIBSE publication TM39 provides guidance to assist with the design and application of the metering strategy. Several recommendations can be applied to Vinegar Yard to assist the building management in understanding the building performance characteristics and to provide an effective tool in managing energy usage.

There are various reasons for metering within a commercial development:

- Apportioning the generated LTHW and CHW costs to multiple tenants within the office floors;
- Providing robust data to assist both the landlord team and commercial tenants in reducing their energy consumption and helping the Building Management Team to operate the building efficiently and effectively;
- Providing support to the landlord and commercial tenants who may have carbon reduction obligations or corporate policies related to energy usage, such as ESOS “Energy Saving Opportunity Scheme” and other voluntary sustainability commitments to achieve zero carbon on the first day of operation as per client aspiration.
- Accurate measurement at the point of generation for all on-floor plants providing, heating, cooling and fresh air ventilation, as well as electricity and heat recovery provided by the usage of heat pumps to measure the added value of this innovative design;
- A clear understanding of the energy consumed by the end of use categories at the office floors (lighting, small power, ventilation and critical missions);
- Useful benchmarking by distinguishing between:

  i. The standard office operation energy consumption;
  ii. The energy used in the amenity and retail areas;
  iii. The energy consumed within the landlord areas;

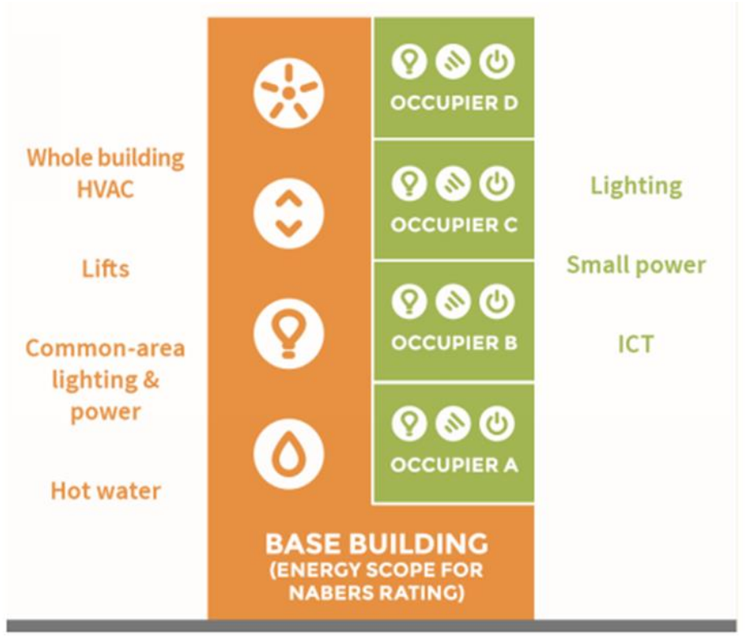

Figure 2- 1: NABERS – UK Base-Building Rating Scope

NABERS, the National Australian Built Environment Rating System, the scheme provides a simple metric to investors, owners and occupiers on how efficiently a building is being operated in-use. The scheme measures the building performance on a scale of zero to six stars. In the UK Better Building Partnership (BBP) will be the owner of the scheme.

3 Guidance & Legislation

Regardless of tenure, the landlord must be able to understand the energy consumption of the buildings and major energy-consuming areas within it. Tenants must be able to view their energy consumption and be able to demonstrate that services are being provided to them at a competitive rate.

3.1 ***Specific legislation applies to commercial buildings:***

- Electricity and Gas “if needed” - approved tariff-based meters, meeting standards set out by the Office of Gas and Electricity Markets (OFGEM) are required for energy monitoring and billing purposes;
- Water – approved meters for the monitoring and billing of the water consumed are required to meet standards set out by the Office of Water Services (OFWAT);
- Heat Networks “if needed” – regulations developed by the Department for Business, Energy & Industrial Strategy apply (Heat Network (Metering and Billing) Regulations 2014;
- Part L2A -2013 – Building Regulations specific to non-domestic buildings;
- CIBSE TM 39:2009 Building Energy Metering
- BREEAM 2018 – Ene 02 Energy Monitoring;
- CIBSE TM 22 - Energy assessment and reporting method;
- The European Measuring Instruments Directive (MID) 2004/22/EC, Measuring Instruments Directive.
- GLA “Be Seen” Energy Monitoring Guidance – Draft April 2020.
- RBKC Greening Supplementary Planning Document (SPD) – Draft Jan 2021.

4 Overview of Metering Methodology

CIBSE Technical Memorandum TM39: 2009 has been used to develop a cost-effective and practical approach to the design of the energy metering systems. The metering strategy for Vinegar Yard is aligned with current regulations and guidance for new buildings.

The metering methodology is provided to address the following considerations:

- Building benchmarking to comply with CIBSE TM 54 for Evaluating Operational Energy Performance of Buildings at the Design Stage and CIBSE TM 46 and advanced modelling requirements set by Better Buildings Partnership BBP;
- Landlord technical energy analysis by use (i.e. type of plant or equipment);
- Billing of each individual commercial tenants in offices and retail units.

The table in the next page summarises the compliance step with CIBSE TM39 steps and the responsibility of each team member:

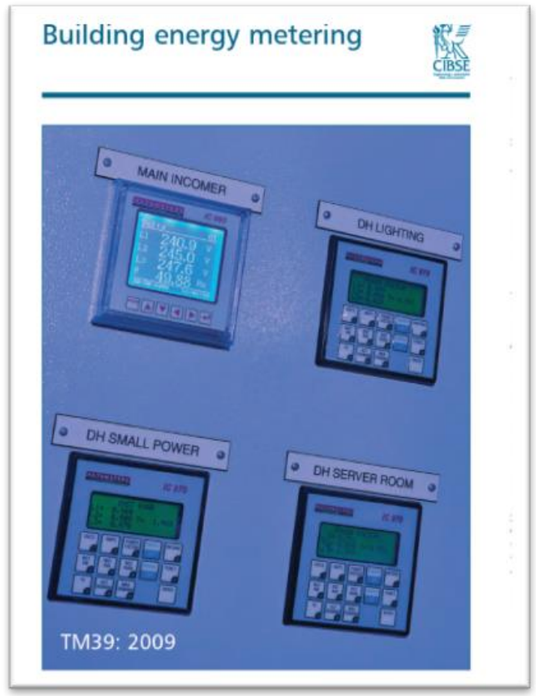

Table 4-1: CIBSE TM39 Framework Checklist

	Description	Responsible Team Member	Actions / Progress	Level of Compliance
Step - 1	Select the boundary within which TM39 will be applied	Sweco MEP/ESD	Clear boundary provided within the EMS system	Work in progress
Step - 2	List all energy that is imported and exported across this boundary, including all the main supplies + Renewable's energy and LZC technologies	Sweco MEP/ESD	The primary supplies are water and electrical power. There is no gas. Meters are installed to measure the heat recovery opportunities from the heat pumps. Additional meters installed to measure the PV panels outcome	Work in progress
Step - 3	List all items within the boundary that will be supplied. These could be end-uses, technologies, tenancies or other activity areas.	Sweco MEP/ESD	Will be developed as part of RIBA Stage 2 -3 design	Work in progress
Step - 4	Decide which of these items should be metered or sub-metered. Consider how the energy data collected within the boundary might need to be or could best be used	Client & Sweco MEP/ESD/Smart Buildings	Will be developed as part of the design progress and will be included in RIBA Stage 3 Schematics.	Work in progress
Step - 5	Select the appropriate meters or method for each item to be metered or sub-metered.	Sweco MEP/Smart Buildings	Will be developed as part of RIBA Stage 3 design	Work in progress
Step - 6	Determine where to locate the meters. Mark the plan to show, within the boundary, which meter is located where.	Sweco MEP	Will be developed as part of RIBA Stage 3 design	Work in progress
Step - 7	Decide how the meters are to be read. For automatically read meters, ensure that readings can be gathered for analysis, particularly if there is an existing EMS system.	Client & Sweco Smart Buildings	The Applicant to advise regarding the level integration between the EMS / BMS and the strategy to be adapted	Work in progress
Step - 8	Review metering strategy for appropriateness, complexity and cost-effectiveness. Go back to step 4 if revisions are required.	Client & Sweco MEP/ESD/Smart Buildings Appointed contractors	Will be developed as part of RIBA Stage 3 design	Work in progress
Step - 9	Specify, implement and commission the metering and submetering decided in step 8	Client & Sweco MEP/ESD/Smart Buildings Appointed contractors	Potential additional review and optimisation work should be scheduled as part of the five years Post Occupancy Evaluation (POE)	Work in progress
Step -10	Ensure a copy of the updated metering strategy is included in the building logbook.	Client & Sweco MEP/ESD/Smart Buildings Appointed contractors	The documentation and reporting templates should be agreed upon in advance as part of RIBA Stage 3 specification to comply with the latest industry guidance	Work in progress

4.1 Proposed Metering Dashboards

Dashboards shall be provided at all graphical interfaces providing interactive visibility of energy and carbon performance data.

The pie charts below summarise the **suggested reporting** templates to demonstrate achieve the targets listed above:

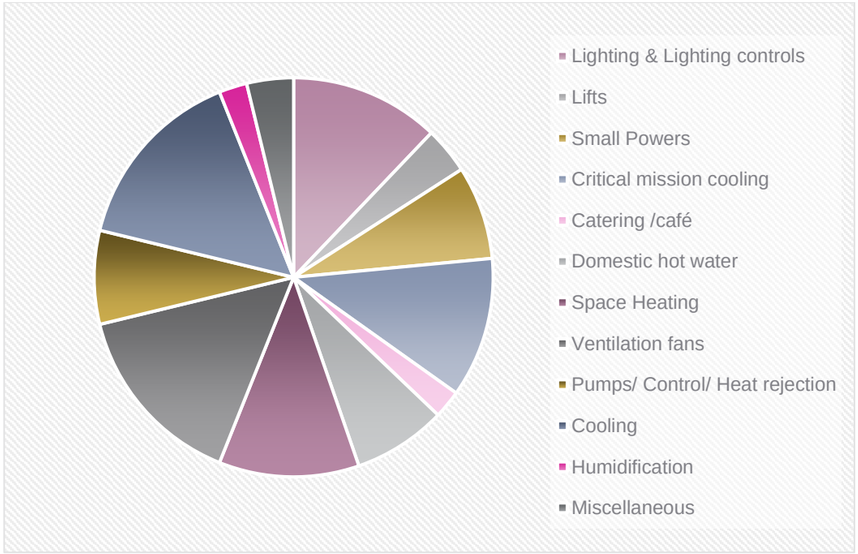

Figure 4-1: EXAMPLE of Energy consumption of commercial areas broken by energy end-usage

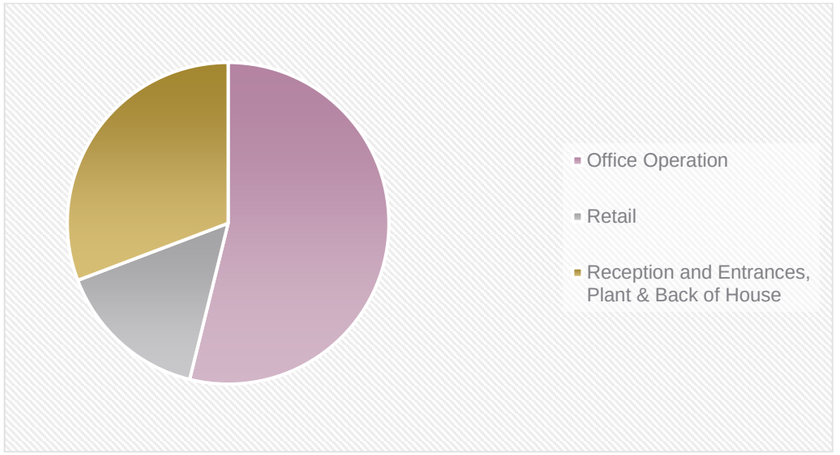

Figure 4-2: EXAMPLE of Different energy consumption broken by function

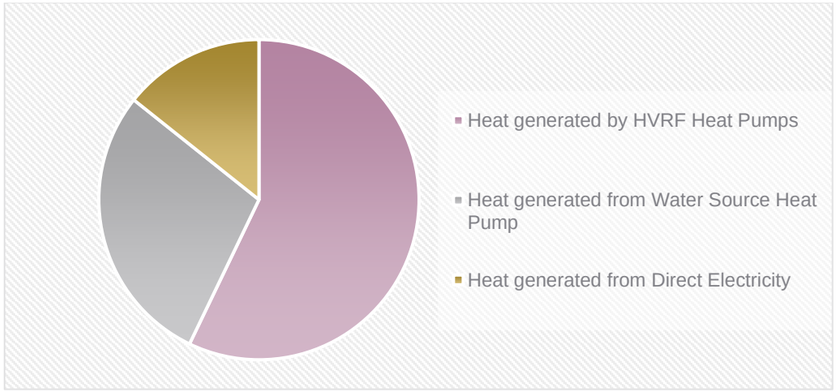

Figure 4-3: EXAMPLE of Heating energy generated broken by sources

5 GLA “Be Seen” Reporting process

5.1 GLA Be Seen Requirements

The Mayor of London has declared a climate emergency and has set an ambition for London to be net zero-carbon. This means all new buildings must target net zero carbon. The Mayor’s London Plan sets the targets and policies required to achieve this. It includes:

A requirement for all major development to ‘be seen’ i.e. to monitor and report its energy performance post-construction to ensure that the actual carbon performance of the development is aligned with the Mayor’s net zero-carbon target. This guidance document explains how to meet this requirement.

To truly achieve net zero-carbon buildings we need to have a better understanding of their actual operational energy performance. Although Part L calculations and Energy Performance Certificates (EPCs) give an indication of the theoretical performance of buildings, it is well established that there is a ‘performance gap’ between design theory and measured reality. By having an integrated Energy Monitoring System, the actual energy consumption of the building can be actively monitored and acted upon appropriately.

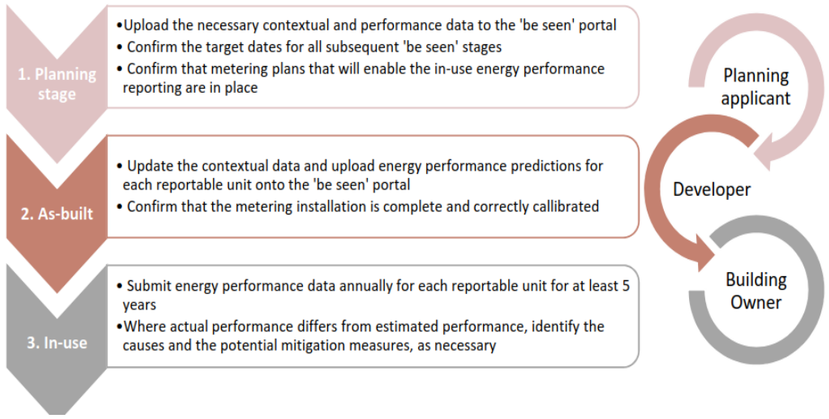

Figure 6-1. “Be Seen” Reporting Process

5.2 “Be Seen” Planning Stage Performance Indicators

The table below summarise the GLA reporting requirement for the current phase of the project:

Table 6-1: Summary of GLA -Be Seen Compliance sheet – Non demotic

Performance Indicator Group	Description		Part L2A Calculations	CIBSE TM 54 Calculations	Notes
Contextual data	Location Unique Property Reference Number (UPRN) or Address		Vinegar Yard , No 9 Fenning Street, SE1 3QR		
	Site plan		Included in the planning documentation		
	Typology / Planning Use Class		D1/B1(b), B1(a) and Retail		
	GIA for each Typology / Use Class	m^2	Refer to Energy and Sustainability Strategy	Total : 30,503	**Area considered in Part-L**: Whole Development **Area considered in CIBSE TM54**: D1/B1(b) and B1(a) only
	Anticipated target dates for each ‘be seen.’ reporting stage	Planning Stage	September 2021		subject to construction programme
		As-built	TBC by planning consultant		
		In-use	TBC by planning consultant		
Building energy use	Grid electricity consumption	kWh/annum	327,166	1,597,178	**Part-L**: heating, cooling, auxiliary, lighting, DHW, equipment **CIBSE TM54**: heating, cooling, auxiliary, lighting, DHW, lifts, equipment, servers, security, catering
	Gas consumption		0	0	
	Other fuels consumption		0	0	
	Energy generation		35,000	35,000	From the PV panels in the roof
	District heating consumption		0	0	
Carbon emissions	Carbon emissions estimates for the whole development	kg CO_2 /m^2_{GIA}/ annum	Refer to Energy and Sustainability Strategy	Refer to Energy and Sustainability Strategy	Using SAP10 Carbon Factors
	Predicted Annual Carbon emissions	tonnes CO_2 / annum	Refer to Energy and Sustainability Strategy	Refer to Energy and Sustainability Strategy	Using SAP 10 Carbon Factors
	Carbon shortfall for the entire development	tonnes CO_2 / annum	Refer to Energy and Sustainability Strategy	N/A	Using SAP10 Carbon Factors
	Estimated carbon offset amount	£/annum	Nil	N/A	The building achieves 35% improvement in emissions against notional building, as required by GLA. 100% Renewable Energy deal is recommended to cover the electrical usage with voluntary offset scheme if needed.

Appendix D – **BREEAM Pre-Assessment**

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BREEAM 2018 NC (Non-Domestic)

Design & Procurement Assessment

Vinegar Yards - Office

119072
10/12/2018
Revision3

SWECO

Issue	Date	Reason for Issue	Prepared		Checked		Approved	
1	10-Oct-18	Pre-assessment	MM	10-Oct-18	KA	10-Oct-18	KA	10-Oct-18
2	27-Nov-18	For Planning	MM	27-Nov-18	KA	27-Nov-18	KA	27-Nov-18
3	10-Dec-18	For information	MM	10-Dec-18	KA	10-Dec-18	KA	10-Dec-18

BREEAM 2018 NC (Non-Domestic) - Design & Procurement Assessment
119072
10/12/2018
Revision3

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What by When

Project Name:	**Vinegar Yards - Office**
BREEAM Scheme:	**BREEAM NC 2018**
Stage:	**Design & Procurement Assessment**
Target Score:	**74.61%**

Whilst it is important for the client and project team to consider sustainability and the BREEAM criteria at an early stage of design, several specialist appointments and the generation of subsequent reports are very important as they will affect the ability to award these credits in the future if these do not happen. Hence, we have listed here these credits and the necessary actions that the client needs to be aware of.

- Targeted
- Credit awarded
- N/A not targeted
- Potential

Issue	Name	RIBA 1	RIBA 2	RIBA 3	RIBA 4	RIBA 5	RIBA 6
MAN 01	Appointment of BREEAM AP						
TRA 01	Travel Plan						
TRA 02	Travel consultation with local authority						
MAT 03	Sustainable Procurement Plan						
MAT 06	Materials efficiency analysis						
LE 01	Appointment of contaminated land specialist						
LE 02 - 05	Appointment of suitably qualified ecologist						
LE 02	Survey and evaluation & determining the site wide outcomes						
MAN 01	Have a schedule of responsibilities						
MAN 01	Agreement of BREEAM target						
MAN 01	Start public consultation						
MAN 02	Life cycle costing analysis - elemental						
HEA 02	Indoor air quality plan						
HEA 05	Appointment of suitably qualified acoustician						
HEA 06	Consultation with Security consultant						
HEA 07	Provide safe external site areas						
ENE 04	Passive design analysis with energy specialist						
ENE 04	Appointment of energy specialist for LZC study						
MAT 01	Building Life cycle Assessment (LCA) submission						
LE 02 - 05	Liaison, implementation and data collation						
WST 01	Production of pre-demolition audit						
WST 05	Conduct a climate change adaptability report for fabric						
WST 06	Disassembly and functional adaptation study						
MAN 03	Register site to considerate construction scheme						
MAN 01	Provide consultation feedback						
MAN 02	Life cycle costing analysis - component level						
MAN 04	Appointment of commissioning manager						
DS	BREEAM DESIGN STAGE CERTIFICATION						
MAN 03	Appointment of site based sustainability champion						

Early Action

Project Name: **Vinegar Yards - Office**
BREEAM Scheme: **BREEAM NC 2018**
Stage: **Design & Procurement Assessment**
Target score: **74.61%**

Whilst it is important for the client and project team to consider sustainability and the BREEAM criteria at an early stage of design, several specialist appointments and the generation of subsequent reports are very important as they will affect the ability to award these credits in the future if these do not happen. Hence, we have listed here these credits and the necessary actions that the client needs to be aware of.

Ecological Consultant Appointment at RIBA Stage 1

Code	Credits	Title	Credit Criteria / Early Action Required
LE 02	2	Identifying and understanding the risks and opportunities for the project	New 2018 Criteria: Route 2 - SQE A suitably qualified Ecologist (SQE) needs to be appointed to survey/assess the site for its current ecological value prior to any demolition etc. The ecologist will need to provide recommendations on any existing ecology which will need protection during the demolition and construction phases
LE 03	3	Managing negative impacts on ecology	
LE 04	4	Change and enhancement of ecological value	
LE 05	2	Long Term ecology management and maintenance	

Contractor Considerations

Code	Credits	Title	Credit Criteria / Early Action Required
Man 03	1	Sustainability Champion (Construction)	A Site Sustainability Manager / BREEAM AP should be appointed during the Construction, Handover & Close out stages (RIBA Stages 5 & 6).

Security Consultant / Officer Consultation at RIBA Stage 2

Code	Credits	Title	Credit Criteria / Early Action Required
Hea 06	1	Safety and Security	Consultation with a suitably qualified security consultant (SQSS) should have taken place at RIBA Stage 2. Security Needs Assessment (SNA) to be provided with recommendations from the SQSS. The final design should reflect the recommendations/solutions and implemented in the as-built development.

Transport Consultant Appointment at RIBA Stage 1

Code	Credits	Title	Credit Criteria / Early Action Required
Tra 01	2	Travel Plan	Travel Plan to be commissioned for the development clearly considering the impact onto the surrounding infrastructure etc. due to the site specific travel survey / assessment having been developed.
Tra 02	1	Sustainable Transport Measures (Option 6)	Consultation with local authority (LA) on the state of the local cycling network and public accessible pedestrian routes, to focus on whichever the LA deems most relevant to the project, and how to improve it. Agree and implement one proposition chosen with the local authority.

Specialists / Others at RIBA Stage 2

Code	Credits	Title	Credit Criteria / Early Action Required
Man 02	2	Life Cycle Cost & Service Life Planning	A Life Cycle Cost analysis should be undertaken at Stage 2; A strategic and system-level Life Cycle Cost analysis is undertaken; A technical design Life Cycle Cost analysis is undertaken at Stage 4.
Hea 02	1	Indoor Air Quality	Appointment of a specialist to carry out an 'Indoor Air Quality Plan' assessment for the development considering neighbouring pollutants, any flue gases etc. proposed and the locations of air intakes and exhausts
Ene 04	2	Passive Design	Appointment of a specialist to carry out the analysis for the passive design and energy strategy, projected climate change scenario should be considered as part of the thermal model
Pol 03	2	Surface Water Run-Off	The commission of a 'Flood Risk Assessment' for the site. This should include an analysis for the 1 in 100 year storm event and attenuation measure recommendations to adhere to adequate discharge flow rates and SUDS techniques

Client Considerations at RIBA Stage 2

Code	Credits	Title	Credit Criteria / Early Action Required
Man 01	1	Project Brief and Design	To award the credit, the client needs to confirm that from RIBA Stage 1 or equivalent the client, building occupier, design team and contractor are involved in contributing to the decision making process for the project. As a minimum this includes meeting to identify and define their roles, responsibilities and contributions during design, construction, Commissioning and handover up to occupation (Stage 6)
Man 01	1	Stakeholder Consultation	During preparation of the brief, all relevant parties and relevant bodies are identified and consulted with by the design team. (Relevant bodies are - Actual intended building users, representative consultation group from the existing community, existing partnerships and networks that have knowledge and experience from existing buildings of the same type, potential users of any shared facilities e.g. operators of clubs and community groups). A consultation plan should have been prepared and includes a timescale and methods of consultation for all relevant parties/bodies and how the relevant parties will be kept informed about progress. Consultation feedback has been given with suggestions made, including how the results of the consultation process have influenced the proposed design. Through consultation and the resulting measures taken any areas of features of historic/heritage value are protected.

Design team considerations at RIBA Stage 2

Code	Credits	Title	Credit Criteria / Early Action Required
Man 03	1	BREEAM AP (Site)	A Site Sustainability Manager / BREEAM AP should be appointed during the Construction, Handover & Close out stages (RIBA Stages 5 & 6).
Mat 01	1	Building Life Cycle Assessment (LCA)	A building LCA on of the superstructure design to be carried out by using either the BREEAM Simplified Building LCA tool or an IMPACT Compliant LCA tool according to the methodology. Submit the Mat 01/02 results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for.
Mat 03	1	Sustainable Procurement Plan	A sustainable procurement plan to be prepared and used by the design team to guide specification towards sustainable construction products.
Mat 06	1	Material Efficiency	Pre-fabrication & WRAP compliance to be shown in minutes of meetings and/or drawings mark-ups.
Wst 05	1	Adaptation to Climate Change	Assessment of new & existing fabric and it's durability to deal with extremes in weather.

BREEAM NC 2018 Credit Review

10/12/2018 Rev.3

Project Name	**Vinegar Yards - Office**
Building Type	**Office**
Project Type	**Shell and Core**

Targeted BREEAM rating %	**74.61**	**Excellent**
Potential BREEAM rating %	**89.19**	**Outstanding**
Achieved scoring %	**3.61**	**Unclassified**

Credit awarded:	Credit awarded
Credit not targeted:	Credit not targeted
Potential additional credit:	Potential additional credit
Further information required:	Further information required

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
MANAGEMENT		0.61%									
Man 01	**Project brief and design**	Project Delivery Planning	1	1		0		CIT*PM*KPF*	2		Design team meetings, scope of work & formal agreements on performance targets with project team members (pre-requisite)
		Stakeholder Consultation (Interested Parties)	1	1		0		CIT*PM*KPF*	2		All relevant third parties (planning consultation with local authority, local residents and any input from end user) been consulted.
		BREEAM AP (Concept Design)	1	1		1		BREEAM AP*	2		BREEAM AP is appointed prior to RIBA Stage 2 and BREEAM target formally agreed with design team.
		BREEAM AP (Developed Design)	1	1		0		BREEAM AP*	3		BREEAM AP is appointed and monitor progress against target throughout the project up to PC Stage.
Man 02	**Life cycle cost and service life planning**	Elemental Life Cycle Cost (LCC)	2	0	2	0		Specialist*	2		An Elemental LCC Analysis is required to be carried out at RIBA Stage 2, then updated at RIBA Stage 4 for component level. (20, 30, 50 or 60 years LCC analysis targeting - Envelope, Services, Finishes & External spaces).
		Component Level LCC options appraisal	1	0	1	0		Specialist*KPF*	4		
		Capital Cost Reporting	1	1		0		Cost Consultant*	4		Report a capital cost in £/m2 for BRE purpose only.
Man 03	**Responsible construction practices**	**Legally harvested and traded timber**					Yes/No?	Contractor*			**This is a minimum requirement for achieving any BREEAM rating.**
		Environmental Management	1	1		0		Contractor*	4		Contractor operates EMS: certificate of ISO 14001 /EMAS and implement best practice pollution prevention policies and procedures on site in accordance with Working at construction and demolition sites: PPG6, Pollution Prevention Guidelines.
		BREEAM AP (Site)	1	1		0		Contractor*	4		A Site Sustainability Manager / BREEAM AP should be appointed to monitor targets during the RIBA Stages 5 & 6.
		Responsible Construction Management **(Minimum Standard: 1 credit for Excellent, 2 for Outstanding)**	2	2		0	Yes/No?	Contractor*	4		**Minimum Standard: E-1; O-2.** The principal contractor evaluates the risks (on site and off site), plans and implements actions to minimise the identified risks i.e. Considerate Constructors Scheme, Fleet Operator Recognition Scheme.
		Monitoring of Construction Site Impacts - Utility Consumption	1	1		0		Contractor*	4		Site-based energy and water usage to be monitored. Display figures on site.
		Monitoring of Construction Site Impacts - Transport of Construction Materials & Waste	1	1		0		Contractor*	4		Vehicle monitoring of materials deliveries from point of supply and vehicle monitoring of waste to establish carbon figures.
Man 04	**Commissioning & Handover**	Commissioning - Testing Schedule & Responsibilities **(Minimum Standard: 1 credit for Very Good / Excellent / Outstanding)**	1	1		0	Yes/No?	Contractor*Specialist*	4		**Minimum Standard: VG/E/O - 1.** Third party commissioning manager to be appointed. Testing schedule and responsibilities to be provided.
		Commissioning - design and preparation	1	1		0		Contractor*Specialist*	4		Appointment of an appropriate project team member, provided they are not involved in the general installation works provide commissioning management.
		Testing & Inspecting Building Fabric	1	1		0		Contractor*	4		Thermographic survey as well as an airtightness test and inspection required.
		Building User Guide					Yes/No?	CIT*Contractor*			**Minimum Standard: VG/E/O - 1.** A technical and non-technical building user guides to be developed.
		Handover	1	1		0		Contractor*	4		Building User Guides as above and a non-technical training schedule for the building occupiers. A technical training schedule for the premises facilities managers.
Man		**TOTAL:**	**18**	**15**	**3**	**1**					
		% of total score:	**11.00%**	**9.17%**	**1.83%**	**0.61%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
HEALTH & WELLBEING	0.73%										
Hea 01	**Visual comfort**	Daylighting	2	0	2	0		KPF*Specialist*	3		Daylighting study to be carried out and achieve average daylight factor of 2% over 80% (100% room dependant) of the floor plate and a uniformity ratio of at least 0.3.
		View Out	1	1		0		KPF*	3		95% of the floor area in 95% of spaces for each relevant building area is within 8 m of an external wall. The window or opening must be ≥ 20% of the surrounding wall area. Or compliance is seeked via BS 8206: part 2.
		Internal & External Lighting Levels, Zoning & Controls	1	1		0		SWECO*Lighting Specialist*	4		Internal lighting in all relevant areas of the building is designed to provide illuminance (lux) levels and colouring rendering index in accordance with the SLL Code for Lighting 2012 and areas with PC CIBSE LG7. Internal lighting is zoned to allow for occupant control.
Hea 02	**Indoor air quality**	**Indoor Air Quality Plan**					Yes/No?	Specialist*	3		Indoor air quality plan to be developed during early design stages in line with GN06.
		Ventilation	1	1		0		SWECO*	4		Provide fresh air into the building in accordance with the criteria of the relevant standard for ventilation. Consideration of carbon dioxide (CO_2) or air quality sensors. Design intakes and exhaust 10m apart and from sources of external pollution or in accordance with PD CEN-TR 16798:4 2017.
Hea 04	**Thermal comfort**	Thermal modelling	1	1		0		SWECO*	3		Carry out dynamic thermal modelling using CIBSE AM 11 compliant software.
		Design for future thermal comfort	1	1		0		SWECO*	3		The building shall be designed to be adaptable for a projected climate change scenario. PMV and PPD to be reported.
Hea 05	**Acoustic performance**	Acoustic performance standards	1	1		0		Sandy Brown*	3		Stage 2 report required covering office use alongside the retail requirements.
Hea 06	**Safety & Security**	Security of Site & Building	1	1		0		KPF*Contractor*Specialist*	2		A suitably qualified security specialist (SQSS) is required to conduct an evidence-based Security Needs Assessment at RIBA Stage 2.
Hea 07	**Safe and healthy surroundings**	Safe Access	1	1		0		KPF*Access Consultant*	4		Dedicated and safe cycle paths are provided from the site entrance to any cycle storage, and connect to off-site cycle paths where applicable. Suitable lighting also required.
		Outside Space	1	0	1	0		KPF*	4		Unknown at this stage whether this will be provided - likely but cannot confirm without landscaping plans. TBC by project team. Potential for now.
Hea		**TOTAL:**	**11**	**8**	**3**	**0**					
		% of total score:	**8.00%**	**5.82%**	**2.18%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
ENERGY		0.64%									
Ene 01	**Reduction of Emissions**	Energy Performance Commissioning - implementation **(Minimum Standard: 4 credits for Excellent / 6 credits for Outstanding)**	9	6		0	Yes/No?	SWECO*	4		**Minimum Standard: E-4; O-6** Credits achieved through IES Modelling Tool and reduction in regulated CO_2 emissions.
		Prerequisite:					Yes/No?	SWECO*	2		**Prior to completion of the RIBA Stage 2, hold a preliminary design workshop.**
		Energy Modelling and Reporting **(Minimum Standard: 4 credits for Outstanding)**	4	0	4	0	Yes/No?	Energy Modeller*	4		Engagment with an energy modelling specialist to focus on operational energy performance. Input of a specialist for these credits is beyond the current scope of SWECO energy appointment. Credits currently potential until decision is made.
Ene 02	**Energy Monitoring**	Sub-Metering of End-use Categories	1	1		0	Yes/No?	SWECO*	4		**Minimum Standard: VG/E/O-1.** Energy metering systems of at least 90% of the estimated annual energy consumption of each fuel is assigned to the end-use categories.
		Sub-Metering of High Energy Load & Tenancy Areas	1	1		0		SWECO*	4		**Sub-metering on a floor by floor basis and tenancy areas.**
Ene 03	**External Lighting**	External Lighting	1	1		0		SWECO*Lighting Specialist*	4		Average initial luminous efficacy of not less than 70 luminaire lumens per circuit Watt. Automatic control to prevent operation during daylight hours and presence detection in areas of intermittent pedestrian traffic.
Ene 04	**Low Carbon Design**	Passive Design Analysis	1	1		0		SWECO*	2		Thermal modelling to be achieved first. Implement passive design measures to reduce the total heating, cooling, mechanical ventilation, lighting loads and energy consumption in line with the passive design analysis findings.
		Free Cooling	1	0		0		M&E Consultant*	4		TBC based on potential for night time vent.
		Low Zero Carbon Feasibility Study	1	1		0		SWECO*	2		LZC Study to establish the most appropriate low or zero carbon energy sources and report the reduction on regulated CO_2 emissions.
Ene 06	**Energy Efficient Transportation Systems**	Energy Consumption	1	1		0		TBC*	4		Lift analysis to determine transportation demand and usage patterns in compliance with BS EN ISO 25745 Part 2 and 3. Looks like escalators will be included at VY so these will also need to be assessed.
		Energy Efficient Features - Lifts	1	1		0		TBC*	4		Energy-efficient features offering the greatest potential energy savings will be part of the system i.e. a standby condition for off-peak periods.
		Energy Efficient Features - Escalators or moving walks	1	1		0		TBC*	4		Current deisgn at VY includes escalators. Specify the energy-efficient features for each escalator or moving walk.
Ene		**TOTAL:**	**22**	**14**	**4**	**0**					
		% of total score:	**14.00%**	**8.91%**	**2.55%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
TRANSPORT		0.96%									
Tra 01	**Transport assessment and travel plan**	Travel plan	2	2		0	**AI >= 40**	Caneparo Associates*	2		Travel plan will be provided by transport consultant covering the key issues.
Tra 02	**Sustainable transport measures**	1. The existing AI calculated in Tra 01	10	9	1	0	**1**	Caneparo Associates*			Transport consultant to note which additional mesures can be provided to the site. Discussions between BREEAM assessor and arcitect to determine which measures can be included.
		2. Demonstrate an increase over the existing Accessibility Index.					**Transport Measures?**	Caneparo Associates*			
		3. Provide a public transport information system in a publicly accessible area, to allow building users access to up-to-date information on the available public transport and transport infrastructure.					**5**	Caneparo Associates*CIT*			
		4. Provide electric recharging stations of a minimum of 3kw for at least 10% of the total car parking capacity for the development.					**Transport Measures?**	Caneparo Associates*CIT*			
		5. Set up a car sharing group or facility to facilitate and encourage building users to car share. Raise awareness of the sharing scheme.					**Transport Measures?**	Caneparo Associates*CIT*			
		6. During preparation of the brief, the design team consults with the local authority (LA) on the state of the local cycling network and public accessible pedestrian routes, to focus on whichever the LA deems most relevant to the project, and how to improve it.					**Transport Measures?**	Caneparo Associates*CIT*	1		
		7. Install compliant cycle storage spaces to meet the minimum levels set out in Table 7.5					**13**	Caneparo Associates*KPF*			
		8. Provide at least two compliant cyclists' facilities for the building users, (including pupils where appropriate to the building type) – Showers; – Changing facilities; – Lockers; – Drying spaces.					**14-15**	Caneparo Associates*KPF*			
		9. At least three existing accessible amenities are present, see Table 7.6.					**16**	Caneparo Associates*			
		10. Enhanced amenities					**Transport Measures?**	Caneparo Associates*KPF*			
		11. Implement one site-specific improvement measure, not covered by the options already listed in this issue, in line with the recommendations of the travel plan.					**Transport Measures?**	Caneparo Associates*CIT*	4		
Tra		**TOTAL:**	**12**	**11**	**1**	**0**					
		% of total score:	**11.50%**	**10.54%**	**0.96%**	**0.00%**					
WATER		0.78%									
Wat 01	**Water Consumption**	Water Consumption	5	3	1	0	Yes/No?	KPF*SWECO*	4		**Minimum Standard: VG/E-1; O-2** Water fittings to have restricted flow rates to achieve targeted credits. Greywater or rainwater system can contribute to these credits.
Wat 02	**Water Monitoring**	Water Monitoring	1	1		0	Yes/No?	SWECO*	4		**Minimum Standard: G/VG/E/O- Criterion 1 only - water meter on mains.** Any water-consuming plant or building areas consuming 10% or more of the building's total water demand. Water flow meters pulsed & BMS connected.
Wat 03	**Water Leak Detection**	Leak Detection System	1	1		0		SWECO*	4		To detect any major leaks within the buildings a leak detection via BMS with audible alarm.
		Flow Control Devices	1	1		0		SWECO*	4		Sanitary supply shut-off valves specified to each toilet area.
Wat 04	**Water efficient equipment**	Water efficient equipment	1	1		0		SWECO*	4		Mitigate 'unregulated water usage' .
Wat		**TOTAL:**	**9**	**7**	**1**	**0**					
		% of total score:	**7.00%**	**5.44%**	**0.78%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
MATERIALS		1.25%									
Mat 01	**Environmental impacts from construction products - Building life cycle assessment (LCA)**	Superstructure - Concept Design	6	4	0	0	Yes/No?	LCA Specialist*KPF*Cost Consultant*AKT II*CIT*	2		LCA assessor to carry out building Life Cycle Assessment (LCA). To be submitted to the BRE before the planning application submission. Credits relate to the approved software route and not the simplified LCA route.
		Superstructure - Technical Design						LCA Specialist*KPF*Cost Consultant*AKT II*CIT*	4		Review required at Stage 4.
		Substructure and hard landscaping options appraisal during Concept Design	1	1		0		LCA Specialist*KPF*Cost Consultant*AKT II*CIT*	2		As above.
Mat 02	**Environmental impacts from construction products - Environmental Product Declarations (EPD)**	Specification of products with a recognised environmental product declaration (EPD)	1	0	1	0		KPF*Contractor*AKT II*	4		Tough to achieve without limiting specifications - input as potential only for now.
Mat 03	**Responsible Sourcing of construction products**	**Pre-requisite: Timber procurement details**					Yes/No?	CIT*Contractor*	4		**Minimum Standard: Responsible sourcing of timber.**
		Enabling Sustainable Procurement	1	1		0		TBC*	2		Sustainable Procurement Plan to be in place before RIBA Stage 2.
		Measuring Responsible Sourcing	3	1		0		KPF*AKT II*SWECO*Contractor*	4		Material specified from manufacturers who can provide EMS Certification (ISO 14001 etc.). Traditionally tough to achieve - 1 credit targeted for now.
Mat 05	**Designing for Durability & Resilience**	Designing for Durability & Resilience	1	1		0		KPF*AKT II*Landscape Architect*	4		Protecting vulnerable parts of the building from damage and exposed parts of the building from material degradation.
Mat 06	**Material Efficiency**	Preparation and Brief	1	1		0	Yes	Design Team*	1		Set targets, opportunities and methods for optimise the use of materials (i.e. pre-fabrication, WRAP compliance etc.). Pre-fabrication & WRAP compliance to be shown in minutes of meetings and/or drawings mark-ups.
		Concept Design					Yes/No?		2		
		Developed Design					Yes/No?		3		
		Technical Design					Yes/No?		4		
		Construction					Yes/No?		5		Commitment letter
Mat		**TOTAL:**	**14**	**9**	**1**	**0**					
		% of total score:	**17.50%**	**11.25%**	**1.25%**	**0.00%**					
WASTE		0.64%									
Wst 01	**Construction Waste Management**	Pre-demolition audit	1	0	1	0		Specialist*	2		**Minimum Standard: O-1** Pre-demolition audit must carried out at RIBA Stage 2 and included in Resource Management Plan (RMP).
		Construction Resource Efficiency	3	2		0	Yes/No?	Contractor*	4		RMP to be prepared covering the targets of non-hazardous waste arising from site construction . Contractor to limit waste to less than 6.5tonnes per 100m2 gross internal area.
		Diversion of Resources from Landfill	1	1		0		Contractor*	4		Contractor to limit waste to landfill. 90% (tonnes) of demolition and 80% non-demolition waste to be diverted from landfill.
Wst 03	**Operational Waste**	Operational Waste	1	1		0	Yes/No?	KPF*Specialist*	4		**Minimum Standard: E/O-1** Based on NIA 1000 sqm - 2 sqm space for recycling bins is required. Additional sqm when catering is provided. Minimum of 30 litres of 3 internal bins (no individual container smaller than7litres) to be provided for multi-residential buildings.
Wst 04	**Speculative Finishes (Offices only)**	Speculative Floor and Ceiling Finishes	1	1		0		KPF*	4		To install floor and ceiling finishes selected by the known occupant or if occupant not known in show area only. KPF to confirm - left as potential for now as unknown.
Wst 05	**Adaptation to Climate Change**	Resilience of structure, fabric, building services and renewables installation	1	1		0		SWECO*KPF*AKT II*Flood Risk Assessor*	2		Conduct a climate change adaptation strategy of new & existing fabric and it's durability to deal with extremes in weather condition. SWECO to provide templates to design team.
Wst 06	**Design for disassembly and adaptability**	Design for disassembly and functional adaptability - recommendations	1	1		0		KPF*AKT II*SWECO*	2		Conduct study by the end of RIBA Stage 2 and develop recommendations prior to RIBA Stage 2. (i.e. alternative building uses, functions, major plant replacement, ventilation strategy to adapt to future building occupant needs, adaptability to changes of in-use etc. SWECO to provide templates to design team.
		Disassembly and functional adaptability – implementation	1	1		0		KPF*AKT II*SWECO*	4		Provide an update during RIBA Stage 4, how the recommendations have been implemented - horizontally or vertically expandability, refurbishment potential, local plant and service distribution routes etc.
Wst		**TOTAL:**	**11**	**8**	**1**	**0**					
		% of total score:	**7.00%**	**5.09%**	**0.64%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
LAND USE & ECOLOGY	1.15%										
LE 01	**Site Selection**	Previously Occupied Land	1	1		0		KPF*	4		75% of new development footprint is built on the previously occupied land.
		Contaminated Land	1	0	1	0		CIT*Specialist*	4		Currently potential - need to see ground investigations report. State of land and contamination currently unknown at Vinegar Yards.
LE 02	**Identifying and understanding the risks and opportunities for the project**	**Prerequisite - Assessment route selection**					**Route 2**	Client*Contractor*			**Prerequisite:** **The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.**
		Survey and evaluation	1	1		0		Ecologist*	1		Ecologist to be appointed capable of undertaking a BREEAM 2018 ecology framework assessment to complete by end of Stage 2. Risk of non-compliance is appointment not made.
		Determining the ecological outcomes of the site	1	1		0		Desing Team*Ecologist*	2		As above. Identify and consider ecological outcome with stakeholders for the sites at RIBA 2.
LE 03	**Managing negative impacts on ecology**	**Prerequisite - identifying the risks & opportunities for the project**					Yes/No?	Client*Contractor*			**LE 02 has been achieved. Prerequisite:** **The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.**
		Planning, liaison, implementation and data	1	1		0		Design Team*	2		Ecologist to be appointed capable of undertaking a BREEAM 2018 ecology framework assessment to complete by end of Stage 2. Risk of non-compliance is appointment not made.
		Managing negative impacts on ecology	2	1		0		Ecologist*	4		As above. One credit targeted for now.
LE 04	**Change and enhancement of ecological value**	**Prerequisite - identifying the risks & opportunities for the project**					Yes/No?	Client*Contractor*			**LE 03 has been achieved. Prerequisite:** **Roles and responsibilities to be assigned. Site preparation and construction works have been planned. The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.**
		Liaison, implementation and data collation	1	1		0		Design Team*	4		Ecologist to be appointed capable of undertaking a BREEAM 2018 ecology framework assessment to complete by end of Stage 2. Risk of non-compliance is appointment not made.
		Enhancement of ecology	3	1		0		Ecologist*	4		As above. One credit targeted for now as ecological enhancements and plans for planting etc. are unknown at this stage for VY.
LE 05	**Long Term ecology management and maintenance**	**Prerequisite - Roles & Responsibilities, implementation, statutory obligations**					Yes/No?	Client*Contractor*	4		**Where presumed, LE 04 has been achieved. Prerequisite:** **Roles and responsibilities have been defined. Site preparation and construction works have been planned and implemented. The client or contractor confirms compliance is monitored against all relevant UK and EU or international legislation relating to the ecology of the site.**
		Planning, liaison, data, monitoring and review management and maintenance	1	1		0		Design Team*	4		Ecologist to be appointed capable of undertaking a BREEAM 2018 ecology framework assessment to complete by end of Stage 2. Risk of non-compliance is appointment not made.
		Landscape and ecology management plan (or similar) development	1	1		0		Landscape Architect*Ecologist*	4		Landscape and ecology management plan, or similar, is developed in accordance with BS 42020:2013 covering as a minimum the first five years after project completion.
LE		**TOTAL:**	**13**	**9**	**1**	**0**					
		% of total score:	**15.00%**	**10.38%**	**1.15%**	**0.00%**					

Credit Ref.	Credit Title	Credit Name	Credits Available	Credits Targeted	Potential Additional	Credits Achieved	Mandatory Elements	Responsibilities	Deadline / RIBA Stage	Status	Comments / Actions
POLLUTION		0.75%									
Pol 01	**Impact of Refrigerants**	Pre-Requisite: systems with electric compressors					Yes/No?	SWECO*	4		**Prerequisite: All systems with electric compressors comply with the requirements of BS EN 378:2016 (parts 2 and 3). Refrigeration systems containing ammonia comply with the Institute of Refrigeration Ammonia Refrigeration Systems code of practice.**
		Impact of Refrigerants	2	1	1	0		SWECO*	4		1 credit - Refrigerant's Direct Effect Life Cycle CO_2 equivalent emissions (DELC CO_2e) of ≤ 1000 kgCO_2e/kW cooling/heating capacity. 2 credits - ≤ 100 kgCO_2e/kW
		Leak Detection	1	1		0		SWECO*	4		All systems are hermetically sealed or only use environmentally benign refrigerants or a permanent automated refrigerant leak detection system is required.
Pol 02	**Local air quality**	Local air quality	2	0	1	0		SWECO*	4		Emissions from all installed combustion plant that provide space heating and domestic hot water do not exceed the levels as set in BREEAM manual i.e. gas boilers NOx = 24mg/kWh.
Pol 03	**Flood and surface water management**	Flood Resilience	2	2		2		AKT II*	4		Drainage Assessment/FRA confirming 2 credits can likely be awarded.
		Surface Water Run Off	2	2		2		AKT II*CIT*	4		As above.
		Minimising Watercourse Pollution	1	0	1	0		AKT II*	4		Appropriate consultant to confirm there is no discharge from the developed site for rainfall up to 5 mm and the pollution prevention systems are in line with the SUDs requirements.
Pol 04	**Reduction of Night Time Light Pollution**	Reduction of Night Time Light Pollution	1	1		0		SWECO*	4		External lighting design is in line with ILP guidance of obtrusive light and can be automatically switched off. Illuminated advertisements are designed in compliance with ILP PLG05 The Brightness of Illuminated Advertisements.
Pol 05	**Reduction of Noise Pollution**	Reduction of Noise Pollution	1	1		0		Sandy Brown*	4		A BS 4142:2014 compliant noise impact assessment to be carried out by Acoustician.
Pol		**TOTAL:**	**12**	**8**	**3**	**4**					
		% of total score:	**9.00%**	**6.00%**	**2.25%**	**3.00%**					
INNOVATION		1.00%									
Inn 01	**Man 03**	Responsible construction practices	1	1		0		Contractor*			Not Targeted.
Inn 03	**Hea 01**	Visual Comfort	1	0		0		Architect*Contractor*			Not Targeted.
Inn 03	**Hea 02**	Emissions by construction products	0	0		0		M&E Consultant* Architect*Contractor*			Not Targeted.
Inn 04	**Hea 06**	Security of Site & Building	1	0		0		Architect*Contractor*Specialist*			Not Targeted.
Inn 05	**Ene 01**	Reduction of Energy Use & Carbon Emissions	5	0		0		M&E Consultant*			Not Targeted.
Inn 06	**Wat 01**	Water consumption	1	0		0		M&E Consultant* Architect*Contractor*			Not Targeted.
Inn 07	**Mat 01**	Environmental impacts from construction products - Building life cycle assessment (LCA)	3	1		0		LCA Specialist*KPF*Cost Consultant*AKT II*CIT*			Assumed that the premium LCA route is chosen. Only available if concept design options are completed in full.
Inn 08	**Mat 03**	Responsible Sourcing of construction products	1	0		0		Architect*Contractor*			Not Targeted.
Inn 09	**Wst 01**	Construction waste management	1	0		0		Contractor*			Not Targeted.
Inn 10	**Wst 02**	Use of recycled and sustainably sourced aggregates	1	0		0		Architect*Contractor*			Not Targeted..
Inn 11	**Wst 05**	Responding to Climate Change	1	0	1	0		Contractor*Architect* Structural Consultant			Potentially available based on other credits in this assessment.
Inn 12	**LE 02**	Ecological value of site and protection of ecological features	1	0		0		Architect*Contractor*			Not Targeted.
Inn		**TOTAL:**	**10**	**2**	**1**	**0**					
		% of total score:	**10.00%**	**2.00%**	**1.00%**	**0.00%**					

Appendix E – **Thermal Comfort Report**

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Thermal Comfort Report

Vinegar Yard

65200352/CG/201126
Revision 03

SWECO

Issue	Date	Reason for Issue	Prepared		Checked		Approved	
01	29/11/18	Revision for issue	CG	29/11/18	GC	29/11/18	PH	29/11/18
02	12/12/18	Revision for issue	CG	12/12/18	GC	12/12/18	PH	12/12/18
03	26/11/20	Revision for issue	CG	26/11/20				

Natural Ventilation and Thermal Comfort
65200352/CG/201126
Revision 03

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1. Executive Summary

The aim of this report is to provide an overview of thermal comfort within the offices, healthcare spaces and retail areas at Vinegar Yard development, for the current weather prediction and for a projected climate change scenario.

This study summarises the latest façade optimisation strategies proposed as regards glazing to solid ratio, solar coatings and shading. These optimisation measures have contributed substantially to increase the fabric energy efficiency, reduce solar gains, cooling loads and its associated carbon emissions.

A detailed thermal comfort analysis using dynamic simulation modelling was carried out in terms of summer and winter operative temperatures; and HVAC systems response to peak demand.

This report shows compliance with the GLA's Cooling Hierarchy and CIBSE thermal comfort criteria. It refers to BREEAM UK New Construction 2018 specific requirements on achieving Hea 04 Thermal Modelling credit.

The results show that all offices, retail areas and healthcare spaces comply with GLA and BREEAM overheating criteria under the moderate summer scenario (DSY1).

The occupants will feel the internal environment to be normal, i.e. not cold or warm, for all the climate predictions assessed (DSY1, DSY2 and DSY3) with less than 10% of people feeling uncomfortable in most of the operating hours.

2. Introduction

The aim of this study is to assess the indoor thermal comfort within the office, healthcare and retail areas at Vinegar Yard development, located in Central London, for current and future weather predictions.

This document summarises the latest design recommendations regarding façade optimisation and calculations heating and cooling loads using dynamic simulation software.

It also highlights the potential credits that could be awarded on Health and Wellbeing (Hea 04) credit under BREEAM New construction 2018 for Non-domestic buildings scheme.

2.1 Development Description

Vinegar Yard is a 19-storey mixed-use development comprised of retail in ground level, 10 levels of healthcare areas and 8 levels of offices. This is a development to provide a flagship Vinegar Yard for St Thomas Bermondsey Limited at the junction of St. Thomas Street and Fenning Street.

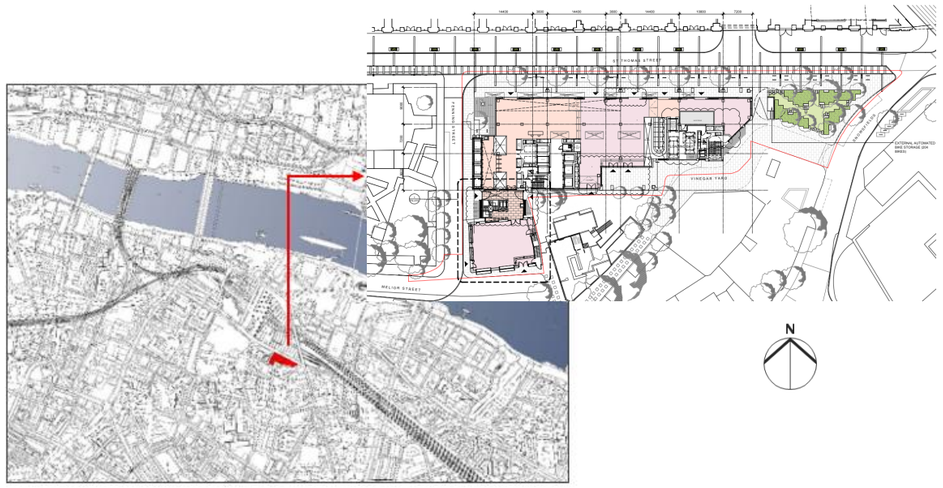


Figure 2.1 Vinegar Yard development: London location plan

2.2 Building Regulations 2013 Part L2A Compliance – Criterion 3

Criterion 3 of Part L2A of the Building Regulations 2013 concerns the amount of solar gain entering the building through glazing. It is understood that the objective of this Criterion is to ensure that spaces are not excessively serviced to maintain thermal comfort, and thus to ensure that the energy consumption and carbon dioxide emissions related to those services are minimised.

This Criterion is purely related to solar gains compared against a benchmark notional building. There is no other indication of overheating compliance from Part L2A 2013 Building Regulations. However, the GLA encourages developments to assess the risk of overheating in non-residential buildings through dynamic simulation as stated in their SPG, section 3.2.3: *"Overheating is not fully assessed by carbon dioxide emission models; therefore, developers are encouraged to* ***undertake dynamic thermal modelling*** *to ensure that their development does not overheat."*

2.53 For the purposes of Part L, reasonable provision for limiting solar gain through the building fabric would be demonstrated by showing that, for each space in the building that is either occupied or mechanically cooled, the solar gains through the glazing aggregated over the period from April to September inclusive are no greater than would occur through one of the following reference glazing systems with a defined total solar energy transmittance (g-value) calculated according to BS EN 410:

a. For every space that is defined in the National Calculation Methodology (NCM) database as being side lit, the reference case is an east-facing façade with full-width glazing to a height of 1.0 m having a framing factor of 10 per cent and a normal solar energy transmittance (g-value) of 0.68.

b. For every space that is defined in the NCM database as being top lit, and whose average zone height is not greater than 6 m, the reference case is a horizontal roof of the same total area that is 10 per cent glazed as viewed from the inside out and having roof-lights that have a framing factor of 25 per cent and a normal solar energy transmittance (g-value) of 0.68.

c. For every space that is defined in the NCM database as being top lit and whose average zone height is greater than 6 m, the reference case is a horizontal roof of the same total area that is 20 per cent glazed as viewed from the inside out and having roof-lights that have a framing factor of 15 per cent and a normal solar energy transmittance (g-value) of 0.46;

Part L2A,2013 criterion 3

2.3 Thermal Comfort Assessment Criteria

Operative temperature as defined by CIBSE Guide A refers to the combination of the air temperature and the mean radiant temperature into a single value to express their joint effect. It is usually the most important variable affecting thermal comfort.

2.3.1 Naturally Ventilated Spaces

CIBSE TM 52: 2013 is used to check overheating in non-residential naturally ventilated buildings.

The assessment consists of three criteria which are detailed below. Of which passing two of the three criteria results into compliance essentially indicate low or no risk of overheating.

ΔT is the difference between actual operative room temperature (T_{OP}) and the maximum acceptable room temperature (T_{max}). The T_{max} is calculated by:

$$T_{max} = 0.33 \times T_{rm} + 21.8$$

Where T_{rm} is the outdoor running mean temperature (°C).

Criterion 1: Hours of Exceedance (H_e)

The number of hours (He) during which DT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.

Criterion 2: Daily weighted exceedance (We)

To allow for the severity of overheating the weighted exceedance (W_e) shall be less than or equal to 6 in any one day where:

$$W_e = (\sum h_e) \times WF$$

$$= (h_{e0} \times 0) + (h_{e1} \times 1) + (h_{e2} \times 2) + (h_{e3} \times 3)$$

Where WF = 0 if ΔT≤0; Otherwise WF = ΔT and h_{ey} is the time (hrs) when WF = y

Criterion 3: Upper limit temperature (Tupp)

To set an absolute maximum value for the indoor operative temperature the value of DT shall not exceed 4 K.

It is recommended that, any occupied spaces **pass 2 of the 3** above presented criteria to indicate the absence of overheating within the occupancy space.

2.3.2 Mechanically Cooled Spaces

CIBSE Guide A Environmental Design 2015 recommends winter and summer operative temperatures for a range of air-conditioned building types in Table 1.5. For open plan offices, they range between 21-23°C in winter and 22-25°C in summer; and for retail between 19-21°C in winter and 21-25°C in summer.

These temperature ranges corresponded to a predicted mean vote (PMV) of ±0.5 and predicted percentage dissatisfied of 10%.

Table 1.5 Recommended comfort criteria for specific applications — *continued*

Building/room type	Customary winter operative temperatures for stated activity and clothing levels*			Customary summer operative temperatures (air conditioned buildings†) for stated activity and clothing levels*		
	Temp. / °C	Activity / met	Clothing / clo	Temp. / °C	Activity / met	Clothing / clo
Offices:						
— board room, large conference room	21–23	1.2	0.9	22–25	1.2	0.7
— general, small conference room, executive office	21–23	1.2	0.9	22–25	1.2	0.7
— open–plan	21–23	1.2	0.9	22–25	1.2	0.7
Retailing:						
— shopping malls	12–19[1]	1.8	1.2	21–25[1]	1.8	0.6
— small shops, department stores[23]	19–21	1.4	1.0	21–25	1.3	0.6
— department stores (upper floors)	19–21	1.4	1.0	21–25	1.3	0.6
— supermarkets[30]	19–21	1.4	1.0	21–25	1.3	0.6
Hospitals and health care buildings:						
— audiometric rooms	—	—	—	—	—	—
— bedheads/wards	22–24	0.9	1.4	23–25	0.9	1.2
— circulation spaces (wards)[20]	19–24[1]	1.8	0.8	21–25[1]	1.8	0.6
— consulting/treatment rooms	22–24	1.4	0.6	23–25	1.4	0.4
General building areas:						
— corridors	19–21	1.4	1.0	21–25	1.3	0.6
— entrance halls/lobbies	19–21	1.4	1.0	21–25	1.3	0.6
— kitchens (commercial)	15–18	1.8	1.0	18–25	1.6	0.6
— toilets	19–21	—	—	21–25	—	—
— waiting areas/rooms	19–21	1.4	1.0	21–25	1.3	0.6

A mechanically cooled building or space should not exceed the predicted indoor temperature values tabulated in table 1.8 for more than 3% of occupied hours for thermal comfort (CIBSE Guide A, 2015), assuming clothing insulation of 1.0 for winter and 0.6 for summer.

Table 1.8 Maximum temperatures (category II expectation) for indoor environment in indoor spaces; clothing is assumed to be 1.0 clo in winter and 0.5 clo in summer (see Table 1.7 for category definitions) (data source: BS EN 15251 (BSI, 2007)

Type and use of space	Assumed activity level (/ met)	Maximum temperature for stated clothing level	
		Winter clo = 1.0	Summer clo = 0.5
Residential (sedentary)	1.2	24.0	26.0
Residential (active)	1.5	22.0	—
Offices	1.2	24.0	26.0
Public spaces (auditoria, café etc.)	~1.2	24.0	26.0
Classrooms	1.2	24.0	26.0
Kindergarten	1.4	22.5	25.5
Shops	1.6	22.0	25.0

In this study offices and healthcare areas are mixed-mode ventilated, cooling will be provided for retail and lobby. The lower and upper temperature limits for those uses for winter and summer respectively is targeted at:

- Offices: Winter: 21°C / Summer: 25°C
- Healthcare: Winter: 22°C / Summer: 25°C
- Retail: Winter: 19°C / Summer: 25°C
- Lobby: Winter: 19°C / Summer: 25°C

2.3.3 Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied (PPD)

PMV and PPD are defined within the EN ISO 7730:2005 as follows:

"A human being's thermal sensation is mainly related to the thermal balance of his or her body as a whole. This balance is influenced by physical activity and clothing, as well as the environmental parameters: air temperature, mean radiant temperature, air velocity and air humidity. When these factors have been estimated or measured, the thermal sensation of the body as a whole can be predicted by calculating the predicted mean vote (PMV). The PMV is an index that predicts the mean value of the votes of a large group of persons on the 7-point thermal sensation scale (see Table 1), based on the heat balance of the human body. Thermal balance is obtained when the internal heat production in the body is equal to the loss of heat to the environment. In a moderate environment, the human thermoregulatory system will automatically attempt to modify skin temperature and sweat secretion to maintain heat balance."

The predicted percentage dissatisfied (PPD) index provides information on thermal discomfort or thermal dissatisfaction by predicting the percentage of people likely to feel too warm or too cool in a given environment. The PPD can be obtained from the PMV, refer to figure 1.3 (Source: CIBSE Guide A 2015).

The assessment considers the following thermal comfort parameters:

Occupancy type	Nominal Design air speed (m/s)	Activity level	Clothing level (clo)
All spaces	0.15	Very light work	0.50 summer clothing 0.80 winter clothing

Table 1 — Seven-point thermal sensation scale

+ 3	Hot
+ 2	Warm
+ 1	Slightly warm
0	Neutral
– 1	Slightly cool
–2	Cool
– 3	Cold

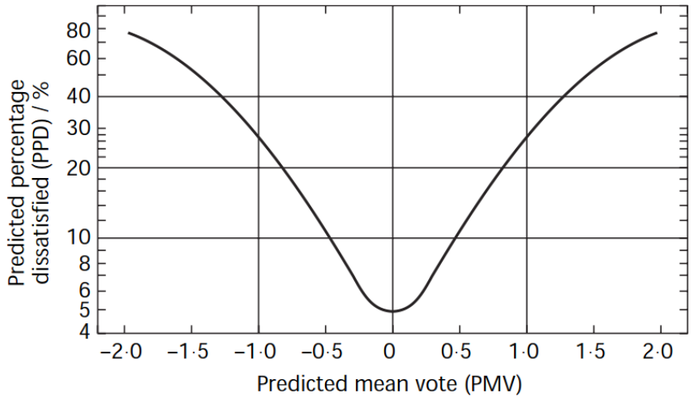


Figure 1.3 PPD as a function of PMV

2.4 Greater London Authority Guidance (GLA) 2018

2.4.1 Cooling Hierarchy

Paragraph 9.1 of the GLA Guidance on Preparing Energy Assessments (October 2018) states that major development proposals should reduce potential overheating and reliance on air-conditioning systems and demonstrate this in accordance with the cooling hierarchy outlined as follows:

London Plan: **Policy 5.9** – Cooling hierarchy
1. Minimise internal heat generation through **energy efficient design**.
2. Reduce the amount of heat entering a building in summer through **passive shading measures** including balconies, louvres, internal or external blinds, shutters, trees and vegetation.
3. Manage the heat within the building through exposed internal **thermal mass and high ceilings**.
4. **Passive ventilation** through the use of openable windows, shallow floorplates, dual aspect units designing in the 'stack effect'.
5. **Mechanical ventilation** can be used to make use of 'free cooling' where the outside temperature is below that in the building during summer months

2.4.2 Overheating Risk Analysis

In line with the GLA Guidance paragraph 9.2 all room pass Part L2A Criterion 3, the **BRUKL reports** are included in Appendix D within the Energy and Sustainability Statement.

In accordance with BREEAM New Construction 2018 the overheating risk analysis follows:

Thermal Comfort Period	Assessment Criteria Reference
Summer	CIBSE TM52:2013 - "The limits of thermal comfort: avoiding overheating in European buildings" CIBSE Guide A 2015, table 1.5
Winter	CIBSE Guide A 2015, table 1.5

This report shows overheating analysis considering 3 weather data scenarios relevant to the site location of the development (**London Weather Central – LWC**) in accordance with CIBSE TM49: Design Summer Years for London (2014):

Design Weather File	Summer description
DSY1 2020 high emissions 50% percentile	Moderately warm
DSY2 2020 high emissions 50% percentile	Very intense single warm spell
DSY3 2020 high emissions 50% percentile	Prolonged period of persistent warmth

Full compliance with the overheating criteria is sought for DSY1 scenario and mitigation measures are proposed to meet the criteria for the other two weather projections.

2.5 BREEAM UK New Construction 2018 – Hea 04 Thermal Comfort

This report shows evidence to achieve one credit under Hea 04 Thermal Comfort – Thermal Modelling and Design for Future Thermal Comfort (criteria 1 to 8), the table below summarizes where the relevant information is located within this report:

Hea 04 – Thermal Modelling Criteria	Section within this report
1. Thermal modelling has been carried out using software in accordance with CIBSE AM11 Building Energy and Environmental Modelling.	Section 3 - Methodology
2. The software used to carry out the simulation at the detailed design stage provides full dynamic thermal analysis. For smaller and more basic building designs with less complex heating or cooling systems, an alternative less complex means of analysis may be appropriate (such methodologies must still be in accordance with CIBSE AM11).	Section 3 – Methodology Section 7 - Results

Hea 04 – Thermal Modelling Criteria	Section within this report
3. The modelling demonstrates that: a. For air-conditioned buildings, summer and winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental Design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type).	Section 7.2 – Mixed Ventilation Scenario and adaptability to climate change
b. For naturally ventilated/free running buildings: i. Winter operative temperature ranges in occupied spaces are in accordance with the criteria set out in CIBSE Guide A Environmental design, Table 1.5; or other appropriate industry standard (where this sets a higher or more appropriate requirement/level for the building type). ii. The building is designed to limit the risk of overheating, in accordance with the adaptive comfort methodology outlined in CIBSE TM52: The limits of thermal comfort: avoiding overheating in European buildings.	The proposal is to have mixed-mode or night-time ventilation to reduce cooling loads within the occupied spaces.
4. For air-conditioned buildings, the PMV (predicted mean vote) and PPD (predicted percentage of dissatisfied) indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.	Section 7.3 – PMV and PPD
5. Criteria 1 to 4 are achieved	Please refer to above – criteria 1-4 have been demonstrably achieved

Hea 04 – Thermal Modelling Criteria	Section within this report
6. The thermal modelling demonstrates that the relevant requirements set out in criterion 3 of Hea04 are achieved for a projected climate change environment.	Refer to Table 7.1.1 and Section 7.2 which demonstrates that the future weather files were use in the modelling process and the proposal meets the requirements.
7. Not applicable – criterion 6 has been met.	n/a – see above.
8. For air conditioned buildings, the PMV and the PPD indices based on the above modelling are reported via the BREEAM assessment scoring and reporting tool.	The PMV and PPD values in section 7.2 will be reflected in the Building scoring and reporting tool.

3. Methodology

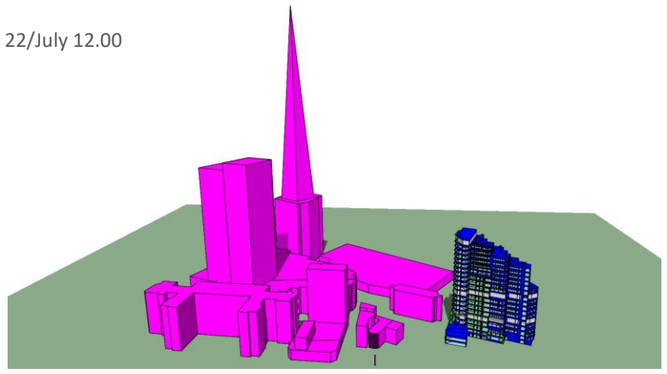
3.1 Thermal Modelling

Sweco have used Integrated Environmental Systems (IES VE) dynamic simulation software to produce the simulation results for this report. The IES software has been approved by the Department for Communities and Local Government (DCLG) for use as a Dynamic Simulation Model (DSM) software package. As part of its approval process, the IES software had to demonstrate that it satisfies all the tests and other requirements defined within sections 2 and 3 of "CIBSE TM33:2006, CIBSE standard tests for the assessment of building services design software".

IES VE software is also listed within CIBSE AM 11: 2015 Building Energy and Environmental Modelling Appendix D as an accredited tool for dynamic simulation modelling.

The following images have been extracted from Vinegar Yard 3D model (shown in blue) in summer (top) and winter (bottom) days at noon.

22/July 12.00



22/Dec 12.00

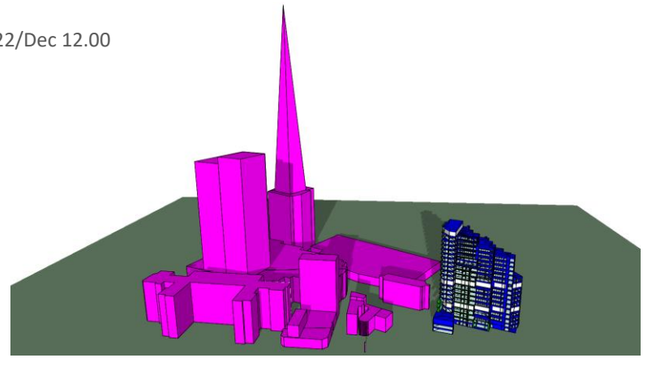


Figure 3-1 IES thermal model view

3.2 Weather Data

The overheating analysis was undertaken using the CIBSE TM49: 'London Design Summer Years' (DSY) mentioned in section 2.4.2.

The table below indicates the average percentage of hours during the summer season (April to September) that the external dry-bulb temperature is above a certain value for each analysed weather scenario:

Dry-bulb temperature (°C) - % hours in range							
	> 26.00	> 27.00	> 28.00	> 29.00	> 30.00	> 31.00	> 32.00
LWC DSY1	5.5	3.2	1.8	1.0	0.6	0.3	0.2
LWC DSY2	6.2	4.5	3.1	2.2	1.7	1.0	0.8
LWC DSY3	7.4	5.8	4.4	3.2	2.1	1.2	0.8

It can be noted that DSY2 and DSY3 have prolonged hours of high temperatures over the summer season. The design intention is to comply with DSY 1 weather data and provide recommendations of adaptation measures to achieve thermal comfort for DSY 2 and 3 in the summer.

3.3 Façade Optimization

Detailed thermal modelling analysis (using industry-recognised & DCLG Certified dynamic simulation software) has been used during the design process to optimise the glazing modifications. This was a useful tool for balancing cooling loads against daylighting, which ensure reasonable levels of natural daylight penetration while limiting unwanted solar gain and heat loss.

Through simulations, it was possible to determine that the design the building façades responds to its orientation and subsequent relationship to direct sun angles. The optimisation of the façade was achieved through balancing the performance specification of the solar-controlled glass, depth of window reveals and actual proportions of glazing and opaque façade elements.

The building façade improvement including glazing modifications will be designed such that the building form and massing will provide passive control of solar gains. This will ensure that solar gains are maximised in winter months (when they are beneficial in reducing heating loads), while in summer months they are minimised (to reduce the effective cooling loads).

4. Building Envelope

The building element properties applied to the thermal model are outlined in the following tables.

Table 4-1 Thermal Performance of Opaque Building Elements

Building Element Parameters	Values
Building Air tightness	3 $m^3/h/m^2$ @ 50pa
Curtain Wall	1.2 W/m^2K
External wall	0.20 W/m^2K
Exposed Roof	0.10 W/m^2K
Internal Wall (Non-Insulated)	1.80 W/m^2K
Internal Ceiling / Floor	1.0 W/m^2K
Exposed Floor	0.15 W/m^2K

Table 4-2 Thermal Performance of Glazing

Location	Glazing G-value (BS EN 410)	Visible Light Transmission	Overall Glazing U-value
Office	0.33	60%	1.2 W/m^2K
Healthcare	0.33	60%	1.2 W/m^2K
Retail	0.50	70%	1.2 W/m^2K
Office Lobby	0.50	70%	1.2 W/m^2K

Windows on healthcare and office levels are set back 175 mm from the external wall line, these reveals help minimising solar gains into the space in summer.

4.1 Auxiliary Ventilation and Infiltration

Fresh air supply is assigned to the areas as shown below.

Table 4.1-1 Auxiliary Ventilation Rates

Location	Description	
All spaces	Infiltration rate	0.15 ach
	Auxiliary Ventilation	12 L/s per person

4.2 Internal Loads and Operational Profiles

A variety of uses is proposed across the four buildings analysed. The tables below break down the internal gains and related operational profiles.

Table 4.2 Internal Gains per Building Use

Location	Lighting (W/m^2)	Small power (W/m^2)	People (m2/per)	Cooling Set-point (°C)	Heating Set-point (°C)	Operational Profile
Offices	6	15	8	23	22	8am to 6pm
Healthcare	15	3	10	23	22	8am to 6pm
Retail	25	5	5	22	21	6am to 8pm
Office Lobby	10	5	4	23	21	8am to 6pm

5. HVAC Strategy

Active features include the power-driven systems used in to operate the building accounting for energy efficiency considerations as presented in this section.

5.1 Heating, Cooling and Ventilation Strategy

The heating and cooling strategy for the Proposed Development will primarily be achieved through reversible air sourced heat pumps (ASHP) located on the roof. The primary function of the heat-pumps will be to move heat around within the building as required during simultaneous heating and cooling operation and to inject heat from thermal storage when there is a deficit or to reject heat to outside when there is a surplus (cannot be stored).

The office buildings have enough thermal energy flows generated by human activity to provide the base for both heating and cooling of the entire site. By connecting buildings spaces with different needs and balancing the energy between them, effectively using all available energy flows makes it possible to decrease both pollution and the energy consumption on the proposed site.

During simultaneous heating and cooling operation, heat will be taken from spaces which require cooling and conveyed via a water loop to the ASHP. At the heat pumps, this heat will be upgraded and conveyed via a low temperature hot water loop to the spaces which require heating.

The ventilation strategy for the office spaces will primarily be achieved through floor by floor (floor void) mounted mechanical ventilation with heat recovery (MVHR) units distributed across the floor spaces. These units will interface with louvres in the external façade to convey air from outside into the building's internal occupied spaces while simultaneously exhausting a similar amount of indoor air. It is estimated that 20-40% of cooling energy can be saved through the use of free cooler outside air to ventilate the spaces during mid-season and night-time.

Heat exchangers within these units will transfer a large portion of the heat contained within the indoor air to the outdoor air being supplied which will mitigate excessive heat loss within the winter.

6. Night Purge Ventilation Strategy

Night purge ventilation is a passive cooling method used during summer which main objective is reducing the need for auxiliary cooling. This strategy consists on purging the heat that has been absorbed by the thermal mass during the day and then release indoors at night time. By operable windows external fresh air is driven into the building by natural forces of the wind or thermally generated pressures, purging indoor warm air and cooling down the thermal mass which will act as a heat sink during the following day.

The figure below illustrates an overview of the night purge ventilation strategy. This method is to be used in the office areas by means of top hung openings across the façade that can be manually or automatic opened for air supply.

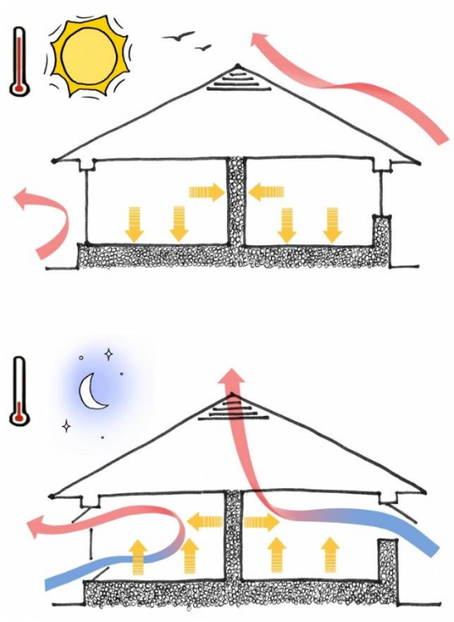


Figure 6-1 Night purge ventilation strategy. Google reference.

During the day fresh air ventilation will be provided by heat recovery units distributed across the floor spaces.

6.1 Required Opening Free Areas

The image below explains the term 'effective free area' used within this report when referring to the clear open area of a window. It is highlighted in purple in the image below and disregards any fixed framing of the window.

Figure 6.1 Effective free area illustration

6.1.1 Windows

For this strategy, the windows at the office and healthcare areas are closed during the day from 8am to 6pm when occupied and allow for natural ventilation at night by achieving the opening areas shown below.

Table 6.1.1 Glazing Equivalent Free Area

Location	Openable Width (m)	Openable Height (m)	Openable Area (m^2)	**Effective Free Area (m^2)**	Max opening degree (°)
Bay type 1.7x0.57	1.63	0.43	0.96	0.43	30
Bay type 2.0x0.57	1.70	0.43	1.14	0.51	30

**Openable values do not include framing.*

6.2 Opening Requirements and Controls

Table 6.2 Opening Operational Profiles

Windows	Day time		Night-time	
	Hours	Degree of opening	Hours	Degree of opening
Office	8am - 6pm	Closed	6pm – 8am	fully open
Healthcare	8am - 6pm	Closed	6pm – 8am	fully open
Retail and Lobby	Cooling provided			

Note: the term 'fully open' refers to the effective free area shown in Table .

The openable windows open only at night when the internal temperature is below 22°C and the outside temperature is below the room dry resultant temperature.

Figure 6.2 shows the profile of night purge ventilation by means of openable windows operating during unoccupied hours (in blue) and active cooling functioning on working hours (in red). The graph corresponds to the warmest day of the year which is July 22nd.

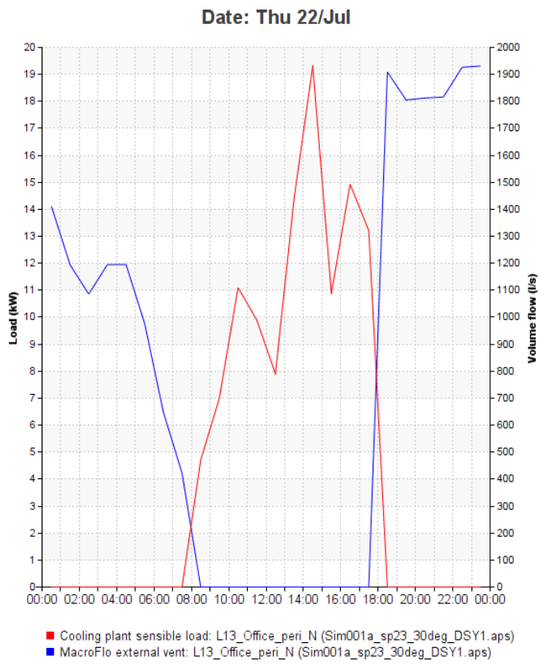


Figure 6.2 Time operation of night purge ventilation vs active cooling.

6.3 Glazed lifts shafts

An overheating check was carried out for the glazed lifts shafts given their high percentage of glazing. The west facing and largest shaft has 1300mm overhangs placed in every level in order to reduce the internal temperature; the other two smaller shafts do not have shading elements. 1m height by the front glazing length of each lift, located at the top and bottom portion, have been assumed as openable windows continuously on in order to account for the stack ventilation effect. The opening areas of the west lift is 12.3m^2 each and 1.62m^2 for the North facing ones (shown in green in figure 6.3 below.

The threshold temperature set as 40C° is not exceeded at any time during the year under weather file DSY2 which considers future weather scenarios with more extreme summers.

Table 6.3 Glazed lifts operative temperatures annual percentages and maximum temperatures

DSY2					
Operative temperature (°C) - % hours in range					
Location	> 20.00	> 25.00	> 30.00	> 35.00	> 40.00
Glass lift LHS	79.1	9.7	0.1	0	0
Glass lift RHS	79.3	9.2	0	0	0
West Glass lift	85	27.8	9.2	2	0

	Peak Date	Peak Time	Operative temperature (°C)
Glass lift LHS	31-Jan	09:30	30.5
Glass lift RHS	12-Jan	09:30	30.15
West Glass lift	08-Jan	04:30	39.49

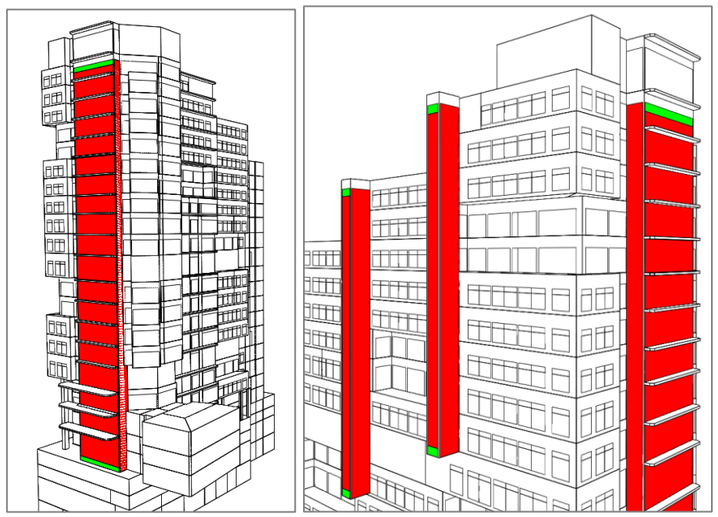


Figure 6.3 Glazed lifts openable windows (in green) to account for stack ventilation effect

7. Thermal Comfort Results

7.1 Mixed mode Ventilation and Adaptability to Climate Change

7.1.1 Summer Thermal Comfort

All the simulations carried out for the mixed mode assessment at offices and healthcare areas considers openable free window areas as 0.43m^2 and 0.51 m^2 to provide night purge ventilation under DSY1 weather file.

The lobby and retail areas will be all mechanically cooled and will not have internal blinds as they would block views out. As the risk of overheating is higher for DSY 2 and 3 in the retail spaces, due to high glazing ratio, it is recommended that retractable awnings, or other types of external shading, are provided across the facades to control solar gains without hampering views in and out of the space.

Moreover, the design development will inform the cooling demand within the space. For this study it was assumed 10W/m^2 this can be further optimised and allowances for climate change and extreme weather projections can be made.

The operative temperature threshold for offices, healthcare, retail and lobby is 25ºC. The target is to have less than 3% of occupied hours above this temperature. The threshold of 25ºC is given by CIBSE Guide A, as stated in section 2.3.2. Results are presented in the table below.

Table 7-2 summarizes the scenarios assessed to determine the risk of overheating and thermal comfort conditions. Thermal modelling results demonstrate that the building design and services strategy for comfort cooling can deliver thermal comfort levels in occupied spaces in accordance with the criteria set out in CIBSE Guide A by using Design Summer Year.

The table below shows the percentage of annual occupied hours that the operative temperature exceeds 25°C during occupied hours in the offices, retail, healthcare areas and lobby considering 3% as the maximum allowance to ensure thermal comfort conditions.

All the areas comply with the criteria for weather scenario DSY1. Cooling set point 23°C during the day and purge ventilation at night was set for offices and healthcare areas. This set point sits within the band 24°C ±2 specified by the M&E design.

The last two columns illustrate the scenarios passing both criteria for each of the weather files including DSY2 and DSY3 as they are considered intense summer periods for assessing projected climate change scenarios in line with BREEAM Hea 04 methodology. Vinegar Yard development can ensure thermal comfort conditions for future climate change in all the areas assessed.

Table 7.2 Percentage of hours of operative temperature above 25ºC

Offices, Healthcare

Building Parameters		Operative temperature (°C) - % hours			Pass Operative temperature Criteria	Pass PMV & PPD Criteria
Scenario	Set point °C	DSY1	DSY2	DSY3		
		>25°C	>25°C	>25°C		
1	24	1.35	-	-	No	No
2	23	0.00	0.10	0.01	Yes	Yes

Office Lobby

Building Parameters		Operative temperature (°C) - % hours			Pass Operative temperature Criteria	Pass PMV & PPD Criteria
Scenario	Set point °C	DSY1	DSY2	DSY3		
		>25°C	>25°C	>25°C		
1	24	0.18	-	-	Yes	No
2	23	0.10	0.43	0.54	Yes	Yes

Retail

Building Parameters		Operative temperature (°C) - % hours			Pass Operative temperature Criteria	Pass PMV & PPD Criteria
Scenario	Set point °C	DSY1	DSY2	DSY3		
		>25°C	>25°C	>25°C		
1	22	0.18	0.64	0.82	Yes	Yes

7.1.2 Thermal zoning

The thermal modelling also has informed the temperature control strategy for the building and its users. The current assessment has been carried out based on the thermal zoning below to ensure providing the adequate amount of heating and cooling that consider the different requirements for the central core of a building compared with the external perimeter adjacent to the glazing.

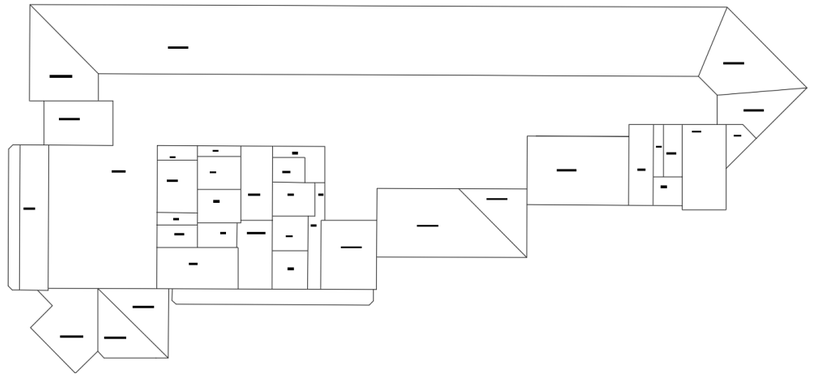


Figure 7.1.2 Vinegar Yard zoning Level 9

7.1.3 Winter Thermal Comfort

Operative temperature for winter comfort range as per CIBSE Guide A table 1.5 is presented in the table below. Results show that all the areas assessed are within the comfortable range during the occupied hours.

A comfortable indoor temperature is maintained in offices and healthcare areas when set point is 22°C; and in retail and lobby when setpoint is 21°C.

Table 7.2.2 Percentage of hours of winter operative temperature ranges – DSY 1

Use	Winter comfort range (CIBSE Table 1.5)	Operative temperature (°C) - % hours in range		
		Winter		
		< 19	< 21	< 22
Offices	21-23°C		0.7	
Healthcare	22-25°C			0.8
Retail	19-21°C	0		
Lobby	19-21°C	0		

7.2 PMV and PPD

Regarding summer thermal comfort indication of predicted mean vote (PMV) and predicted percentage dissatisfied (PPD), as defined in EN ISO 7730:2005, the results are indicated as a range in the table below in which offices, retail areas and office lobby were assessed under current and future weather predictions (DSY2 and DSY3)

Table 7.2 PMV/PPD for offices, retail and office lobby

Weather File	Use	PMV	PPD
DSY1	All areas	-0.25 to 0.50	5-10%
DSY2			
DSY3			

Results indicate that all the areas assessed are within PMV band value 0.0 to 0.50, PPD corresponds to values between 5 to 10%. Based on the results, the occupants of the areas assessed will feel the environment to be normal, i.e. not cold or warm under current and future weather conditions. The designed HVAC cooling system can meet the set point rapidly due to high plant response.

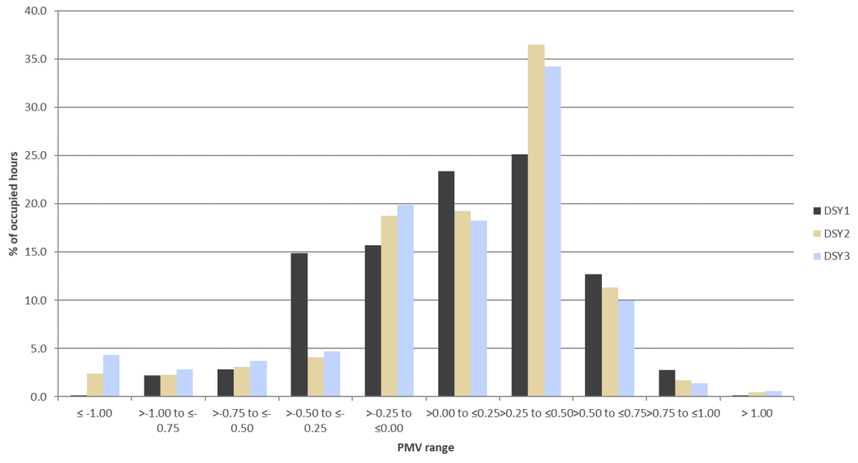


Figure 7.2-1 PMV range compliant for all the areas assessed

8. Conclusions

This report has given an overview of the passive design measures to provide thermal comfort conditions within the offices, retail, lobby and healthcare areas in Vinegar Yard development:

Façade Optimisation:

- At offices and healthcare areas window recess of 175mm providing shading and reducing solar radiation incidence; and 300mm overhang above large glazing panes.
- Glazing g value 0.33 on all the facades is a compliant option.
- For retail areas, it is recommended that retractable awnings, or other types of external shading, should be provided across the facades to control solar gains without hampering views in and out of the space.
- Glazing g value 0.33 on West and North glazed lift shafts.

Active measures include:

- HVAC system with summer set point of 23°C for offices, healthcare spaces and lobby; and 22°C for retail.
- HVAC system with winter set point of 22°C for offices, healthcare spaces; and 21°C for retail and lobby.
- The heating and cooling strategy for the Proposed Development will primarily be achieved through reversible air sourced heat pumps (ASHP) located on the roof.

Thermal modelling has confirmed that the above measures would provide a thermally comfortable indoor environment with acceptable ranges of people dissatisfied.

It can be concluded that the development achieves a comfortable environment under a mixed mode ventilated scenario under weather scenarios DSY1, DSY2 and DSY3.

It must be stressed that any change to specified equivalent opening free areas can drastically impact the results. Therefore, the design team should flag any issues regarding the reliance on opening windows for thermal comfort as the design develops.

8.1 BREEAM Compliance NC 2018_Hea04 credit

Regarding Health and Wellbeing (Hea) credit 04 – Thermal Comfort requirements of the BREEAM UK NC 2018 for Non-domestic buildings, the design team has conducted a thermal comfort study and applied appropriate measures to improve resilience and adaptability to a future weather scenario.

This study supports and complies with the requirements to achieve the two associated Hea04 credits as described in section 2.5.

8.2 GLA 2018_Cooling Hierarchy Compliance

Vinegar Yard development comply with the cooling hierarchy as set out in the right-hand side column:

London Plan: **Policy 5.9** – Cooling hierarchy	Building Strategy
1. Minimise internal heat generation through energy efficient design	Glazing ratio optimised throughout the building to provide sufficient daylight and solar control glass applied to minimise solar gains. LED lighting is proposed to reduce internal heat gains.
2. Reduce the amount of heat entering a building in summer through shading measures including balconies, louvres, internal or external blinds, shutters, trees and vegetation.	In office and healthcare areas glazing has 1750mm recess from the front of the façade and 300mm overhang over the large glazing panes.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.	High ceilings increase the volume of internal air and consequently the thermal inertia of the environment.
4. Passive ventilation	Night purge ventilation releases heat during the night when rooms are unoccupied, which reduces cooling demand during the day.
5. Mechanical ventilation	Highly efficient mechanical ventilation system is proposed for fresh air supply all year round.

London Plan: **Policy 5.9** – Cooling hierarchy	Building Strategy
6. Active cooling systems	Cooling is needed when internal temperature exceeds 23°C in offices, healthcare spaces and lobby; and 22°C in retail.

Appendices

Appendix A – PMV and PPD Tables

PMV

DSY1										
Predicted mean vote (PMV) - % of hours in range										
Room Name	<= -1.00	>-1.00 to <=-0.75	>-0.75 to <=-0.50	>-0.50 to <=-0.25	>-0.25 to <=0.00	>0.00 to <=0.25	>0.25 to <=0.50	>0.50 to <=0.75	>0.75 to <=1.00	> 1.00
L09_Outpatient	0	2.1	2.8	12.1	17.6	33.4	30.5	1.5	0	0
L09_Outpatient_peri_W	0	2.1	3.2	12.7	18.2	32.4	29.7	1.8	0	0
L09_Outpatient_peri_NW	0	2.7	4.2	13.7	18.9	29.8	28.3	2.4	0	0
L09_Outpatient_peri_N	0	2.4	3.4	13	18	31.7	29.7	1.9	0	0
L09_outpatient2_peri_S3	0	3.7	4.3	7.8	12	21.2	28.4	21	1.7	0
L09_outpatient2_peri_E	0	4.4	3.9	7.4	13.1	24	33.3	13.4	0.7	0
L09_outpatient2_peri_SW	0	3.5	4.2	7.8	12.8	20.2	29.8	20.2	1.5	0
L09_outpatient_peri_NE	0	1.7	2.1	11.2	16.9	25.7	36.4	5.9	0	0
L09_outpatient_peri_E	0	3.4	3.4	8.4	15.3	23.9	34.6	10.8	0.2	0
L09_Outpatient_peri_S	0	2.7	3.5	11.5	17	29.8	32.4	3.1	0	0
L09_Outpatient3_peri_SE	0	3.6	3.6	6.9	14	20.8	27.6	22.3	1.1	0
L18_Office	0	1.9	3.4	12.9	18.5	29.9	31.5	2	0	0
L18_Office2_peri_S2	0	3.8	3.7	7.9	12.3	19.8	28.2	22.5	1.8	0
L18_Office2_peri_E	0	4.2	3.4	6.9	12.4	20.5	32.1	19.7	0.9	0
L18_Office2_peri_SW	0	3.4	2.8	7.1	14.3	21.8	29.5	20.1	1.1	0
L18_Office2_peri_S	0	6.5	8.6	14.7	28.5	26.3	14.7	0.6	0	0
L18_Office2_peri_W	0	2.4	3.9	12.5	18.4	26.5	31.1	5.2	0	0
L13_Office_peri_W	0	2.7	3.8	13.8	18.7	33	26.2	1.8	0	0
L13_Office_peri_NW	0	3	4.4	14.3	19.1	28.5	27.9	2.8	0	0
L13_Office_peri_N	0	2.4	3.4	13.4	17.6	28.2	31.7	3.3	0	0
L13_Office2_peri_S4	0	3.1	3.8	8.9	12.7	19.2	24.4	23.4	4.5	0.1
L13_Office2_peri_E	0	4.5	4	7.6	13.7	23.7	32	14	0.6	0
L13_Office2_peri_SW	0	3.3	3.9	8.2	13.8	20.2	29.8	19.5	1.4	0
L13_Office_peri_S	0	2.8	3.8	10.9	17.5	26.2	32.6	6	0.2	0
L13_Office_peri_E	0	1.9	2.4	12.7	17.3	25.1	35.6	4.9	0.2	0
L13_Office_peri_E	0	2.9	1.8	9.2	15.9	20.3	29.9	19	1.1	0
L13_Office	0	1.9	3.7	13.4	18.3	33.9	27.3	1.5	0	0
L13_Office_peri_S3	0	3.2	4.3	11.1	16.4	27.2	33.6	4.3	0	0
L18_Office2_peri_N	0	3.6	2.8	7.2	15.2	22.7	32.4	15	1.1	0
L00_retail_peri_E	5.2	0	2.4	6.1	10.4	20.9	31.4	17.2	3.6	2.8
L00_retail_peri_N2	0.1	0	0.6	8.6	12.2	20.6	33.3	23.9	0.4	0.3
L00_lobby_dh	0	0	1.6	41.7	19.2	10.1	7.6	15.4	4.3	0
L00_lobby_peri_E	1.6	0	1	29.6	12.1	8.7	3.8	15.6	24.9	2.8
L00_lobby_peri_W	0.6	0	2.1	25.5	24.3	6.5	4.7	9	25.9	1.5
L00_retail_peri_N	0	0	0	0.5	14.6	33.6	34.7	16.6	0	0
L00_retail	0	0	0	0	31	47.7	6.6	14.7	0	0
L00_retail_peri_S	0	0	0	0.5	18.9	33.9	24.6	22	0.1	0
L00_lobby	0	0	0	59.8	2.6	4.3	1.3	27.7	4.2	0
L00_lobby_peri_N2	0	0	2	36.9	13.5	10.5	5.3	16.8	15.1	0
L00_lobby_peri_W	0	0	1.1	38.3	8	10.7	4	21.1	16.7	0
L00_lobby	0	0	0.1	57.4	2.7	5.6	2.3	32	0	0
Average	0.18	2.19	2.86	14.88	15.70	23.39	25.14	12.73	2.76	0.18

DSY2										
Predicted mean vote (PMV) - % of hours in range										
Room Name	<= -1.00	>-1.00 to <=-0.75	>-0.75 to <=-0.50	>-0.50 to <=-0.25	>-0.25 to <=0.00	>0.00 to <=0.25	>0.25 to <=0.50	>0.50 to <=0.75	>0.75 to <=1.00	> 1.00
L09_Outpatient	2.1	2.1	5.2	4.2	9.6	21.5	46.7	8.5	0	0
L09_Outpatient_peri_W	2.9	3.2	4.3	4.4	10.7	20.9	44.2	9.5	0	0
L09_Outpatient_peri_NW	4.4	4.2	3.3	6.1	11.2	20.1	41.1	9.4	0.2	0
L09_Outpatient_peri_N	3.5	3.6	3.7	5.4	11.1	19.5	43.6	9.7	0	0
L09_outpatient2_peri_S3	2	2.7	3.2	3.3	30.4	17.1	31.8	5.4	3.7	0.5
L09_outpatient2_peri_E	2.1	2.6	3.5	3.8	27.6	19.4	33.4	5.3	2.2	0
L09_outpatient2_peri_SW	2.1	2.8	3.1	3.7	32.1	17.9	29.3	5.1	3.4	0.4
L09_outpatient_peri_NE	3.1	3.4	2.9	4.7	15.7	18.6	42.2	8.2	1.2	0
L09_outpatient_peri_E	2.8	3	3.8	4.1	22.3	17.9	36.8	7	2.3	0
L09_Outpatient_peri_S	2.5	2.7	4.6	4.1	13.4	20.2	42.8	9.1	0.5	0
L09_Outpatient3_peri_SE	1.8	2.4	3.7	3.8	29.8	16.8	29.5	6.5	5.4	0.2
L18_Office	4	4	3.3	5.6	11.2	17.2	43.8	11	0	0
L18_Office2_peri_S2	2.4	2.5	2.9	3.4	32.4	17.1	29.3	5.5	3.9	0.5
L18_Office2_peri_E	2.3	2.4	3.3	3.5	32.7	19.1	28.9	4.6	3.2	0
L18_Office2_peri_SW	2.7	2.6	3.2	3.7	31.5	17.9	28.9	6	3.6	0
L18_Office2_peri_S	14.7	7.4	7.3	7.1	4.8	22.7	26.3	9.2	0.5	0
L18_Office2_peri_W	4.4	4	3.3	5.6	14.6	19.2	39.1	9	0.8	0
L13_Office_peri_W	3.7	4.2	3.4	5.9	10.2	20.2	42.4	10.2	0	0
L13_Office_peri_NW	4.9	4.3	3.4	6.3	12.2	18.6	39.5	10.5	0.3	0
L13_Office_peri_N	3.7	3.2	3.8	5.1	13.2	19	41.8	9.8	0.3	0
L13_Office2_peri_S4	3	2.5	2.8	3	30.3	16.3	28.5	5.2	7.9	0.6
L13_Office2_peri_E	3.1	2.3	3.7	3.4	26.6	19.5	33.1	5.7	2.6	0
L13_Office2_peri_SW	2.6	2.8	3.1	4	31.1	17.4	29.1	5.6	4	0.3
L13_Office_peri_S	3.7	3.1	4	5	17.9	18.7	37.6	8.9	1	0
L13_Office_peri_E	3.1	3.5	3.4	4	14.8	19.2	42.1	8.9	1	0
L13_Office_peri_E	2.2	2.9	3.4	3.2	31.5	18.4	26.8	7.5	4.1	0
L13_Office	2.8	3.3	4.4	4.7	9.8	20.7	43.9	10.5	0	0
L13_Office_peri_S3	3.3	3.2	3.7	4	14.7	21	41.8	7.5	0.8	0
L18_Office2_peri_N	3.4	2.9	3.7	2.9	26.4	19.2	31.1	6.4	4	0
L00_retail_peri_E	0	0.3	4.2	5.4	5.8	32.5	11.3	26.2	3.9	10.3
L00_retail_peri_N2	0	0.1	3.9	5.7	1.2	45.3	13	28.8	0.9	1
L00_lobby_dh	0	0.1	0.6	1.3	8.5	16	70.1	3.4	0	0
L00_lobby_peri_E	0	0	0.2	0.4	47.4	6.2	32.9	2.4	5.7	4.8
L00_lobby_peri_W	0	0.1	0.5	0.4	50.2	5.8	36.2	2.5	2.9	1.5
L00_retail_peri_N	0	0	5.1	8.8	0.7	29.6	1.6	54.3	0	0
L00_retail	0	0	0.5	7.4	0	28.6	0	63.5	0	0
L00_retail_peri_S	0	0	3.4	7	0.6	38.8	2	47.9	0.4	0
L00_lobby	0	0	0	0.3	8	8.2	81.2	2.3	0	0
L00_lobby_peri_N2	0	0.1	0.3	1.2	31.6	10.2	53.8	2.8	0	0
L00_lobby_peri_W	0	0	0.3	0.7	34.4	8.2	53.3	3.1	0	0
L00_lobby	0	0	0.1	0.6	0	9.7	86.8	2.8	0	0
Average	2.42	2.30	3.09	4.08	18.74	19.28	36.53	11.36	1.72	0.49

DSY3										
Predicted mean vote (PMV) - % of hours in range										
Room Name	<= -1.00	>-1.00 to <=-0.75	>-0.75 to <=-0.50	>-0.50 to <=-0.25	>-0.25 to <=0.00	>0.00 to <=0.25	>0.25 to <=0.50	>0.50 to <=0.75	>0.75 to <=1.00	> 1.00
L09_Outpatient	5.1	5.6	4.4	4.3	8.5	20.2	46.3	5.6	0	0
L09_Outpatient_peri_W	6.3	5	4.7	4.1	9.7	21.5	42.5	6.2	0	0
L09_Outpatient_peri_NW	8.1	4.1	5	4.7	10.4	19.9	40	7.8	0	0
L09_Outpatient_peri_N	6.8	5.1	4.7	4.2	10.4	20.8	41.6	6.4	0	0
L09_outpatient2_peri_S3	4.2	2.5	3.7	5.1	34.1	14.4	27.6	5.7	2.7	0
L09_outpatient2_peri_E	4.4	3.3	3.7	5.4	29.6	16	29.6	6.6	1.5	0
L09_outpatient2_peri_SW	4.2	2.7	4.2	4.8	34	14.2	26.9	5.4	3.4	0.2
L09_outpatient_peri_NE	6.6	4.2	4.8	4.7	18.8	17.1	38	5.6	0.2	0
L09_outpatient_peri_E	6.1	3.8	4	5.6	28.2	15.9	29.8	6.3	0.4	0
L09_Outpatient_peri_S	6	4.7	4.4	4.6	14.4	20.8	39.1	6	0	0
L09_Outpatient3_peri_SE	5	3.6	4	4	34.4	16	22.7	6.9	3.5	0
L18_Office	7.9	4.5	4.4	4.4	11.5	21.3	40.5	5.6	0	0
L18_Office2_peri_S2	4.1	2.6	3.8	5	34.9	14.2	27	5.4	2.9	0
L18_Office2_peri_E	3.9	3.1	3.7	5.6	35	14.8	25.5	6.1	2.2	0
L18_Office2_peri_SW	4.4	3.2	3.7	5	33.4	14.2	28.1	5.5	2.5	0
L18_Office2_peri_S	19.2	4.4	7.9	9.2	3.4	16	30.2	9.9	0	0
L18_Office2_peri_W	7.2	4.9	4.8	4.7	16.3	19.4	35.5	7	0.2	0
L13_Office_peri_W	6.9	5	5.1	4.5	8.9	21.9	40.8	6.9	0	0
L13_Office_peri_NW	8.9	3.9	5.3	4.7	11.5	20.8	37.3	7.5	0.1	0
L13_Office_peri_N	6.6	5.2	4.7	4.2	13.9	20.7	38.5	6.3	0	0
L13_Office2_peri_S4	4	3.1	4	3.9	31.7	13.8	25.5	6.6	7.6	0
L13_Office2_peri_E	4.5	3	4.2	5.8	29.2	16.6	28.1	6.6	2	0
L13_Office2_peri_SW	4.4	3	4.1	5.2	32.8	15	26.5	5.9	3.1	0.1
L13_Office_peri_S	6.9	4.4	4.6	4.9	19.9	20.3	32.8	6	0.2	0
L13_Office_peri_E	6	4.9	5	4.7	18.5	18.1	36.3	6.3	0.2	0
L13_Office_peri_E	4.7	4.3	4.2	5	31.1	14.8	24.8	6.6	4.5	0
L13_Office	5.9	5.3	5	3.9	8.2	22.9	42.6	6.3	0	0
L13_Office_peri_S3	5.5	3.9	4.5	5.6	17.1	19.3	37.6	6.4	0.1	0
L18_Office2_peri_N	5.2	3.9	4.1	5.3	28.3	14.6	29.5	5.5	3.6	0
L00_retail_peri_E	0	0.1	5	7.2	5.6	27.5	11.4	26.5	4.4	12.3
L00_retail_peri_N2	0	0	3.9	7.8	2.6	39.6	16.9	27	1.3	1.1
L00_lobby_dh	0	0.1	1	1.4	12.8	15.3	65.7	3.7	0	0
L00_lobby_peri_E	0	0	0.5	1	41.5	6.7	36.9	1.2	7.1	5.1
L00_lobby_peri_W	0	0.1	0.8	1.1	46.5	7	35	1.3	3.7	4.6
L00_retail_peri_N	0	0	5.1	11	0.7	31.9	1.7	49.7	0	0
L00_retail	0	0	0.4	9.5	0	30.4	0	59.7	0	0
L00_retail_peri_S	0	0	3.9	7.8	0.7	39	2.4	46.2	0	0
L00_lobby	0	0	0	0.5	13.1	8.2	76.5	1.6	0	0
L00_lobby_peri_N2	0	0	0.9	1.1	35.3	9.7	50.5	2.4	0	0
L00_lobby_peri_W	0	0	0.5	0.9	37.6	8.5	50.2	2.2	0	0
L00_lobby	0	0	0.1	1.2	0.8	10.4	86	1.6	0	0
Average	4.37	2.87	3.73	4.72	19.89	18.29	34.25	9.95	1.40	0.57

PERCENTAGE OF PEOPLE DISSATISFIED

DSY1						
Percentage people dissatisfied- % of hours in range						
Room name	<= 5.00	>5.00 to <=10.00	>10.00 to <=15.00	>15.00 to <=20.00	>20.00 to <=25.00	> 25.00
L09_Outpatient	0	90.8	0.4	1.8	6.9	0
L09_Outpatient_peri_W	0	90	0.6	3	6.4	0
L09_Outpatient_peri_NW	0	90.1	0.7	3.3	6	0
L09_Outpatient_peri_N	0	90.5	0.6	3.1	5.8	0
L09_outpatient2_peri_S3	0	76.9	7.8	7.1	5.8	2.4
L09_outpatient2_peri_E	0	79.5	4.9	8.6	6.5	0.6
L09_outpatient2_peri_SW	0	77.2	7.2	8.2	5.4	2
L09_outpatient_peri_NE	0	83.6	1.7	6.1	8.3	0.2
L09_outpatient_peri_E	0	80.9	3.7	8.7	6.4	0.3
L09_Outpatient_peri_S	0	87.2	0.9	4.9	6.9	0
L09_Outpatient3_peri_SE	0	77.5	7.9	7.3	5.2	2.1
L18_Office	0	89	0.7	3.3	7	0
L18_Office2_peri_S2	0	76.6	8	7.4	5.2	2.8
L18_Office2_peri_E	0	77	7.5	8.8	5.4	1.4
L18_Office2_peri_SW	0	77.4	7	7.5	5.9	2.1
L18_Office2_peri_S	0	95.6	0	1	3.4	0
L18_Office2_peri_W	0	86.4	1.5	4.8	7.2	0.1
L13_Office_peri_W	0	91.4	0.7	2.6	5.3	0
L13_Office_peri_NW	0	89.2	1	3.7	6.1	0
L13_Office_peri_N	0	87.8	1	4.2	7	0
L13_Office2_peri_S4	0	75.9	8.2	5.8	5.1	5.1
L13_Office2_peri_E	0	79.8	5.2	8.1	6.2	0.7
L13_Office2_peri_SW	0	77.5	7.1	7.7	5.6	2.1
L13_Office_peri_S	0	84.7	2	6.7	6.3	0.2
L13_Office_peri_E	0	84.3	1.4	6.6	7.4	0.3
L13_Office_peri_E	0	78	7.6	8.3	4.9	1.2
L13_Office	0	73.1	4.5	6.2	7.7	8.6
L13_Office_peri_S3	0	74.6	3.9	11	9.5	0.9
L18_Office2_peri_N	0	43.1	26.9	18.2	7	4.8
L00_retail_peri_E	0	30.2	18.1	14.1	8.4	29.2
L00_retail_peri_N2	0	40.4	13.7	13.3	4.1	28.5
L00_lobby_dh	0	94.7	0.1	0.6	4.5	0.1
L00_lobby_peri_E	0	97.9	0	0	2.1	0
L00_lobby_peri_W	0	89.1	0.1	1.4	9.3	0.1
L00_retail_peri_N	0	12.4	36.2	29	17.1	5.2
L00_retail	0	37	22.3	16.8	7.9	16.1
L00_retail_peri_S	0	31.2	22.4	18.6	10.4	17.4
L00_lobby	0	16.2	34.9	28.6	20.3	0
L00_lobby_peri_N2	0	91.5	0.4	2	6.1	0
L00_lobby_peri_W	0	85.8	1.5	5.5	7.2	0
L00_lobby	0	78.5	6.1	7.6	6.6	1.1
	0.00	74.89	6.99	7.84	6.97	3.31

DSY2						
Percentage people dissatisfied- % of hours in range						
Room name	<= 5.00	>5.00 to <=10.00	>10.00 to <=15.00	>15.00 to <=20.00	>20.00 to <=25.00	> 25.00
L09_Outpatient	0	90.5	1.1	3.2	5.2	0
L09_Outpatient_peri_W	0	89.9	1.5	3.3	5.3	0
L09_Outpatient_peri_NW	0	89.5	1.7	3.4	5.2	0.2
L09_Outpatient_peri_N	0	90.2	1.7	3.3	4.8	0
L09_outpatient2_peri_S3	0	75.6	7.1	7.7	6.4	3.1
L09_outpatient2_peri_E	0	77.8	4.7	9	7.1	1.3
L09_outpatient2_peri_SW	0	76	7.4	7.7	6.1	2.7
L09_outpatient_peri_NE	0	84.1	2.7	5.1	7.4	0.7
L09_outpatient_peri_E	0	79.2	3.8	7.9	8	1.1
L09_Outpatient_peri_S	0	86.8	1.8	4.4	6.7	0.3
L09_Outpatient3_peri_SE	0	75.3	6.2	8	6.6	3.9
L18_Office	0	88.8	1.5	3.6	6.1	0
L18_Office2_peri_S2	0	75.2	7.5	7.7	6.3	3.2
L18_Office2_peri_E	0	75.4	6.9	9.4	6.4	2
L18_Office2_peri_SW	0	76.9	7.2	7.9	5.5	2.6
L18_Office2_peri_S	0	94.7	0.3	1.2	3.4	0.3
L18_Office2_peri_W	0	85.7	2.6	4.6	6.6	0.5
L13_Office_peri_W	0	90.6	1.4	3.2	4.8	0
L13_Office_peri_NW	0	88.9	1.9	3.7	5.2	0.3
L13_Office_peri_N	0	87.4	2.2	3.9	6.4	0.2
L13_Office2_peri_S4	0	74.8	7.2	6.9	5.4	5.7
L13_Office2_peri_E	0	78.2	5.2	7.8	7.3	1.5
L13_Office2_peri_SW	0	76.2	7.2	7.5	5.9	3.1
L13_Office_peri_S	0	84.3	2.6	6.1	6.1	0.8
L13_Office_peri_E	0	84.3	2.8	4.7	7.7	0.6
L13_Office_peri_E	0	75.7	6.4	8.7	6.4	2.6
L13_Office	0	73.6	3.6	7	8.7	7.1
L13_Office_peri_S3	0	76.3	3.4	9.6	9.4	1.3
L18_Office2_peri_N	0	42.4	28	16.6	7.8	5.2
L00_retail_peri_E	0	29.7	20.5	12	6.6	31.3
L00_retail_peri_N2	0	37.7	19.1	10.4	5.2	27.6
L00_lobby_dh	0	94.5	0.2	0.9	4	0.5
L00_lobby_peri_E	0	97.2	0	0	2.8	0
L00_lobby_peri_W	0	90.2	0.5	1.1	7.6	0.6
L00_retail_peri_N	0	13.8	38.8	24.6	17.8	5
L00_retail	0	37.5	23.3	15.4	7.1	16.7
L00_retail_peri_S	0	32.6	24	16.7	8.5	18.2
L00_lobby	0	18.2	34.5	29.2	18.1	0
L00_lobby_peri_N2	0	90.9	1.1	3.3	4.8	0
L00_lobby_peri_W	0	85	2.5	4.8	7.2	0.6
L00_lobby	0	77.5	5.4	7.5	7	2.5
	0.00	74.37	7.50	7.54	6.85	3.74

DSY3						
Percentage people dissatisfied- % of hours in range						
Room name	<= 5.00	>5.00 to <=10.00	>10.00 to <=15.00	>15.00 to <=20.00	>20.00 to <=25.00	> 25.00
L09_Outpatient	0	89	0.7	3.2	7.1	0
L09_Outpatient_peri_W	0	88.2	1	3.8	7	0
L09_Outpatient_peri_NW	0	88.7	1.5	3.8	5.9	0.1
L09_Outpatient_peri_N	0	88.3	1.5	3.5	6.7	0
L09_outpatient2_peri_S3	0	77.5	8.5	7.5	4.1	2.5
L09_outpatient2_peri_E	0	78.9	5.9	9	5.2	1.1
L09_outpatient2_peri_SW	0	77.4	7.9	7.9	4	2.8
L09_outpatient_peri_NE	0	83.7	3.6	5.9	6.6	0.2
L09_outpatient_peri_E	0	79.9	4.2	9.8	5.6	0.5
L09_Outpatient_peri_S	0	85.9	1.8	5.6	6.7	0
L09_Outpatient3_peri_SE	0	77.5	9.1	6.4	3.6	3.3
L18_Office	0	87	1.4	4.3	7.3	0
L18_Office2_peri_S2	0	77	9.1	7	4.1	2.8
L18_Office2_peri_E	0	76.9	8.6	8.6	4	1.9
L18_Office2_peri_SW	0	77.5	8.3	7.3	4.6	2.3
L18_Office2_peri_S	0	95.1	0	1	3.9	0
L18_Office2_peri_W	0	85.1	3	5.6	6.1	0.2
L13_Office_peri_W	0	89.3	0.9	3.6	6.2	0
L13_Office_peri_NW	0	87.2	2.3	3.9	6.5	0.1
L13_Office_peri_N	0	86.2	2.5	4.5	6.8	0.1
L13_Office2_peri_S4	0	76.8	8	5.3	3.9	6
L13_Office2_peri_E	0	79.3	5.7	8.6	4.8	1.6
L13_Office2_peri_SW	0	77.9	7.8	7.4	4.1	2.9
L13_Office_peri_S	0	83.4	3.4	6.8	5.9	0.5
L13_Office_peri_E	0	83.6	3.3	6.8	6.2	0.1
L13_Office_peri_E	0	78	8.2	6.9	3.8	3.1
L13_Office	0	76.1	3.6	5.9	7.3	7
L13_Office_peri_S3	0	75.4	4.5	9.5	8.1	2.4
L18_Office2_peri_N	0	45.7	25.2	15.8	6.2	7
L00_retail_peri_E	0	34.8	18.2	12.9	7.2	26.8
L00_retail_peri_N2	0	43.8	15.3	10	4	26.9
L00_lobby_dh	0	93.5	0.4	1.1	4.6	0.5
L00_lobby_peri_E	0	98.1	0	0	1.9	0
L00_lobby_peri_W	0	88.8	0.5	1.6	8.6	0.5
L00_retail_peri_N	0	16.5	34.9	23.2	18.1	7.4
L00_retail	0	39.7	19.9	14.4	7.1	18.8
L00_retail_peri_S	0	35.2	20.5	16.5	8.1	19.7
L00_lobby	0	23.4	33.8	24.8	17.7	0.4
L00_lobby_peri_N2	0	89.7	0.5	3.4	6.4	0
L00_lobby_peri_W	0	85.1	2.4	6.2	6.1	0.2
L00_lobby	0	78.7	6.8	6.6	5.1	2.9
	0.00	75.12	7.43	7.46	6.27	3.72

Appendices

Appendix B – Operative Temperature Tables

File	DSY1	
	Operative temperature (°C) - % hours in range	
		Setpoint 23
	Location	> 25.00
Sim001a_sp23_30deg_DSY1.a	L09_Outpatient	0
	L09_Outpatient_peri_W	0
	L09_Outpatient_peri_NW	0
	L09_Outpatient_peri_N	0
	L09_outpatient2_peri_S3	0
	L09_outpatient2_peri_E	0
	L09_outpatient2_peri_SW	0
	L09_outpatient_peri_NE	0
	L09_outpatient_peri_E	0
	L09_Outpatient_peri_S	0
	L09_Outpatient3_peri_SE	0
	L18_Office	0
	L18_Office2_peri_S2	0
	L18_Office2_peri_E	0
	L18_Office2_peri_SW	0
	L18_Office2_peri_S	0
	L18_Office2_peri_W	0
	L13_Office_peri_W	0
	L13_Office_peri_NW	0
	L13_Office_peri_N	0
	L13_Office2_peri_S4	0.1
	L13_Office2_peri_E	0
	L13_Office2_peri_SW	0
	L13_Office_peri_S	0
	L13_Office_peri_E	0
	L13_Office	0
	L13_Office_peri_S3	0
	L18_Office2_peri_N	0
		0.00
		Setpoint 22
	L00_retail_peri_E	0.6
	L00_retail_peri_N2	0.3
	L00_retail_peri_N	0
	L00_retail	0
	L00_retail_peri_S	0
		0.18
		Setpoint 23
	L00_lobby	0
	L00_lobby_peri_N2	0
	L00_lobby_peri_W	0
	L00_lobby	0
	L00_lobby_dh	0
	L00_lobby_peri_E	0.7
	L00_lobby_peri_W	0
		0.10

File	DSY2	
	Operative temperature (°C) - % hours in range	
		Setpoint 23
	Location	> 25.00
Sim002a_sp23_30deg_DSY2.a	L09_Outpatient	0
	L09_Outpatient_peri_W	0
	L09_Outpatient_peri_NW	0
	L09_Outpatient_peri_N	0
	L09_outpatient2_peri_S3	0.3
	L09_outpatient2_peri_E	0.1
	L09_outpatient2_peri_SW	0.3
	L09_outpatient_peri_NE	0
	L09_outpatient_peri_E	0.1
	L09_Outpatient_peri_S	0
	L09_Outpatient3_peri_SE	0.2
	L18_Office	0
	L18_Office2_peri_S2	0.5
	L18_Office2_peri_E	0.1
	L18_Office2_peri_SW	0
	L18_Office2_peri_S	0.1
	L18_Office2_peri_W	0
	L13_Office_peri_W	0
	L13_Office_peri_NW	0
	L13_Office_peri_N	0
	L13_Office2_peri_S4	0.5
	L13_Office2_peri_E	0.1
	L13_Office2_peri_SW	0.4
	L13_Office_peri_S	0
	L13_Office_peri_E	0
	L13_Office	0
	L13_Office_peri_S3	0.1
	L18_Office2_peri_N	0
		0.10
		Setpoint 22
	L00_retail_peri_E	2
	L00_retail_peri_N2	1
	L00_retail_peri_N	0.1
	L00_retail	0
	L00_retail_peri_S	0.1
		0.64
		Setpoint 23
	L00_lobby	0
	L00_lobby_peri_N2	0
	L00_lobby_peri_W	0
	L00_lobby	0
	L00_lobby_dh	0
	L00_lobby_peri_E	2
	L00_lobby_peri_W	1
		0.43

File	DSY3	
	Operative temperature (°C) - % hours in range	
		Setpoint 23
	Location	> 25.00
Sim003a_sp23_30deg_DSY3.a	L09_Outpatient	0
	L09_Outpatient_peri_W	0
	L09_Outpatient_peri_NW	0
	L09_Outpatient_peri_N	0
	L09_outpatient2_peri_S3	0
	L09_outpatient2_peri_E	0
	L09_outpatient2_peri_SW	0
	L09_outpatient_peri_NE	0
	L09_outpatient_peri_E	0
	L09_Outpatient_peri_S	0
	L09_Outpatient3_peri_SE	0
	L18_Office	0
	L18_Office2_peri_S2	0
	L18_Office2_peri_E	0
	L18_Office2_peri_SW	0
	L18_Office2_peri_S	0
	L18_Office2_peri_W	0
	L13_Office_peri_W	0
	L13_Office_peri_NW	0
	L13_Office_peri_N	0
	L13_Office2_peri_S4	0.2
	L13_Office2_peri_E	0
	L13_Office2_peri_SW	0
	L13_Office_peri_S	0
	L13_Office_peri_E	0
	L13_Office	0
	L13_Office_peri_S3	0
	L18_Office2_peri_N	0
		0.01
		Setpoint 22
	L00_retail_peri_E	2.5
	L00_retail_peri_N2	1.6
	L00_retail_peri_N	0
	L00_retail	0
	L00_retail_peri_S	0
		0.82
		Setpoint 23
	L00_lobby	0
	L00_lobby_peri_N2	0
	L00_lobby_peri_W	0
	L00_lobby	0
	L00_lobby_dh	0
	L00_lobby_peri_E	2.3
	L00_lobby_peri_W	1.5
		0.54

Appendix F – **PV Layout**

Refer to KPF Design and Access Statement for PV Proposals.

The proposed photovoltaic systems within Vinegar Yard will be designed and installed in accordance with all relevant statutory instruments and regulations current at the time of installation, and in particular the latest edition of the British and international standards. Each PV array shall be, arranged for optimum tilting and orientation, fixed to the building fabric by an approved anchoring system.

Access to roof shall be via automatic access hatch with stairs to floor below, to facilitate inspection and maintenance of any PV panels at roof level by appropriately skilled personnel experienced for the type of work. An additional access hatch will be provided at roof level to the floor below to enable any plant replacement from roof level.

Access, maintenance and replacement of the south facade integrated glazed photovoltaic cells shall be via the BMU located at roof level. Access, maintenance and replacement of the warehouse roof PVs will be via an elevated working platform or similar. PV access, maintenance and replacement will be by skilled personnel experienced for the type of work.

CAT 5 water supply facilities will be provided at roof level providing wash down facilities for the cleaning of PVs where required.

Any inverter units and junction boxes associated with the photovoltaics shall be easily accessible and provided with the required ingress protection.

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Appendix G – **PV Payback Calculations**

Inputs

Annual electricity output of PV	35,000		kWh/yr
Degredation of performance	1.0%		%/yr
Electricity price (year 1)	£	0.1800	/kWh
Annual maintenance costs (year 1)	£	2,500	
FIT Generation			/kWh
Average electricity inflation	7.5%		
Average CPI inflation	2.5%		
Capital cost reduction of basecase	£	-	
Capital cost of proposed PV	£	100,000	
Capital cost premium	£	100,000	

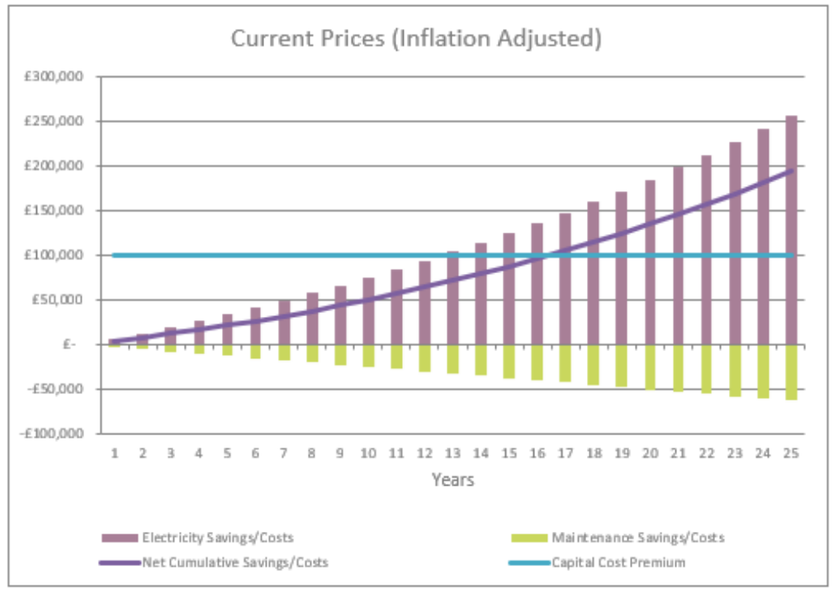
Outputs

Simple payback (at nominal prices)	19		years
Discounted payback (at present prices)	17		years
Net present value	£	94,275	
Internal Rate of Return			

Note:

Nominal: Savings/costs (capital and operational) include effects of inflation (utility and general CPI) over time.

Current (Inflation Adjusted): Operational savings/costs include effects of utility inflation over time, but do not account for general CPI inflation
Capital costs are not inflated over time (i.e. do not account for general CPI inflation)



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