Energy Statement

Battersea Park Road

Revision S2G, November 2024

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Contents

1 Executive Summary

This report encompasses the energy strategy and operational carbon results for Plot 1, Plot 2 & Plot 3 of the Battersea Park Road development. The results demonstrate that the sitewide betterment over Approved Document Part L 2021 is 52% (73% domestic and 36% non-domestic) when the fabric and MEP specification outlined in this report is implemented, which significantly exceeds the minimum 35% on-site carbon reduction over Part L 2021 outlined within Policy SI 2 of the London Plan and Policy LP10 of the Wandsworth Local Plan 2023-2038.

1.1 Description

This Energy Statement has been prepared to support the detailed planning application for the proposed Battersea Park Road development. The proposal comprises affordable residential units (Affordable Housing Building, Plot 1) and student accommodation (Student Accommodation Building, Plots 2 and 3) with associated amenity spaces alongside a mix of commercial and local community and learning uses.

1.2 Policy

Part L compliance modelling has been completed in accordance with the requirements of Chapter 15 (Sustainable Infrastructure) of the London Plan 2021 and Policy LP10 (Responding to the Climate Crisis) of the Wandsworth Local Plan 2023 - 2038 (Adopted July 2023). Energy modelling has been completed applying the energy hierarchy process of Be Lean, Be Clean and Be Green as outlined within both Policy SI 2 and Policy LP10.

Both planning policies require major developments to achieve a minimum 35% on-site carbon reduction over Part L 2021. Residential developments are expected to be able to exceed this, and so these developments are required to achieve a minimum of 50% on-site carbon reduction over Part L 2021.

The Be Lean target for domestic is 10% over the baseline while the non-domestic target is 15% over the baseline.

1.3 Passive & Active Measures

In developing the energy strategy for Battersea Park Road, high standards of fabric thermal performance and passive design have been applied to minimise the buildings' primary energy demands. This includes applying U-values and air permeability values significantly better than Part L standards, including heat recovery ventilation, low energy lighting and controls, waste-water heat recovery and on-site renewable energy generation.

1.4 District Heating

The heating and domestic hot water strategy in this report is based on communal heat pumps. At this point in time, the local district heating network (DHN) operator (EQUANS) have confirmed that it is not possible to give timescales for a connection due to technical constraints associated with extending the network to Sleaford St. However, provision has been made in the design for the installation of a district heat network heat exchanger for future connection to the DHN within each energy centre as well as pipework in trenches that connect each of the three separate energy centres to allow a single connection to the DHN in the future. We also plan to continue discussions with EQUANS throughout the next design stage.

1.5 BREEAM

To address the wider sustainability issues, the development is targeting BREEAM Outstanding certification against the BREEAM 2018 New Construction scheme for non-residential buildings. Similarly, residential buildings are targeting 4 Stars under the BRE Home Quality Mark (HQM) scheme. This is in accordance with the requirements of Policy LP10 which requires BREEAM Outstanding and the HQM certifications to be targeted. Further details of the sustainability strategy including BREEAM and HQM Pre-assessments are provided within the development's Sustainability Statement.

1.6 Results

Major developments are required to achieve a minimum 35% on-site carbon reduction over Part L 2021. The results from the Part L modelling demonstrate that the Battersea Park Road development achieves an aggregate 52% carbon improvement compared to 2021 standards, which significantly exceeds the 35% target of Policy SI2 and LP10 respectively. An additional benchmark has been set for residential developments of 50%; as this development is a mix of PBSA, residential and commercial rather than purely residential, the additional benchmark for residential can be relaxed slightly when looked at sitewide but has been significantly exceeded for the domestic element of the development (a 73% improvement).

The non-domestic elements of the site achieve a 36% improvement which meets the requirements of Policy SI 2. The GLA acknowledges that non-residential developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35% improvement (see "15th June 2022 - Note to accompany GLA Energy Assessment Guidance 2022").

The sitewide Be Lean betterment is 14% which falls slightly below the 15% target; this is justified in Section 6.7.

1.7 Carbon Offset Payment

This leaves a total residual carbon of 1,675 tonnes of CO_2 to be offset through the borough's carbon fund, equating to £159,127 (based on the GLA Energy Assessment Guidance of £95/Tonne CO_2). These values are based on the SAP 10 carbon factors applying the GLA Carbon Emission Reporting Spreadsheet V2.0.

1.8 Supplementary Information

As required by the GLA, extensive evidence is contained within the appendix, including information on MEP systems, PV roof markup, energy centres and future DHN connection point, energy memo responses and supporting calculations.

Along with all SAP worksheets, five separate BRUKL reports are available and will be provided in a zip file format along with this report and the GLA carbon reporting spreadsheet (the relevant energy hierarchy stage reports the reductions in domestic, non-domestic and site-wide results):

1. Plot 1 all non-domestic elements
2. Plot 1 just landlord elements
3. Plot 1 minus landlord elements
4. Plot 2 whole building
5. Plot 3 whole building

1.9 Summary of Changes

1.9.1 Energy Statement

The latest revision of the energy statement "6892 Battersea Park Road Energy Statement 2024.11.12 RevS2G" encompasses the responses to the GLA Energy Memo received 28/5/2024. Changes to the report and further appendices include:
1. Updated SAP and BRUKL figures in line with comments
2. External wall buildup
3. SAP y-value changed from 0.04 to 0.08

4. SAP window U-value changed from 1.4 to 1.2
5. Distribution losses increased from 90/95% to 85/90% respectively (see Section 5)
6. Further quality assurance mechanisms
7. Commitment to provide the trenches and pipework to connect all blocks to a future DHN via a single connection point
8. Further DHN correspondence
9. Further justification of high glazing percentages to amenity and retail
10. Retail and amenity glazing g-value reduced to 0.21
11. Updated report format

1.9.2 Overheating Assessment

The latest revision of the overheating assessment " 6892 Battersea Park Road Overheating Assessment 2024.11.12 RevS2E" encompasses the responses to the GLA Energy Memo received 21/8/2024. Changes to the report and further appendices include:
1. U-value update to Plot 1 glazing (1.4 to 1.2)
2. Further work on the natural ventilation only scenario to achieve 100% compliance
3. Inclusion of full cooling hierarchy iterations (provided in accompanying supporting documents)

Results	Plot 1	Plot 2	Plot 3
HVAC System	ASHP Space Heating & DHW MVHR	ASHP Space Heating & DHW MVHR	ASHP Space Heating & DHW MVHR
Renewables	ASHP & PV	ASHP & PV	ASHP & PV
Expected PV generation	8,564 kWh/annum	6,595 kWh/annum	46,403 kWh/annum
Regulated energy consumption	16,467 kWh/annum (BRUKL) 96,856 kWh/annum (SAP)	101,068 kWh/annum	238,229 kWh/annum
Unregulated energy consumption	78,506 kWh/annum (BRUKL) 136,713 kWh/annum (SAP)	201,274 kWh/annum	347,175 kWh/annum
Part L 2021 compliance achieved	✓	✓	✓
GLA Be Lean (sitewide)		14%	
GLA overall betterment (sitewide)		52%	

2 Introduction

London has an ambition to become net zero carbon by 2050, meaning that all new buildings must be net zero carbon. The Mayor of London's London Plan sets the targets and policies to achieve this which include adherence to the energy hierarchy, post-construction monitoring to ensure actual carbon performance and the calculation of whole life-cycle carbon impact. This energy statement will focus on the thermal modelling of the energy hierarchy and the definitions for each step, along with clarification on Policies SI 2 to SI 4.

With the introduction of Approved Document Part L and the subsequent update of the GLA Energy Assessment Guidance 2022, a 35% carbon reduction over a Part L 2021 notional baseline is targeted for the non-domestic elements of the site and a 50% carbon reduction over a Part L 2021 notional baseline is targeted for the domestic elements of the site. Plot 1 apartments are assessed under Part L1, while the landlord areas, commercial units and student accommodation are assessed under Part L2.

With the UK Government declaring a climate change emergency, it is important that built environment responds to reducing greenhouse gas emissions while also addressing the wider sustainability issues that affect the environment, economy, and society. It is this reason why low carbon design and sustainability feature high on the agenda for the Battersea Park Road development.

This report therefore aims to quantify the carbon and energy performance of the proposals while also responding to the energy and carbon emission reduction policies of the London Plan 2021 and the Wandsworth Local Plan 2023 - 2038.

To achieve a low carbon building an energy hierarchy process has been applied that prioritises passive measures to reduce energy demand. This is then followed by the implementation of highly efficient active systems and plant that incorporate heat recovery and smart controls to ensure energy consuming systems are operating effectively and efficiently. Finally, the opportunities for renewable technologies are explored such as photovoltaic panels and solar thermal systems to provide renewable energy to the building. This hierarchy process is illustrated in Figure 2.1.

The Be Lean, Be Clean and Be Green emission reductions have been re-calculated using the GLA Carbon Emission Reporting Spreadsheet v2.0 which has been provided as part of this planning application.

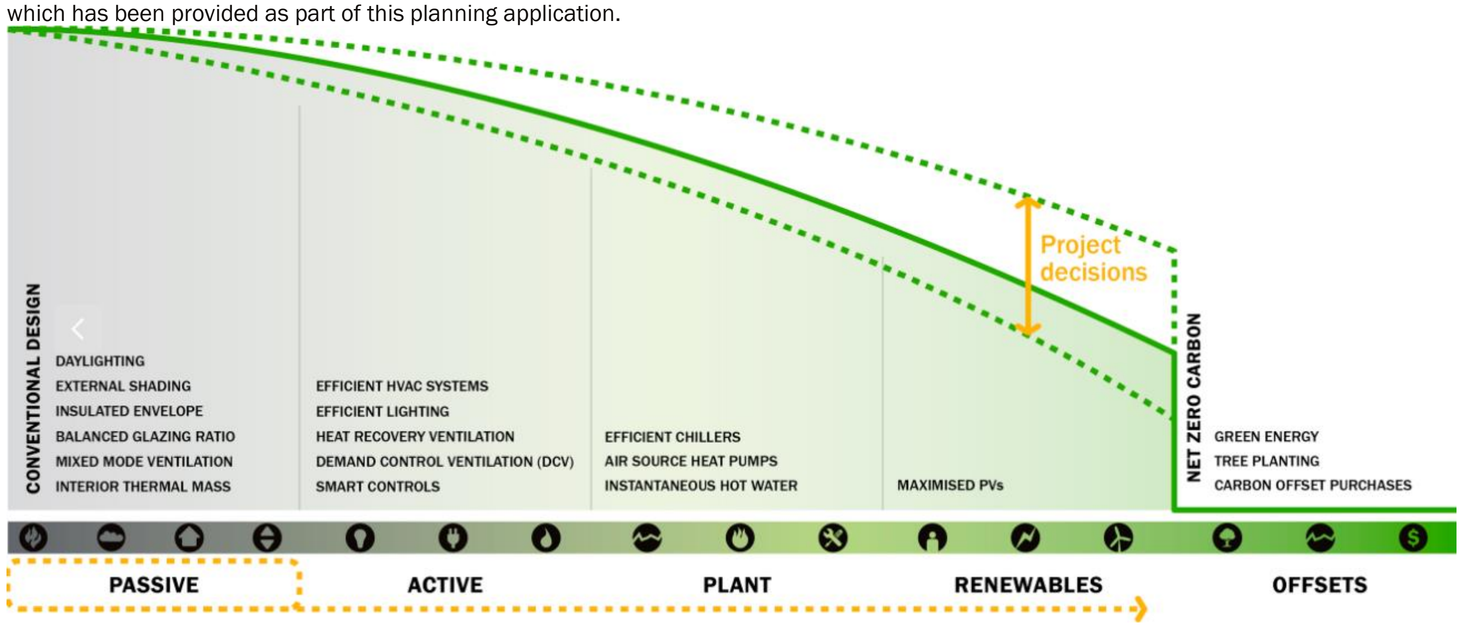


Figure 2.1 Pathway to Zero Carbon

2.1 Proposed Development

The site is located within the Battersea area, with Battersea Park Road to the North, Sleaford Street to the West and New Covent Road to the East. The proposal includes the construction of three separate buildings within the development site (Figure 2.2). These three plots will consist of two student accommodation blocks and one affordable housing block with space for 4 commercial retail units.

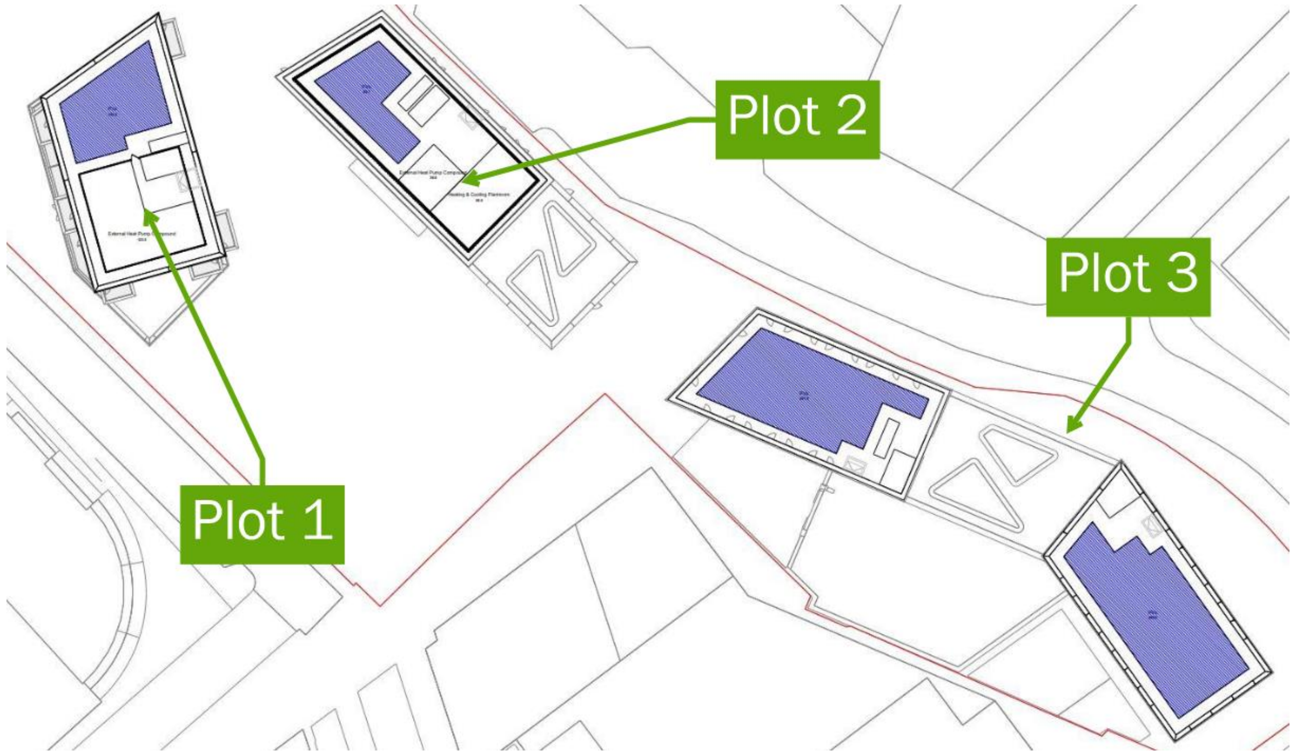


Figure 2.2 Battersea Park Road development site plan

3 Planning Policy

There are several planning policies that are relevant to the Battersea Park Road development. This section of the report summarises the pertinent carbon and energy policies that apply to the development that have been addressed within this report. These are namely the National Planning Policy Framework (December 2023), the London Plan (March 2021), GLA Energy Assessment Guidance 2022 and the Wandsworth Local Plan 2023 - 2038 (July 2023).

3.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) is a key part of Government reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth. It sets out the Government's planning policies for England and how these are expected to be applied. The NPPF replaces the current suite of national Planning Policy Statements, Planning Policy Guidance Notes and some Circulars.

Section 2 Achieving Sustainable Development (Paragraphs 7 to 14) of NPPF 2023 sets out the key strategies to deliver sustainable developments. This is centred around three overarching objectives as summarised below. The Environmental Objective specifically refers to climate emergency.

1. An Economic Objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.
2. A Social Objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.
3. An Environmental Objective – to protect and enhance our natural, built and historic environment, including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

3.2 The London Plan

3.2.1 Policy SI 2 - Minimising Greenhouse Gas Emissions

GLA Energy Hierarchy

The following hierarchy requires a quantification of carbon emissions at each step and is reported via the GLA's carbon emissions reporting spreadsheet.

- Be Lean – use less energy and manage demand during operation through fabric and servicing improvements and the incorporation of flexibility measures.
- Be Clean – exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly by connecting to district heating networks.
- Be Green – maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

An additional step in the hierarchy is to ensure post-construction that buildings perform as they were designed.

- Be Seen – monitor, verify and report on energy performance through the mayor's post construction monitoring platform for at least 5 years.

Requirements

- A minimum of 35% total on-site carbon reduction for major developments.
- The carbon reduction through passive measures (Be Lean), is 10% for residential development and 15% for non-residential.
- Where the net zero carbon target is not met onsite, any shortfall is provided by either: – a cash in lieu contribution to the borough's carbon offset fund, – off-site, provided that an alternative proposal is identified, and delivery is certain.
- Carbon emissions not covered by building regulations, i.e., unregulated emissions, must be calculated.
- Demonstrate actions taken to reduce life-cycle carbon emissions via a Whole Life-Cycle Carbon Assessment.
- To use more up to date carbon factors that are not yet reflected in Building Regulations.

Carbon Offsetting

- The price for offsetting carbon is regularly reviewed and can vary between boroughs.
- The nationally recognised price is £95 per tonne of CO_2 over a 30-year lifespan.

Whole Life-Cycle Approach

- Operational carbon emissions will continue to decline over a development's lifespan as the grid carbon factor decreases and operational energy targets become more stringent
- Unregulated emissions (e.g., plug loads, cooking, external lighting, etc.) are captured within the whole life-cycle assessment
- Embodied carbon (e.g., raw material extraction, manufacture, transport, etc.) is captured within the whole life-cycle assessment
- Other carbon emissions (e.g., those associated with maintenance, repair, replacement, the dismantling and demolition, etc.) are also captured within the whole lifecycle assessment

3.2.2 Policy SI 3 - Energy Infrastructure

Early-Stage Engagement

- Developers should engage with energy companies and bodies at an early stage to establish future infrastructure and energy requirements
- For large scale development (particularly universities, hospitals and social housing), energy master planning should be developed to establish the most effective energy supply options

Development Plans

- Identify the need for, and suitable sites for, any necessary energy infrastructure requirements including energy centres, energy storage and upgrades to existing infrastructure
- Identify existing heating and cooling networks, identify proposed locations for future heating and cooling networks and identify opportunities for expanding and inter-connecting existing networks as well as establishing new networks

Communal Low-Temperature Heating Systems

- Major development proposals within Heat Network Priority Areas are encouraged to consider communal low-temperature heating systems rather than multiple individual heating systems
- The following heating hierarchy should be followed:
  - 1) Connect to local existing or planned networks
  - 2) Use zero-emission or local secondary heat sources in conjunction with heat pumps (if required)
  - 3) Use low-emission CHP (only where this is part of an area-wide network, the development's electricity demands are met and provide demand response to the local electricity network)
  - 4) Use ultra-low NOx gas boilers

Heat Network Priority Areas

- Heat Network Priority Areas are identified in the London Heat Map website
- These are areas where the heat demand is high enough that heat networks are likely to offer the best solution
  a. Where a development is within the Heat Network Priority Areas but does not have enough proximity to an existing heat network, the heating system should be designed to facilitate cost-effective connection to a future network
  b. Allocating plant space for heat exchangers
  c. Allocating plant space for thermal stores – Provision for future connection at the site boundary
  d. Safeguarding suitable pipework routes at the site boundary

Renewable and Secondary Energy

- Development proposals should identify opportunities to maximise on-site energy production via:
  - Solar PV
  - Solar thermal
  - Heat pumps
  - Wind
  - Hydropower
  - Other innovative low and zero carbon technologies

3.2.3 Policy SI 4 - Managing Heat Risk

Urban Heat Island Effect

- Developments should minimise adverse urban heat island impacts through passive design measures and green infrastructure
- Green infrastructure has the benefits of shading roof surfaces and heat mitigation through evapotranspiration
- Urban heat island effect, along with higher temperatures due to climate change, a growing population and urbanisation means that London is experiencing more severe hot weather events

Overheating

- Proposals need to demonstrate how the energy strategy has been developed in conjunction with minimised internal overheating and reliance on air conditioning
- The following cooling hierarchy should be followed:
  - 1) Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
  - 2) Minimise internal heat generation through energy efficient design
  - 3) Manage the heat within the building through exposed internal thermal mass and high ceilings
  - 4) Provide passive ventilation
  - 5) Provide mechanical ventilation
  - 6) Provide active cooling systems
- Where air conditioning is unavoidable, these systems should be designed to reuse the waste heat they produce, rather than contributing to the urban heat island effect
- CIBSE TM59 (residential) and TM52 (non-residential) overheating assessments should be applied to new developments and refurbishments

3.3 Wandsworth Local Plan 2023 -2038 (July 2023)

The Wandsworth Local Plan 2023 - 2038 set outs the Council's planning policies and guidance for the development of the borough over the period of 2023 to 2038. It sets out the Council's proposed vision, objectives and spatial strategy. It includes area strategies, policies and site allocations which will support their delivery. It identifies where development will take place and how places within the borough will evolve through the application of placemaking principles to guide change and support inclusive growth over the next 15 years. Whilst facilitating the management of development, the Local Plan will also protect and enhance what is good and special about Wandsworth, including its culture, sense of community, heritage, neighbourhood character, open spaces, quality parks, schools and community facilities, and thriving small businesses.

Section 15 of the Local Plan sets out the policies and guidance relating to Tackling Climate Change. Strategically addressing climate change is an important challenge for Wandsworth, ensuring that the growth of the borough is sustainably delivered, both through a robust approach to the protection and effective management of the borough's environment and natural resources, but also by identifying opportunities for growth to support the development of more sustainable buildings and neighbourhoods that are designed to minimise their contribution to, and to mitigate the effects of, climate change – thereby contributing to an overall improvement in the quality of life of the borough's residents.

The Wandsworth Local Plan 2023 - 2038 Policy LP 10 (Responding to the Climate Crisis) outlines the standards and performance required of new developments such as the Battersea Park Road development. The policy aims to minimise Wandsworth's contribution to climate change and ensure that the borough develops in a way which respects environmental limits, is resilient to the effects of climate change and improves quality of life. Details of how the policy aims to achieve this are as follows:

3.3.1 Sustainable Construction and Design

Developments will be required to achieve high standards of sustainable design and construction in order to mitigate the effects of climate change, and to realise the Council's ambition of becoming zero carbon by 2050. In order to mitigate the effects of climate change and achieve the Council's target of becoming a zero-carbon borough by 2050, development proposals should:

- Incorporate the London Plan's circular economy principles at the start of the design process.
- Submit a Whole Life Cycle Assessment for all major applications.
- Incorporate Sustainable Drainage Systems (SuDS) or demonstrate that any proposed alternative sustainable approaches to the management of surface water will be equally effective.
- Use sustainable construction methods and sustainably sourced and recycled materials and maximise the use of the river for freight.
- Retain existing buildings and their embodied carbon in renewal and regeneration projects where this is a viable option.
- Re-use any demolished materials in-situ where practicable to minimise the transportation of materials and waste, reduce the need for mineral extraction and reduce carbon emissions.
- Incorporate water conservation measures, to meet a maximum water efficiency standard of 110 litres per person per day for homes (including an allowance of five litres or less per person per day for external water consumption). Planning conditions will be applied to new residential development to ensure that the water efficiency standards are met.
- Incorporate green roofs and walls wherever possible (see LP57 Urban Greening Factor for additional green features).

Development proposals will be required to meet the following:

- New non-residential buildings over 100m² will be required to meet BREEAM 'Outstanding' standard, unless it can be demonstrated that this would not be technically feasible. New buildings should be designed taking into account changes to the climate over their lifespan.
- Where proposals are for a change of use to residential, they will be required to meet BREEAM Domestic Refurbishment 'Outstanding' standard, unless it can be demonstrated that this would not be technically feasible.
- New residential development will be expected to meet the BRE Home Quality Mark or Passivhaus standards wherever practicable.

3.3.2 Reducing Carbon Dioxide Emissions

Development proposals will be required to incorporate measures which improve energy conservation and efficiency, as well as contribute to renewable and low carbon energy generation. Proposals will be required to meet the following minimum reductions in carbon emissions:

- All new major development should achieve zero carbon standards, as set out in the London Plan, with a minimum on-site reduction of 35%.
- All non-major new residential development provided in new buildings should achieve a minimum on-site reduction of 35%.
- Residential development should achieve at least a 10% reduction and non-residential development should achieve at least a 15% reduction through the use of energy efficiency measures.
- In exceptional circumstances, where it is clearly demonstrated that the above cannot be fully achieved on-site, as a last resort, any shortfall to achieve the zero-carbon standard and/ or the on-site threshold must be addressed by making a financial contribution to the Council's Carbon Offset Fund.
- Development, including the re-use or extension of existing buildings, should achieve the maximum feasible reductions in carbon emissions and support in achieving the strategic carbon reductions target set out in this Plan, while protecting the heritage and character of the buildings.

3.3.3 The Energy Hierarchy

All development is required to follow the energy hierarchy set out within the London Plan (Policy SI2) with respect to its design, construction, and operation.

3.3.4 Energy Assessments

All new residential development and major non-residential development proposals are required to submit an energy assessment, and minor non-residential development proposals are strongly encouraged to provide one.

3.3.5 Compliance and Monitoring

Major development proposals will be required to provide, or fund the provision of, post-construction monitoring of the building's energy use and renewable/low-carbon equipment to demonstrate full compliance with the commitments identified within the permission, for a period of four years.

3.3.6 Adapting to Climate Change

The Council will expect all development to be fully resilient to the future impacts of climate change in order to minimise the vulnerability of people, property, the public realm and essential infrastructure to its effects. Retrofitting of existing buildings, through the use of low-carbon measures, to adapt to the likely effects of climate change should be maximised and will be supported. However, there are risks of maladaptation and it is important that right retrofit and adaption of buildings is undertaken.

3.3.7 Overheating

New development should, through its layout, design, construction, materials, landscaping, and operation, minimise the effects of overheating, mitigate the urban heat island effect, and minimise energy consumption in accordance with the cooling hierarchy set out in the Policy SI4 of the London Plan.

4 Building Regulations UK - Part L

This Section of the report outlines the calculation procedures to determine the regulated and unregulated emissions associated with the Battersea Park Road proposal.

4.1 Regulated Emissions

The Building Regulations of England and Wales sets minimum energy and carbon performance standards to be achieved. This is detailed within Part L1 and Part L2 of the regulations for new domestic and non-domestic buildings, respectively.

The proposed development will be subject to complying with Part L 2021 of the Building Regulations of England and Wales with the carbon emissions benchmarked against the Part L1 and Part L2 targets. Since the building comprises of both residential (domestic) and commercial (non-domestic) uses, dwellings will be subject to compliance against Part L1, while the student residential, landlord areas and retail units will be subject to compliance against Part L2.

The carbon emissions for residential buildings are assessed using the SAP 10.2 methodology which calculates and benchmarks the dwelling carbon emissions (known as the DER) against a target (known as the TER). To comply with Part L the DER must be less than or equal to the TER. In addition to the carbon assessment, Part L1 also requires minimum standards in fabric performance to be achieved using a factor known as the Dwelling Fabric Energy Efficiency (DFEE). This measure only considers the thermal performance of the fabric including U-values, air permeability, thermal bridging, and opportunities for passive solar gain. To comply with this aspect of the building regulations significant enhancements to the fabric thermal performance are required. All domestic dwellings within the Battersea Park Road development have been assessed against Part L1 with SAP 10.2 calculations completed.

For non-residential areas of the building (including student accommodation), the carbon emissions have been assessed via the dynamic simulation methodology which similarly requires the Building Emission Rate (BER) to be less than or equal to a notional building Target Emission Rate (TER). All non-domestic areas of the building have been assessed via this methodology. It should be noted that the carbon emissions assessed under Part L are limited to the energy used to heat, cool, ventilate, light and provide hot water to the internal spaces of a building. These emissions are known as regulated emissions.

Atelier Ten have created an energy model of the proposed building using the dynamic simulation software IESVE. The model represents the proposed architecture and services strategy of the Battersea Park Road development, including the proposed fabric thermal performances and system efficiencies.

The building's proposed energy and carbon performance is calculated using the UK Government's SAP and NCM (National Calculation Methodology NCM) parameters for assessment against Part L1 and Part L2, respectively. The complex interaction between the building fabric, building services, renewable technologies, system controls and local weather are calculated to determine the overall carbon performance.

The carbon emission DER and BER outputs for the residential and non-residential areas of the building have been entered into the GLA Carbon Emission Reporting Spreadsheet v2.0.

The results from Part L energy modelling applying the Be Lean, Be Clean and Be Green energy hierarchy are provided in Sections 6, 7 & 8 of this report.

4.2 Unregulated Emissions

Policy SI 2 of the London Plan and the GLA Guidance of preparing energy assessments requires the unregulated emissions (i.e., energy associated with plug-in appliances, computers/ laptops, cooking, lifts etc.) to be estimated and reported within the Energy and Sustainability Statement.

Estimating the unregulated energy consumption for buildings is a challenging aspect as there is a significant number of variables and unknowns that can influence performance, such as how many and how long will residents have their laptops and devices plugged in to charge. In terms of residential unregulated energy, the SAP outputs provide an estimate the unregulated energy consumption from appliances and cooking.

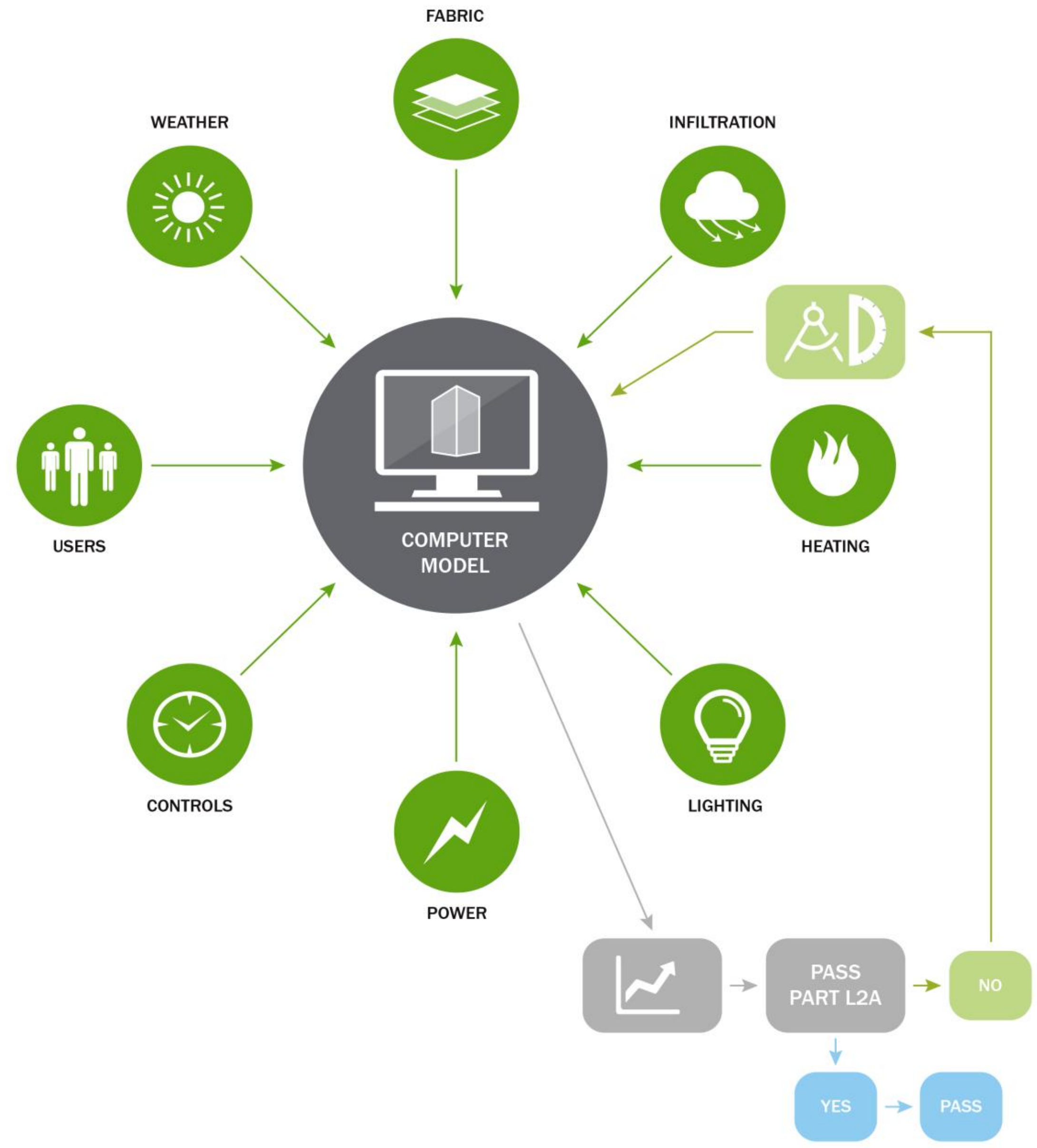


Figure 4.1 Part L energy modelling process

In terms of the non-residential areas, the BRUKL report (which is an output of the energy model) of provides an estimated energy consumption for unregulated energy usage.

Both these measures have been applied to estimate the unregulated energy consumption for the residential and non-residential areas of the building. The estimates have been applied within the GLA Carbon Emission Reporting Spreadsheet v2.0.

5 Energy Strategy

This section outlines the key inputs into the final energy models.

5.1 Plot 1 (Build to Rent)

Table 5.1 Fabric parameters applied in the Plot 1 thermal modelling

Element or System	Modelled Parameter/Performance
Fabric Thermal Performance	
External Wall U-Value	• 0.12 W/m²K
Floor U-Value	• 0.10 W/m²K
Roof U-Value	• 0.10 W/m²K
Glazing U-value (inc. frame)	• 1.2 W/m²K
Door U-value	• 1.2 W/m²K (glazed pedestrian door)
Internal Wall/Ceiling Properties	• Double plasterboard 30mm
Building Air Permeability	• 3 m³/h.m² @ 50Pa
Glazing Performance	
Glazing g-value/Visible Light Transmittance	• Varies between 0.21/0.6, 0.28/0.6 and 0.35/0.65 • See appendix for marked up model views

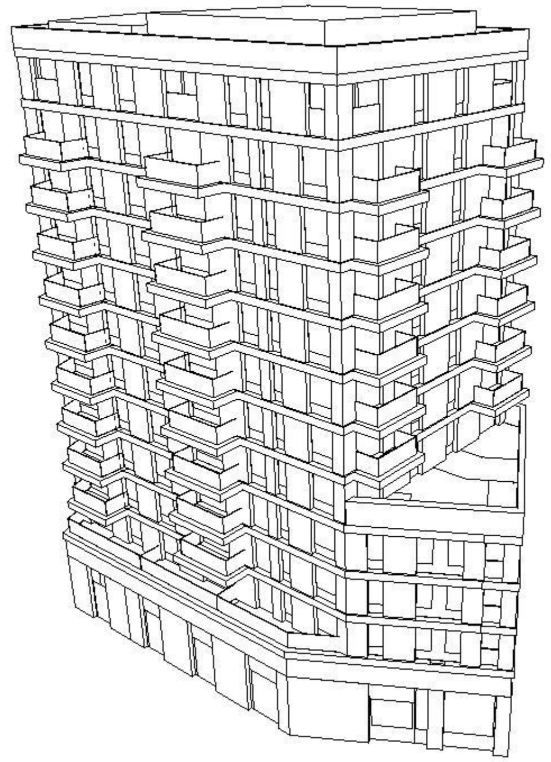


Figure 5.1 IESVE thermal model of Plot 1 of scheme

Table 5.2 Energy modelling strategy applied in the dynamic simulation modelling (Plot 1 SAP & BRUKL)

Element or System	
HVAC	
Space Heating (Residential SAP)	• Wet heating system generated by electric ASHP with • SCoP of 3.39 • 15% delivery losses
Space Heating (Landlord BRUKL)	• Assigned to BtR landlord areas • Central heating using water: radiators • Electric air source heat pump • SCoP = 3.39
MVHR (Residential SAP)	• MVHR • SFP of 0.7 W/l/s • Heat recovery efficiency of 85%
VRF (Commercial BRUKL)	• Assigned to Retail and Day Centre • UK NCM type = Variable refrigerant flow • SFP = 1.4W/l/s • Heat recovery = 85% • SCoP = 4.11 • EER = 4.28 • SEER = 6.70
Domestic Hot Water	
Domestic Hot Water (Residential SAP)	• Electric ASHP • Seasonal efficiency of 3.39 • 15% delivery losses
Domestic Hot Water (Commercial BRUKL)	• Assigned to Retail and Day Centre • Electric air source heat pump • Seasonal efficiency = 3.39 • Delivery efficiency = 0.9
Other	
Power factor correction (BRUKL)	• >0.95
Lighting (SAP & BRUKL)	• 120lm/cw throughout
Lighting controls (BRUKL)	• Presence detectors in circulation areas, bin & cycle stores and amenity • Manual switches in apartments • Daylight dimming to retail units and day centre
PV (Assigned to landlord areas)	• See Appendix for markup • PV panel area 41.3m², 22.6% efficiency, southeast facing, 30° pitch

5.2 Plot 2 (PBSA)

Table 5.3 Fabric parameters applied in the Plot 2 thermal modelling

Element or System	Modelled Parameter/Performance
Fabric Thermal Performance	
External Wall U-Value	• 0.12 W/m²K
Floor U-Value	• 0.10 W/m²K
Roof U-Value	• 0.10 W/m²K
Glazing U-value (inc. frame)	• 1.2 W/m²K
Door U-value	• 1.2 W/m²K (glazed pedestrian door)
Internal Wall/Ceiling Properties	• Double plasterboard 30mm
Building Air Permeability	• 3 m³/h.m² @ 50Pa
Glazing Performance	
Glazing g-value/Visible Light Transmittance	• Varies between 0.21/0.6, 0.28/0.6 and 0.35/0.65 • See appendix for marked up model views

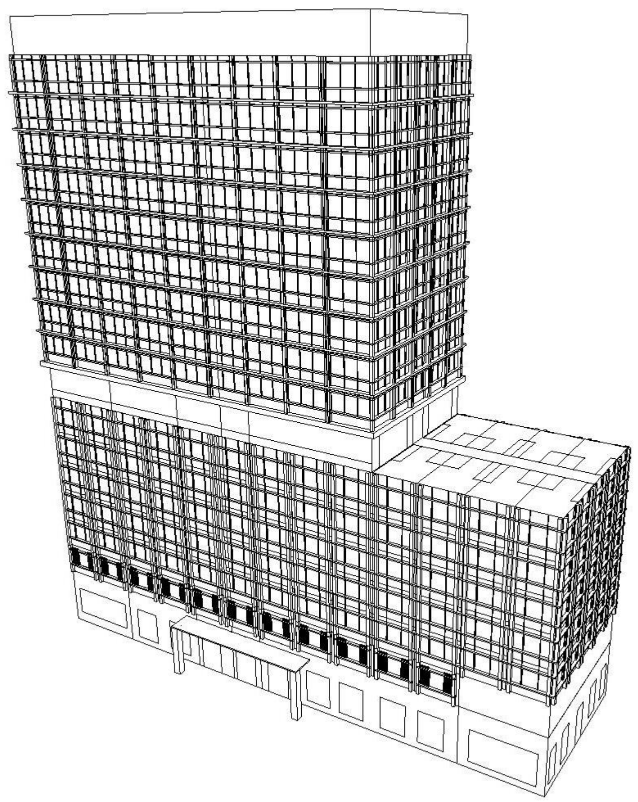


Figure 5.2 IESVE thermal model of Plot 2 element of scheme

Table 5.4 Energy modelling strategy applied in the dynamic simulation modelling (Plot 2 BRUKL)

Element or System	
HVAC	
Space Heating	• Assigned to PBSA Living Areas • Central heating using water: radiators • Electric air source heat pump • SCoP = 3.39
VRF	• Assigned to Commercial and Amenity • UK NCM type = Variable refrigerant flow • SFP = 1.4W/l/s • Heat recovery = 85% • SCoP = 4.11 • EER = 4.28 • SEER = 6.70
DX Split System	• Assigned to Comms • UK NCM type = Split system • SFP = 1.14 W/l/s • Heat recovery = 85% • SCoP = 4.01 • EER = 5.79 • SEER = 5.79
MVHR (WCs)	• Assigned to WCs • UK NCM air supply mechanism = Centralised balanced A/C or mech vent system • Heat recovery = 85% • Mech extract SFP = 1.6 W/l/s
MVHR (PBSA Living Areas)	• Assigned to PBSA Living Areas • UK NCM air supply mechanism = Centralised balanced A/C or mech vent system • Heat recovery = 85% • Mech extract SFP = 0.5 W/l/s • Demand control based on gas sensors
Domestic Hot Water	
Domestic Hot Water (Commercial)	• Assigned to all L00 retail • Electric air source heat pump • Seasonal efficiency = 3.39 • Delivery efficiency = 0.9
Domestic Hot Water (Waste-Water Heat Recovery)	• Assigned everywhere else • Electric air source heat pump • Seasonal efficiency = 3.39 • WWHR uplift to 6.12 • Delivery efficiency = 0.85
Other	
Power factor correction	• >0.95
Lighting	• 120lm/cw throughout
Lighting controls	• Presence detectors present in bin and cycle stores, circulation, laundry, gym, amenity and entrance/reception • Daylight dimming in reception, amenity and retail
PV	See Appendix for markup • PV panel area 46.4m², 22.6% efficiency, southwest facing, 90° pitch vertical on plant screen

5.3 Plot 3 (PBSA)

Table 5.5 Fabric parameters applied in the Plot 3 thermal modelling

Element or System	Modelled Parameter/Performance
Fabric Thermal Performance	
External Wall U-Value	• 0.12 W/m²K
Floor U-Value	• 0.10 W/m²K
Roof U-Value	• 0.10 W/m²K
Glazing U-value (inc. frame)	• 1.2 W/m²K
Door U-value	• 1.2 W/m²K (glazed pedestrian door)
Internal Wall/Ceiling Properties	• Double plasterboard 30mm
Building Air Permeability	• 3 m³/h.m² @ 50Pa
Glazing Performance	
Glazing g-value/Visible Light Transmittance	• Varies between 0.21/0.6, 0.28/0.6 and 0.35/0.65 • See appendix for marked up model views

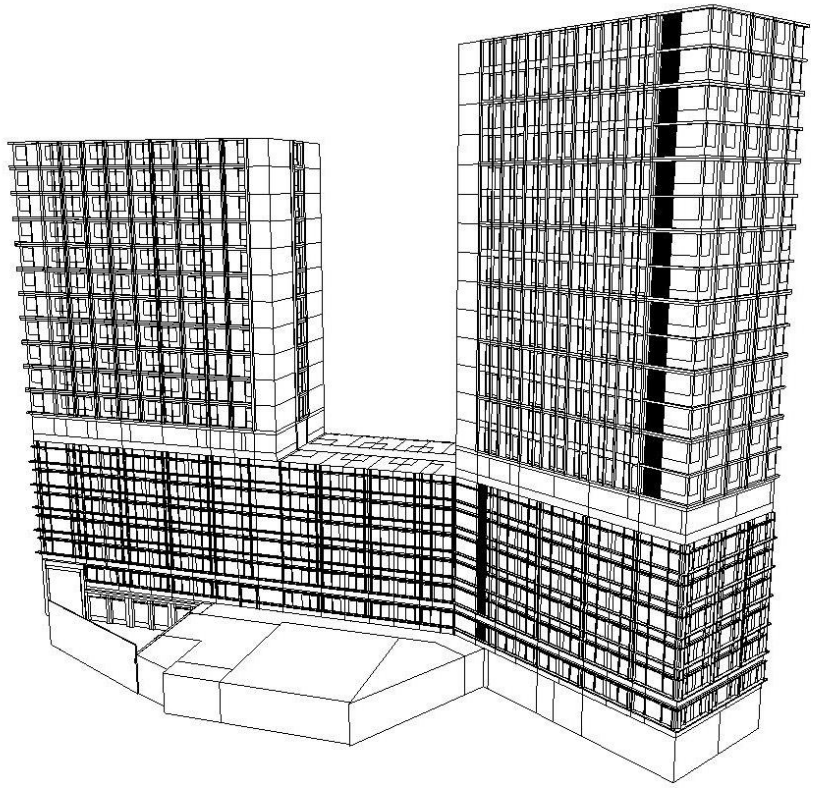


Figure 5.3 IESVE thermal model of Plot 3 element of scheme

Table 5.6 Energy modelling strategy applied in the dynamic simulation modelling (Plot 3 BRUKL)

Element or System	
HVAC	
Space Heating	• Assigned to PBSA Living Areas • Central heating using water: radiators • Electric air source heat pump • SCoP = 3.39
VRF	• Assigned to Commercial and Amenity • UK NCM type = Variable refrigerant flow • SFP = 1.4W/l/s • Heat recovery = 85% • SCoP = 4.11 • EER = 4.28 • SEER = 6.70
DX Split System	• Assigned to Comms • UK NCM type = Split system • SFP = 1.14 W/l/s • Heat recovery = 85% • SCoP = 4.01 • EER = 5.79 • SEER = 5.79
MVHR (WCs)	• Assigned to WCs • UK NCM air supply mechanism = Centralised balanced A/C or mech vent system • Heat recovery = 85% • Mech extract SFP = 1.6 W/l/s • Demand control based on gas sensors
MVHR (PBSA Living Areas)	• Assigned to PBSA Living Areas • UK NCM air supply mechanism = Centralised balanced A/C or mech vent system • Heat recovery = 85% • Mech extract SFP = 0.5 W/l/s
Domestic Hot Water	
Domestic Hot Water (Commercial)	• Assigned to all L00 retail • Electric air source heat pump • Seasonal efficiency = 3.39 • Delivery efficiency = 0.9
Domestic Hot Water (Waste-Water Heat Recovery)	• Assigned everywhere else • Electric air source heat pump • Seasonal efficiency = 3.39 • WWHR uplift to 6.12 • Delivery efficiency = 0.85
Other	
Power factor correction	• >0.95
Lighting	• 120lm/cw throughout
Lighting controls	• Presence detectors present in bin and cycle stores, WCs, circulation, laundry, gym, amenity and entrance/reception • Daylight dimming in reception, amenity and retail
PV	See Appendix for markup: Northwest tower • PV panel area 36.8m², 22.6% efficiency, southwest facing, 90° pitch vertical on plant screen • PV panel area 125m², 22.6% efficiency, southwest facing, 30° pitch Southeast tower • PV panel area 41.6m², 22.6% efficiency, southwest facing, 90° pitch vertical on plant screen • PV panel area 48.8m², 22.6% efficiency, southeast facing, 30° pitch

6 Energy Analysis - Be Lean Stage

This section of the report presents the results from Part L1 and L2 compliance modelling for the Battersea Park Road development for the Be Lean aspect, following the GLA Energy Assessment Guidance (June 2022).

6.1 Be Lean

The Be Lean aspect of the energy hierarchy aims to minimise a building's primary energy demand through the implementation of passive design measures and fabric thermal performance. A fundamental aspect of achieving this is the application of high standards of fabric thermal performance such as low element U-values, glazing solar performance, and limiting heat loss from thermal bridges and air leakage of the building.

The proposed energy performance of fans, pumps, lighting, insulation, and controls are also included within the Be Lean aspect, with the main heating source being a notional building system type. This would be as follows:

- Domestic parts: Gas boilers with 89.5% SEDBUK (2009) efficiency
- Non-domestic parts: Heat pumps with SCoP of 2.8 for space heating and 3.1 for domestic hot water (see Appendix C)

Policy SI 2 of the London Plan recommends that a 10% improvement over the baseline emissions (i.e. TER) is achieved under the Be Lean aspect for residential and 15% for non-residential.

6.2 Passive Design & Fabric Performance

As part of the design development of Battersea Park Road, iterative energy modelling was undertaken of the building's façade to maximise the opportunity for passive solar heat gain and daylight penetration, while minimising unwanted peak solar gains and heat loss. The aim of this analysis was twofold: to reduce the primary energy demands of the buildings, and to enhance the health and wellbeing and comfort of occupiers in terms of visual comfort and thermal comfort.

As part of the façade analysis, the specifications and performance of the construction elements have been refined to reduce all aspects the building's energy consumption. The outcome from this analysis has resulted in fabric thermal performances enhanced significantly beyond Part L standards. By applying these enhanced U-values the building's energy demand for space heating is significantly reduced.

Approximate glazing percentages for each plot are as follows.

- Plot 1: 30% external glazing
- Plot 2: 28% external glazing
- Plot 3: 30% external glazing

A g-value of 0.28 is used for south and west elevations, and 0.35 for north and east elevations, have been applied to all plots. A g-value of 0.21 has been applied to the high levels of glazing to the retail and amenity areas. This strategy has been adopted to maximise passive solar gains to the residential spaces (to minimise space heating demands) while minimising solar gains and cooling demands to the non-residential areas.

6.3 Building Services

As mentioned previously, the strategy described here will be based on communal ASHP. The dwellings and student residential apartments will be heated via radiators (with LTHW generated by ASHP) and ventilated via mechanical ventilation with heat recovery (MVHR). The communal circulation spaces will be heated via radiators fed by ASHP. System parameters from manufacturers data are contained in Appendix A.

- Domestic hot water will be provided to the dwellings and student residential apartments via the same ASHP system as space heating. The commercial retail units and community areas will be served by a low GWP VRF system with a capped connection to the communal heat network to support future tenant flexibility
- The waste-water heat recovery present in Plot 2 & 3 will be attributed in the Be Green section as an uplift to the ASHP seasonal efficiency.
- Lighting to the development will be via high-efficiency LED lighting with automatic presence detection controls in circulation and landlord spaces. Lighting controls to the dwellings will be via manual switches.
- Equipment to ensure an electrical power factor of >0.95 will be installed where required.

For the Be Lean analysis, PV is removed and the ASHP & VRF systems are assigned notional heat pump efficiencies which are contained within the appendix.

6.4 Energy Costs

Efforts have been made to minimise energy costs to occupants of the Battersea Park Road development. This was achieved by prioritising passive energy efficiency measures before proceeding with the energy system selection, adhering to the energy hierarchy.

The high standard of materials chosen for constructions ensure longevity and future climate resilience by minimising the need for potential extensive and expensive retrofitting to meet future requirements.

See Section 9 for more information on protecting customers from high energy costs in the Be Seen section.

6.5 Cooling Loads

The commercial cooling actual loads are higher than the notional due to the commercial units within the development having a higher proportion of glazing than considered under a notional building assessment.

This glazing arrangement has been strongly encouraged in dialogue with the Local Authority whose priorities are having high levels of active frontage and creating an open and welcoming environment. The units are relatively small spaces, and it is expected that they will be suitable for small cafes and convenience stores benefiting from a high level of transparency and visibility afforded to them by their prominent locations. These qualities will create an attractive prospect for potential tenants.

Similarly, the glazing present in the amenity areas (Plot 2 L07 & Plot 3 L07) came as a result of meetings with the local planning authority who wanted views out as well as a clear break in both buildings.

Cooling is only present in spaces served by the VRF system which are the commercial units and amenity spaces, which have a significantly higher glazing percentage than the domestic and student residential spaces. Cooling has been allowed for in the amenity spaces due to the unknown end use of the spaces. This results in the increase from notional to actual demand as shown in Table 6.1.

6.6 Be Lean Results

Results tables below demonstrate a sitewide Be Lean reduction of 14%. This falls slightly short of the London Plan Policy SI 2 recommendation for a 15% reduction in carbon emissions through energy efficiency measures but exceeds the 10% reduction expected from residential developments.

The Energy Use Intensity (EUI) and space heating demand of the development is shown in Table 6.2.

The total Part L Fabric Energy Efficiency Standard (FEES) is shown in Table 6.3.

Site-wide figures are demonstrated in Table 6.6 showing a 14% site-wide improvement from Lean measures.

Table 6.1 Be Lean non-domestic sitewide cooling demand

	Area weighted average non-residential cooling demand (MJ/m²)	Total area weighted non-residential cooling demand (MJ/year)
Actual	1.76	51,174
Notional	1.37	39,910

Table 6.2 Energy use intensity

	Energy Use Intensity	Space Heating	Methodology used
	kWh/m²/yr	kWh/m²/yr	
LETI Recommended Values (residential)	*35*	*15*	
Plot 1 Domestic (inc. landlord areas)	60.35*	11.36	SAP 10.2 & Part L2 DSM
LETI Recommended Values (all other non-residential)	*55*	*15*	-
Plot 1 Non-domestic (Minus domestic and landlord)	40.48	24.17	Part L2 DSM
Plot 2 Non-domestic (Full Building)	33.92	7.98	Part L2 DSM
Plot 3 Non-Domestic (Full building)	31.55	9.53	Part L2 DSM

**Note* - unregulated energy from SAP modelling is already 34.8 kWh/m² and therefore a total of 35kWh/m² including regulated and unregulated is unachievable.

Table 6.3 Fabric energy efficiency

	Target Fabric Energy Efficiency	Design Fabric Energy Efficiency	Improvement
	MWh/yr	MWh/yr	(%)
Domestic development total	30.41	29.35	3%

Table 6.4 Be Lean domestic results (Plot 1 apartments)

	Regulated Domestic Carbon Emissions			
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	51.1	N/A	N/A	N/A
After energy demand reduction (Be Lean)	39.6	11.5	22%	22%
After potential DH connection (Be Clean)	N/A	N/A	N/A	N/A
After PV on-site renewables (Be Green)	N/A	N/A	N/A	N/A

The individual domestic and non-domestic results are provided in the full SAP and BRUKL sheets that will be provided alongside this report.

Table 6.5 Be Lean non-domestic results (Plots 2, 3 and Plot 1 landlord and commercial)

	Regulated Non-Domestic Carbon Emissions			
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	65.5	N/A	N/A	N/A
After energy demand reduction (Be Lean)	60.2	5.3	8%	8%
After potential DH connection (Be Clean)	N/A	N/A	N/A	N/A
After PV on-site renewables (Be Green)	N/A	N/A	N/A	N/A

Table 6.6 Be Lean sitewide results (Plots 1, 2 and 3)

	Regulated Site-Wide Carbon Emissions			
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	116.6	N/A	N/A	N/A
After energy demand reduction (Be Lean)	99.8	16.8	14%	14%
After potential DH connection (Be Clean)	N/A	N/A	N/A	N/A
After PV on-site renewables (Be Green)	N/A	N/A	N/A	N/A

6.7 Justifications

6.7.1 Cooling Loads

The cooling load for the actual building is higher than the notional building mainly due to the high glazing percentages to the retail units and amenity areas. Both of these glazing percentages have been encouraged by the local authority who wanted both active frontage to the retail and a clear band across the L07 amenity to Plots 2 & 3. Note that higher fabric standards than the notional reduce the effect of free cooling through the fabric and also that criterion 3 checks on all cooled areas pass the solar gain check apart from three Plot 3 spaces which marginally fail.

6.7.2 Be Lean Shortfall

A range of passive measures have been explored but have negative impacts on other considerations such as daylighting, overheating and costs. For example, the g-value and glazed percentages have been decreased for overheating mitigation, but the result is a reduction in useful winter solar gains. To increase either g-value or glazed percentage would improve both daylighting and heating loads, but at the expense of a higher reliance on mechanical conditioning in summer. WWHR, high efficacy lighting, solar shading and high fabric standards have been implemented, along with a holistic view of window design. See Appendix H for the sitewide façade optimisation design note that was produced when the scheme went from Part L 2013 compliance standards to Part L 2021 compliance standards and the work that resulted in the holistic design. It should also be noted that the WWHR is taken into account in the Be Green section as it is part of the ASHP DHW system; if this was accounted for in the Be Lean stage, the non-domestic Be Lean betterment would exceed the 15% target.

7 Energy Analysis - Be Clean Stage

This section of the report presents the results from Part L1 and L2 compliance modelling for the Battersea Park Road development for the Be Clean aspect and follows the GLA Energy Assessment Guidance (June 2022).

7.1 Be Clean

Once the demand reduction aspects have been delivered through the Be Lean aspect, the Be Clean aspect of the energy hierarchy promotes the connection to existing heat networks or the consideration of a new district heating network to serve the new development.

For developments located within Heat Network Priority Areas (HNPAs) such as Battersea Park Road, communal low temperature heating systems should be considered. If there is an existing or planned heat network near the proposed development, connection to this network is encouraged. Where existing heat network connection is not available, zero-emission sources such as heat pumps should be deployed as the primary source of heat generation. In addition, developments are required to provide the infrastructure and plant/equipment space to allow the connection of the building to a heat network in the future.

Proposals are to apply the heating hierarchy outlined in Policy SI 3 of the London Plan where feasible.

7.2 London Heat Map

To assess the opportunity for a development to connect to an existing or planned heat network, applicants are to consult the London Heat Map. Correspondence with the district heat network operator is contained within the Appendix, confirming that a connection cannot be made now and timescales for a future connection cannot currently be confirmed. However, their intention is to make a connection available in the future via Sleaford Street.

Therefore, the nearby DHN has been considered but it is unfeasible to connect at this point. Provision has been made for future connection in the energy centres with trenches connecting each energy centre to allow a single point of connection.

Communal block by block heating is proposed as described in the Energy Statement. A community heat network (i.e. all buildings served from one single energy centre) is not proposed on the grounds of future building sale. This is a key aspect of the circular economy and future adaptability of the development as it does not tie in a building to a single utility provider for heat.

We will continue discussions with the network operator/s throughout the next design stage to establish if the feasibility of a connection changes prior to starting on site.

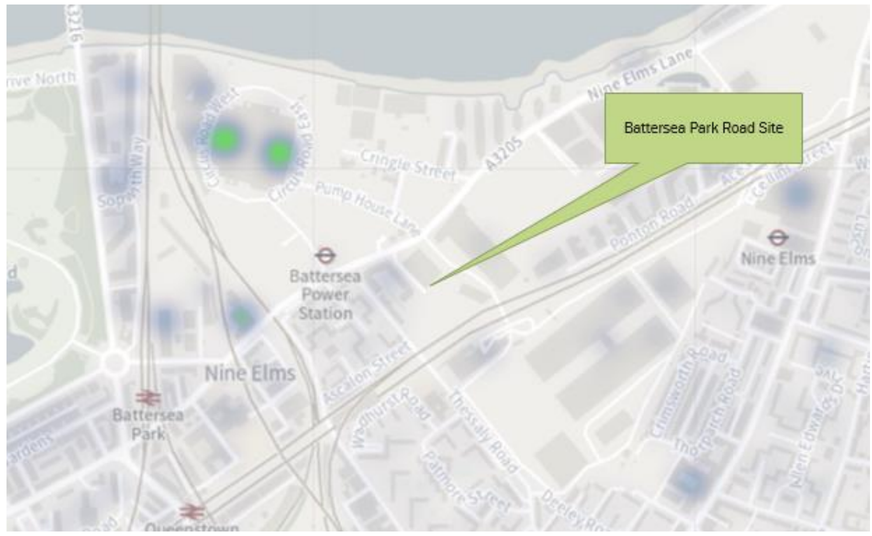


Figure 7.1 London Heat Map and the Battersea Park Road site

7.3 Be Clean Results

The Be Clean stage of the energy hierarchy is the same as the Be Lean due to being unable to connect to district heat networks at the current time. The communal heat pump system proposed has been attributed to the Be Green stage of the energy hierarchy as per GLA guidance regarding communal heat pumps. Details on the energy centres are contained in the Appendix.

Carbon emissions from the Be Clean stage have still been reported, albeit with no change from the Be Lean results.

Table 7.1 Be Clean domestic results (Plot 1 apartments)

	Regulated Site-Wide Carbon Emissions			
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	51.1	N/A	N/A	N/A
After energy demand reduction (Be Lean)	39.6	11.5	22%	22%
After potential DH connection (Be Clean)	39.6	0.0	0%	22%
After PV on-site renewables (Be Green)	N/A	N/A	N/A	N/A

Table 7.2 Be Clean non-domestic results (Plots 2, 3 and Plot 1 landlord and commercial)

	Regulated Site-Wide Carbon Emissions			
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	65.5	N/A	N/A	N/A
After energy demand reduction (Be Lean)	60.2	5.3	8%	8%
After potential DH connection (Be Clean)	60.2	0.0	0%	8%
After PV on-site renewables (Be Green)	65.9	N/A	N/A	N/A

Table 7.3 Be Clean (sitewide) results (Plots 1, 2 and 3)

Regulated Site-Wide Carbon Emissions				
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	116.6	N/A	N/A	N/A
After energy demand reduction (Be Lean)	99.8	16.8	14%	14%
After potential DH connection (Be Clean)	99.8	0.0	0%	14%
After PV on-site renewables (Be Green)	N/A	N/A	N/A	N/A

8 Energy Analysis - Be Green Stage

This section of the report presents the results from Part L1 and L2 compliance modelling for the Battersea Park Road development for the Be Green aspect and follows the GLA Energy Assessment Guidance (June 2022).

8.1 Be Green

Once the demand reduction and clean energy aspects of Be Lean and Be Clean have been applied respectively, applicants are required to investigate the opportunity for renewable technologies under Be Green.

As the developments' energy needs will be delivered through all-electric means the heating load will be provided by the air source heat pumps with efficiencies stated.

Although the London Plan encourages the area of photovoltaic panels (PV) to be maximised where possible, there is a trade-off between providing space for external terraces, green/brown/blue roofs and plant space required by air source heat pumps. This applies to all roof mounted renewable solutions such as solar thermal panels and wind turbines. Furthermore, with the national grid becoming decarbonised, it is increasingly more challenging for renewable technologies to offset and payback their embodied carbon. It is therefore important that a holistic analysis of roof space was considered in terms of the overall sustainability and environmental potential that they offer. Despite this, PV has been maximised by not only a raised podium for horizontal panels, but also vertical PV introduced on the south facing plant screens.

8.2 Building Services

As mentioned previously, the strategy is be based on communal ASHP providing space heating, domestic hot water and the limited amount of cooling present in the commercial and amenity spaces.

8.3 PV Generation

Around 25% of roof space at the Battersea Park Road development has been assigned to host PV arrays, with most of the roof area on the buildings being used as landscaped terraces and plant space for the building's air source heat pumps and other HVAC systems. Coordination with plant space and parapet heights has resulted in a total of approximately 215 m² of rooftop mounted PV panels in this development. A further vertical mounted array of approximately 125 m² PV panels has also been included to the south facing plant screens at roof level (markup contained within the appendix).

This array of 340m² will generate approximately 61,562 kWh a year for use by the non-domestic systems. This equates to approximately 77kWp.

Plot 1 = 41.3m², southeast facing, 30° pitch

Plot 2 = 46.4m², southwest facing, 90° pitch

Plot 3 = 78.4m², southwest facing, 90° pitch & 125m², southwest facing, 30° pitch & 48.8m², southeast facing, 30° pitch

8.4 ASHP Generation

The total space heating and DHW estimate from the compliance modelling for each block is given in the table below. All space heating and DHW across all blocks are served by ASHP (i.e., heat fraction from heat pump technologies has been maximised). The primary flow circuit will operate at approximately 55°C as per the datasheet in Appendix A.

Distribution efficiencies at this stage are:
- 85% for space heating and DHW in SAP
- NCM default for space heating (BRUKL)
- 90% for DHW in BRUKL to commercial areas (ground floor)
- 85% for DHW in BRUKL to all other areas

Table 8.1 ASHP energy estimate breakdown

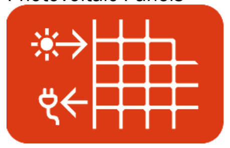
Element	Heat Pump Energy (MWh/annum/year)		
	Space Heating	DHW	Total
Plot 1 (Resi)	15.1	85.7	100.8
Plot 1 (Non-resi)	0.99	0.22	1.22
Plot 2 (Non-resi	21.1	12.6	33.7
Plot 3 (Non-resi)	54.6	47.6	102.2
Total	91.8	146.1	**237.9**

8.5 Low/Zero Carbon and Renewable Generation Appraisal

This section of the report presents the results from a low carbon and renewable technology feasibility study for the Battersea Park Road development. The result of the LZCT feasibility study is that air source heat pumps and photovoltaics were deemed most appropriate. Roof areas suitable for PV are shared with other uses such as landscaped terraces, green roofs and plant space.

Water source heat pumps and hydroelectricity have been excluded from the assessment as these would require extensive infrastructure which is neither practical nor economically viable. Fuel cells have also been excluded from the assessment due to the infancy of this technology which would result in a significant technical, commercial and economic risk to the project.

Table 8.2 Low and zero carbon renewable technology feasibility study

Technology	Comments
Photovoltaic Panels  Building mounted solar photovoltaic panels to generate renewable electricity	• PV panels provide clean green energy. • Maximizing available roof area for active PV array meets all Part L requirements and is in line with local planning requirements (i.e., GLA Be Green policy) • Operating and maintenance costs for PV panels are considered to be low compared to other renewable energy systems. • Roof access will be required as photovoltaics require maintenance and cleaning. • Simple and cost-effective technology to reduce CO_2 emissions. • Technology recommended due to the above, located on the roof of the BtR element and the PBSA element subject to overshading analysis, plant location, external terrace spaces and green roof coordination
Air Source Heat Pump  Use of the thermodynamic refrigeration cycle to generate hot water using air as a heat source	• ASHP technology can provide heating and cooling simultaneously with high efficiencies achieved. • Technology can be combined with cooling systems • Technology can provide domestic hot water • Performance of technology subject to external ambient air temperatures • Acoustic attenuation often required due to noise from ASHPs • Technology recommended for the BtR and PBSA until a future connection to a DHN can be feasible

8.6 Be Green Results

The results from the site wide Be Green energy modelling are summarised in the following tables. Significant carbon savings are made from the use of electric air-source heat pumps to provide space heating, domestic hot water and the limited amount of cooling to the development whilst being complimented with a PV array. Efforts were made to coordinate PV with the urban greening and plant requirements.

Table 8.3 Be Green domestic results (Plot 1 apartments)

Regulated Domestic Carbon Emissions				
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	51.1	N/A	N/A	N/A
After energy demand reduction (Be Lean)	39.6	11.5	22%	22%
After potential DH connection (Be Clean)	39.6	0.0	0%	22%
After PV on-site renewables (Be Green)	14.0	25.6	50%	73%

Table 8.4 Be Green Non-Domestic Results (Plots 2, 3 and Plot 1 landlord and commercial)

Regulated Non-Domestic Carbon Emissions				
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	65.5	N/A	N/A	N/A
After energy demand reduction (Be Lean)	60.2	5.3	8%	8%
After potential DH connection (Be Clean)	60.2	0.0	0%	8%
After PV on-site renewables (Be Green)	41.8	18.4	28%	36%

Table 8.5 Be Green sitewide results (Plots 1, 2 and 3)

Regulated Site-Wide Carbon Emissions				
	Carbon emissions (tonnes CO_2/annum)	Stage Savings (tonnes CO_2/annum)	Stage carbon savings (%)	Cumulative savings (%)
Baseline Part L 2021 of the Building Regulations compliant development	116.6	N/A	N/A	N/A
After energy demand reduction (Be Lean)	99.8	16.8	14%	14%
After potential DH connection (Be Clean)	99.8	0.0	0%	14%
After PV on-site renewables (Be Green)	55.8	44.0	38%	52%

9 Energy Analysis - Be Seen Stage

9.1 Planning Stage

The image below is a summary of the Be Seen requirements at different stages:

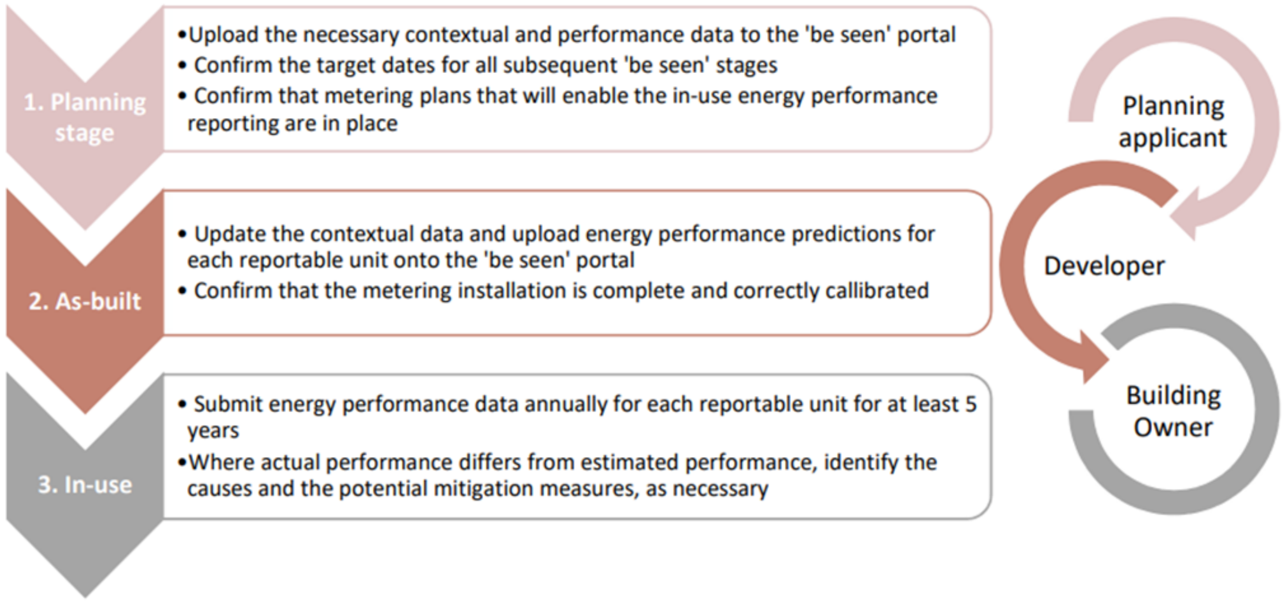


Figure 9.1 Be Seen requirements at planning stage, as-built stage and in-use stage (extract from GLA Be Seen Guidance April 2020)

The following guidance is based on the GLA Be Seen Guidance (April 2020). ‘Be Seen’ is split into three parts – Planning Stage, As-built Stage & In-use Stage.

- During planning stage, the applicant is required to submit an estimate of the ‘Be Seen’ energy performance using the ‘Be Seen’ spreadsheet.
  - Once planning approval has been granted at RIBA Stage 2/3, the applicant will submit this within 4 weeks.
  - The applicant is also required to ensure all affected parties (developer, building owner, landlord or occupier, etc.) are aware of their responsibilities at subsequent reporting stages; the responsibilities for data submission and accurate estimates as the design develops are secured through a legal agreement known as a Section 106 agreement between the local authority and the applicant.
- Planning stage performance indicators include:
  - Contextual data
  - Location Unique Property Reference Number (UPRN) or Address (if no UPRN available)
    - Site plan
    - Typology / Planning Use Class (all included)
    - GIA (m²) for each Typology / Use Class
    - Anticipated target dates for each ‘be seen’ reporting stage
  - Building energy use
    - Grid electricity consumption (kWh)
    - Gas consumption (kWh)
    - Other fuels consumption (kWh)
    - Energy generation (kWh)
    - District heating/cooling consumption (kWh) (if applicable)
  - Carbon emissions
    - Carbon emissions estimates (tonnes CO_2/m²) for residential and non-residential uses separately as well as the whole development
    - Carbon shortfall for the entire development (tonnes CO_2)
    - Estimated carbon offset amount (£)

9.2 Occupant Costs

Applicants are be expected to consider the estimated costs to occupants of the energy assessment and outline how they are committed to protecting the consumer from high prices.

In line with the energy hierarchy, the energy efficiency measures in this report outline how passive design principles have been implemented to reduce energy demand. This is through the thermal properties of the envelope, use of heat recovery ventilation and then how the space heating, domestic hot water and part of the electricity demand will be met through the use of renewable low/zero carbon generating technologies.

The proposal is for all generated heat and electricity will be used on-site, meaning there is no need for storage of energy or heat.

The Be Lean target of 15% has been met, and the space heating demand of <15 kWh/m² for all plots demonstrates that space heating has been reduced through the design outlined in this report. LETI (Low Energy Transformation Initiative) and Passivhaus both recommend a target of 15kWh/m² space heating.

This is further enhanced by the Be Seen process; we are working in alignment with the 'Be Seen' process and responsibilities defined within the 'Be Seen' energy monitoring guidance - this is recognised by the GLA guidance as important in keeping running costs low. Metering data will be used to close the performance gap for this development, and future developments that could benefit from the data.

CIBSE Heat Network Codes of Practice will be consulted at each stage to ensure distribution losses are minimised and that the cost to consumers is kept low.

Further quality assurance mechanisms include:

- Transparent billing, including separation of the ongoing maintenance and capital replacement aspects of the standing charge
- Targeting the credit for Aftercare support (BREEAM Man 05 Aftercare via contractors for PBSA and the equivalent HQM for the BTR - 11.4 Post Occupancy Evaluation)
- Consumer choice for metering arrangements at no extra cost (e.g. Prepayment Meters (PPM)) for the BTR element)

10 Results

This section of the report summarises the results from the Be Lean, Be Clean and Be Green energy modelling for the domestic and non-domestic areas of the development and outlines the carbon offset required to achieve zero carbon. A carbon offset of £95 per tonne of CO_2 has been applied as per GLA guidance. Full SAP and BRUKL sheets for every stage of the energy hierarchy for each plot will be provided alongside this report.

10.1 Part L Summary

This section of the report summarises the results from the Be Lean, Be Clean and Be Green energy modelling for the non-domestic results of the development and outlines the carbon offset required to achieve zero carbon. This is reported for:

- Plot 1 SAP
- Plot 1 BRUKL
  - Plot 1 BRUKL landlord only element
  - Plot 1 BRUKL minus landlord element
- Plot 2 BRUKL
- Plot 3 BRUKL

A carbon offset of £95 per tonne of CO_2 has been applied as per GLA guidance.

The Be Lean and Be Green calculations for all areas of the buildings (i.e. BRUKL reports and SAP output sheets) will be sent in a ZIP folder along with this report and the GLA carbon reporting spreadsheet.

10.2 Carbon Offset Payment

Based on the results above, the total carbon offset for the Battersea Park Road development is 1,675 Tonnes (broken down into 421 tonnes of CO_2 for domestic and 1,254 tonnes of CO_2 for non-domestic). Applying the GLA standard carbon offset payment of £95/tonne CO_2, the overall carbon offset payment to Wandsworth council is £159,127.

Table 10.1 Part L 2021 compliance results summary

Element of Development	Part L 2021 Compliance
Plot 1 (SAP)	
Target Emissions Rate (TER)	13.0 $kgCO_2/m^2$
Dwelling Emissions Rate (BER)	3.57 $kgCO_2/m^2$
Is DER lower than or equal to TER?	BER ≤ TER
Part L 2021 Betterment	72.5%
Plot 1 (BRUKL)	
Target Emissions Rate (TER)	1.80 $kgCO_2/m^2$
Building Emissions Rate (BER)	0.597 $kgCO_2/m^2$
Is BER lower than or equal to TER?	BER ≤ TER YES
Part L 2021 Betterment	61%

Plot 1 (BRUKL) landlord only element		Plot 1 (BRUKL) minus landlord element	
Target Emissions Rate (TER)	1.23 $kgCO_2/m^2$	Target Emissions Rate (TER)	4.51 $kgCO_2/m^2$
Building Emissions Rate (BER)	0.093 $kgCO_2/m^2$	Building Emissions Rate (BER)	3.33 $kgCO_2/m^2$
Is BER lower than or equal to TER?	BER ≤ TER YES	Is BER lower than or equal to TER?	BER ≤ TER YES
Part L 2021 Betterment	92%	Part L 2021 Betterment	26%

Element of Development	Part L 2021 Compliance
Plot 2 (BRUKL)	
Target Emissions Rate (TER)	2.13 $kgCO_2/m^2$
Building Emissions Rate (BER)	1.49 $kgCO_2/m^2$
Is BER lower than or equal to TER?	BER ≤ TER YES
Part L 2021 Betterment	30%
Plot 3 (BRUKL)	
Target Emissions Rate (TER)	2.32 $kgCO_2/m^2$
Building Emissions Rate (BER)	1.48 $kgCO_2/m^2$
Is BER lower than or equal to TER?	BER ≤ TER YES
Part L 2021 Betterment	36%

11 Conclusion

The world is in a climate change emergency, and it is more important than ever that the built environment responds to reducing greenhouse gas emissions while also addressing the wider sustainability issues that affect the environment, economy, and society.

The urgency of sustainable development is a key aspect to the UK achieving its 2050 Net Zero Carbon obligation and similarly London achieving its Net Zero Carbon City 2030 target. It is for these reasons why the London Plan 2021 aims to place sustainable development at the core of its planning policies.

This Energy Statement has been prepared to support the detailed planning application for the proposed development at Battersea Park Road and outlines the proposed measures to achieve compliance with the London Plan net zero carbon planning policies. This specifically includes a response to Policies SI 2 (Minimising Green House Gas Emissions) and SI 3 (Energy Infrastructure).

Part L compliance modelling has been completed in accordance with the London Plan energy hierarchy process which demonstrates a 52% site-wide carbon improvement over 2021 emission standards. The Be Lean requirements set out in Policy SI 2 have fallen slightly short of the 15% target (14% achieved) but this has been justified in the Be Lean analysis section.

Major developments are required to achieve a minimum 35% on-site carbon reduction over Part L 2021. The results from the Part L modelling demonstrate that the Battersea Park Road development achieves an aggregate 52% carbon improvement compared to 2021 standards which significantly exceeds this 35% target. An additional benchmark has been set for residential developments of 50%; as this development is a mix of PBSA, residential and commercial rather than purely residential, the additional benchmark for residential can be relaxed slightly when looked at sitewide but has been significantly exceeded for the domestic element of the development (a 73% improvement).

The non-domestic elements of the site achieve a 36% improvement which meets the requirements of Policy SI 2. Furthermore, the GLA acknowledges that non-residential developments may find it more challenging to achieve significant on-site carbon reductions beyond Part L 2021 to meet both the energy efficiency target and the minimum 35% improvement (see "15th June 2022 - Note to accompany GLA Energy Assessment Guidance 2022").

To achieve this level of carbon reduction, the building's energy demand has been reduced through the implementation of energy efficiency measures such as high standards of fabric thermal performance, airtight construction, mechanical ventilation heat recovery systems, waste-water heat recovery systems, air source heat pumps and low energy lighting and controls. By implementing these strategies, an impressive site-wide carbon reduction on baseline Part L performance of 52% has been achieved, as well as the wider sustainability credentials.

To achieve the London Plan zero carbon target, a carbon offset of 1,675 tonnes of CO_2 is required, which equates to a carbon offset payment of £159,127 (based on the GLA standard carbon offset payment of £95/tonne CO2).

All four of the commercial units and the day centre achieve the Ene 01 credits for a prerequisite of BREEAM Outstanding.

By applying the energy strategy detailed within this report, the Battersea Park Road development demonstrates a significant commitment to reducing carbon emissions while also achieving the Committee on Climate Change recommendations for all electric buildings. Furthermore, with the national grid becoming decarbonised, the operational carbon emissions of the Battersea Park Road development will continue to reduce each year as a result of its all-electric heating strategy.

Appendices

Appendix A - System Efficiencies

Accounting for DHW Heat Recovery in IES

6892 Battersea Park Road
Revision 00, 14.03.2023

Prepared by:	Patrick Sharpe	14/03/2023
Checked by:	Zac Vandevoir	22/03/2023
Approved by:	Pafsanias Vissariou	22/03/2023

1 Summary

IES does not include a mechanism for including waste-water heat recovery (WWHR) for compliance simulations. However, domestic hot water (DHW) is typically one of the largest sources of energy consumption in compliance simulations of homes. As a result, DHW WWHR can have a big impact on building energy consumption. This design note describes a technique for integrating DHW WWHR into IES for compliance simulations.

1.1 Approach

The intent of this design note is to describe the reduction in hot-water demand from WWHR as an increased CoP that can be inserted into IES as the source of heating for the DHW.

Here, it is assumed that WWHR is applied only to the showers. Where other sources of WWHR are included, the equations will need to be re-written to further subdivide DHW consumption.

1.2 Final expression

The following expression gives the DHW heat pump CoP that needs to be input into IES to account for the reduced heating demand associated with WWHR in the showers:

$$SCoP_{WWHR} = \frac{SCoP_{HP}}{(SH_{\%})(1-\varepsilon_{HR}) + (1-SH_{\%})}$$

Where $SCoP_{WWHR}$ is the SCoP that evaluates the correct DHW energy use with WWHR with the baseline DHW demand calculated by IES, $SCoP_{HP}$ is the CoP of the heat pump that provides the heat for DHW, $SH_{\%}$ is the proportion of DHW use attributed to showers, and ε_{HR} us the heat recovery efficiency of the WWHR unit. Here, both $SH_{\%}$ and ε_{HR} are between 0 and 1.

The derivation of the final expression is given in Appendix A.

1.3 Typical values

In residential settings, the proportion of DHW use attributable to the showers is can be expected to be high - typically in excess of 0.8. Examples in the SAP calculator give utilisation factors in excess of 0.9.

The heat recovery efficiency of WWHR systems are typically lower than those common in ventilation air. Heat recovery efficiencies are given by the manufacturer, but values around 0.6 can be expected.

SCoPs of DHW heat pumps will be specified by the manufacturer. SCoPs between 3.2 and 4.2 are common.

Appendices

Appendix A Derivation

An expression for the baseline DHW heating demand (without WWHR) can be given, where DHW load is broken down by shower and other sources:

$$D_{base} = DHW_{SH} + DHW_{other}$$

where D_{base} is the total baseline hot water demand, and DHWSH and DHW_{other} are the hot water demand arising from showers and other sources respectively.

The proportion of DHW load arising from showers can then be given by:

$$SH_{\%} = \frac{DHW_{SH}}{D_{base}} = 1 - \frac{DHW_{other}}{D_{base}}$$

Where $SH_{\%}$ is the proportion of DHW load arising from showers.

The DHW heating demand with WWHR to the showers can now be expressed:

$$D_{WWHR} = DHW_{SH}(1 - \varepsilon_{HR}) + DHW_{other}$$

$$D_{WWHR} = D_{base}\big((SH_{\%})(1 - \varepsilon_{HR}) + (1 - SH_{\%})\big)$$

Where DWWHR is the DHW heating demand with WWHR, and ε_{HR} is the heat recovery efficiency of the WWHR unit.

An expression for the DHW energy consumption with and without WWHR can be given by:

$$E_{base} = \frac{D_{base}}{SCoP_{HP}}$$

$$E_{WWHR} = \frac{D_{WWHR}}{SCoP_{HP}}$$

Where E_{base} and EWWHR are the DHW energy consumption for the without and with WWHR respectively, and $SCoP_{HP}$ is the seasonal coefficient of performance of the heat pump used to provide the DHW.

As IES does not provide a method of inputting WWHR system efficiencies, the DHW demand used by IES will be equivalent to the base case. To account for this we can derive an expression for a fictitious heat pump SCoP that would provide the energy consumption of the WWHR case with the baseline DHW demand:

$$SCoP_{WWHR} = \frac{D_{base}}{E_{WWHR}} = CoP_{HP}\frac{D_{base}}{D_{WWHR}}$$

Where $SCoP_{WWHR}$ is the SCoP of the heat-pump that accounts for the reduced DHW demand associated with waste-water heat recovery.

The final expression can then be given:

$$SCoP_{WWHR} = \frac{SCoP_{HP}}{(SH_{\%})(1 - \varepsilon_{HR}) + (1 - SH_{\%})}$$

Shower Energy Consumption Calculator

Duration (Minutes)	Flow rate (L/Min)	Total Water used (Litres)	Total Energy (kWh)	Recoverable Energy (kWh)
5	5.5	27.5	0.92732	0.80

Number of Showers

No. of showers present	233.0	Total Showers Per Day	170.1
Occupancy rate	0.73	Total Showers Per Year	62083
Users per shower present	1.000		

	Total Energy Required (kWh)	Total Recoverable Energy (kWh)	Direct Energy Recovered (kWh)	Energy Required for DHW (kWh)	Effective COP of WWHRS Unit	WWHRS System Efficiency
Per Day	**157.7**	**136.0**	**77.5**	**80.2**	1.97	49.1%
Per Year	**57570.4**	**49629.6**	**28288.9**	**29281.5**	1.97	

Recoup Unit	Pipe HEX
Installation Method	B
Efficiency of unit	57.0%
Assumed Efficency	
Installed Budgetary cost	£250
Project budget cost	£29,125
Shower temperature (°C)	41
Incoming Mains Cold Water Temp. (°C)	12
Temperature loss to atmosphere (°C)	4

DHW Cylinder Present	No	
Volume (Litres)	300	150
Heat Loss per year (kWh)	620.5	438

****** SAP (2021) defaults for showering (UK)**	
Site specific assumptions below:	
Shower water flow rate (litres/min)	5.5
Shower duration (minutes)	5
Shower water temperature (°C)(60 litres of hot water per day, per room)	41
Shower uses per day (persons per day) (at specified occupancy rate)	
Number of showers connected to 1no WWHRS (Pipe HEX)	2
***Therfore installed costs = installation cost of 1no WWHRS unit / number of showers connected to that unit**	
Total budget for hotel (at first fix) =	£29,125
SAP assumed delivered DHW temperature (°C)	56

occpancy rate 0.73 (SAP default for housing)
users per shower (room) 1
Budgetary cost (based on 2 no Showers per 1 no WWHRS. 2:1)

Note...
Typical lower floor plan shows x16 showers suitable for connecting to x8 WWHRS, 2:1
And x5 showers suitable for connecting to x5 WWHRS, 1:1

Average Costs Per Year

Fuel	Price per kWh*	Cost without WWHRS	Average Cost Per Year with Heat recovery	Saving	ROI (years)
Natural Gas	£0.0740	£4,734	£2,640	£2,093	13.91
LPG	£0.1550	£9,915	£5,530	£4,385	6.64
Electric (Direct)	£0.2830	£16,292	£8,287	£8,006	3.64
Electric (Heat Pump)	£0.2830	£7,909	£4,023	£3,886	7.49

CO_2 Savings associated with Showering

Fuel	Carbon Dioxide Factor ($kgCO_2$ per kWh)*	Primary Energy Factor**	$kgCO_2$ per year (No WWHRS)	$kgCO_2$ per year (With WWHRS)	$kgCO_2$ Saving per year	%Saving	tCO_2 Savings per year	WWHRS serviceable lifetime (y)	WWHRS savings over lifetime (tCO2)
Natural Gas	0.208	1.13	16705	9318	7388	44.2%	7.39	40	**295.51**
LPG	0.241	1.14	19527	10891	8636	44.2%	8.6	40	**345.43**
Electric (Direct)	0.286	1.501	24714	12570	12144	49.1%	12.14	40	**485.76**
Electric (Heat Pump)	0.286	1.501	11997	6102	5895	49.1%	5.90	40	**235.81**

*** Values taken from the Energy Saving Trust Website - Values correct as of August 2022**
https://energysavingtrust.org.uk/about-us/our-calculations
**Values taken from the BRE Website - Values correct for SAP 10.2
*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1000108/EHS_19-20_Energy_report.pdf
**** https://www.ncm-pcdb.org.uk/sap/filelibrary/pdf/WWHRS-Instantaneous_Shower-Method_Statement_24_09_2021.pdf

RECOUP
recoupwwhrs.co.uk

Shower Energy Consumption Calculator

Duration (Minutes)	Flow rate (L/Min)	Total Water used (Litres)	Total Energy (kWh)	Recoverable Energy (kWh)
5	5.5	27.5	0.92732	0.80

Number of Showers

No. of showers present	516.0	Total Showers Per Day	376.7
Occupancy rate	0.73	Total Showers Per Year	137488
Users per shower present	1.000		

	Total Energy Required (kWh)	Total Recoverable Energy (kWh)	Direct Energy Recovered (kWh)	Energy Required for DHW (kWh)	Effective COP of WWHRS Unit	WWHRS System Efficiency
Per Day	**349.3**	**301.1**	**171.6**	**177.7**	1.97	49.1%
Per Year	**127494.9**	**109909.4**	**62648.4**	**64846.5**	1.97	

Recoup Unit	Pipe HEX
Installation Method	B
Efficiency of unit	57.0%
Assumed Efficency	
Installed Budgetary cost	£250
Project budget cost	£64,500
Shower temperature (^oC)	41
Incoming Mains Cold Water Temp. (^oC)	12
Temperature loss to atmosphere (^oC)	4

DHW Cylinder Present	No	
Volume (Litres)	300	150
Heat Loss per year (kWh)	620.5	438

**** SAP (2021) defaults for showering (UK)

Site specific assumptions below:

Shower water flow rate (litres/min)	5.5
Shower duration (minutes)	5
Shower water temperature (°C)(60 litres of hot water per day, per room)	41
Shower uses per day (persons per day) (at specified occupancy rate)	
Number of showers connected to 1no WWHRS (Pipe HEX)	2

***Therfore installed costs = installation cost of 1no WWHRS unit / number of showers connected to that unit**

Total budget for hotel (at first fix) =	£64,500
SAP assumed delivered DHW temperature (°C)	56

occpancy rate	0.73 (SAP default for housing)
users per shower (room)	1

Budgetary cost (based on 2 no Showers per 1 no WWHRS. 2:1)

Note...
Supplied floor plan shows x20 showers suitable for connecting to x10 WWHRS, 2:1
And x4 showers suitable for connecting to x4 WWHRS, 1:1

Average Costs Per Year

Fuel	Price per kWh*	Cost without WWHRS	Average Cost Per Year with Heat recovery	Saving	ROI (years)
Natural Gas	£0.0740	£10,483	£5,847	£4,636	13.91
LPG	£0.1550	£21,957	£12,247	£9,710	6.64
Electric (Direct)	£0.2830	£36,081	£18,352	£17,729	3.64
Electric (Heat Pump)	£0.2830	£17,515	£8,909	£8,607	7.49

CO_2 Savings associated with Showering

Fuel	Carbon Dioxide Factor ($kgCO_2$ per kWh)*	Primary Energy Factor**	$kgCO_2$ per year (No WWHRS)	$kgCO_2$ per year (With WWHRS)	$kgCO_2$ Saving per year	%Saving	tCO_2 Savings per year	WWHRS serviceable lifetime (y)	WWHRS savings over lifetime (tCO2)
Natural Gas	0.208	1.13	36996	20635	16361	44.2%	16.36	40	**654.44**
LPG	0.241	1.14	43244	24120	19124	44.2%	19.1	40	**764.98**
Electric (Direct)	0.286	1.501	54732	27838	26894	49.1%	26.89	40	**1075.76**
Electric (Heat Pump)	0.286	1.501	26569	13513	13055	49.1%	13.06	40	**522.21**

*** Values taken from the Energy Saving Trust Website - Values correct as of August 2022**
https://energysavingtrust.org.uk/about-us/our-calculations
**Values taken from the BRE Website - Values correct for SAP 10.2
*** https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1000108/EHS_19-20_Energy_report.pdf
**** https://www.ncm-pcdb.org.uk/sap/filelibrary/pdf/WWHRS-Instantaneous_Shower-Method_Statement_24_09_2021.pdf

recoupwwhrs.co.uk

A.1 Waste Water Heat Recovery

Based on a seasonal efficiency of 3.39, a percentage of 91% DHW use due to showers and a heat recovery efficiency of 49.1%. Using the below methodology results in an uplifted seasonal efficiency of 6.12 for the DHW systems to the Plot 2 & 3 student areas.

- DHW use due to showers = 91%
  - Values of >90% are quoted within SAP software, see Figure A.1
- Heat recovery in showers = 49.1%
  - Figure provided by Recoup in the calculation sheets attached
- DHW seasonal efficiency = 3.39
  - Provided in the ASHP manufacturers data below (Section A.3)
- Results in 1.81 improvement factor
  - Applied to the 3.39 results in uplift to 6.12 seasonal efficiency

Waste Water Heat Recovery System

Waste Water Heat Recovery System — recoup

ID	Manufacter Ref. Number	Manufacturer Name	Brand Name	Model Name	Model Qualifier	First Year	Final Year	Efficiency	UtilisationFactor
80192	20075	Recoup Energy Solutions Ltd	Recoup	Pipe Active	System B		current	0	0.922
80193	20075	Recoup Energy Solutions Ltd	Recoup	Pipe Active	System C		current	0	0.937
80142	20075	Dutch Solar Systems BV	RECOUP	Drain+ Duo HE	System B	2017	current	0	0.946
80191	20075	Recoup Energy Solutions Ltd	Recoup	Pipe Active	System A		current	0	0.948
80080	20075	Dutch Solar Systems BV	RECOUP	Tray+	System B	2012	2014	0	0.95
80140	20075	Dutch Solar Systems BV	RECOUP	Easyfit+	System B	2017	current	0	0.956
80111	20075	Recoup Energy Solutions Ltd	RECOUP	Pipe+ HF	System B	2015	current	0	0.957
80148	20075	Recoup Energy Solutions Ltd	Recoup	Pipe HEX	System B	2019	current	0	0.957
80149	20075	Recoup Energy Solutions	Recoup	Pipe HEX Pd	System B	2019	current	0	0.958

Figure A.1 Recoup systems within the SAP database, showing 92.2% as the lowest assumed utilisation factor

A.2 VRF

Details of VRF efficiency used in energy model.

R410A Mini VRF Heat Pump - Twin Fan

Seasonal Efficiency	Ecodesign		Part L	
	SEER (C)	SCOP	SEER (C)	SCOP
PUMY-P112V(Y)KM6(5)	6.75	4.30	6.58	4.01
PUMY-P125V(Y)KM6(5)	6.65	4.40	6.65	4.24
PUMY-P140V(Y)KM6(5)	7.65	4.44	6.46	3.87
PUMY-P200YKM3	7.15	3.66	6.11	3.91
PUMY-P250YBM2	6.51	4.22	7.01	3.83
PUMY-P300YBM2	6.76	4.35	7.13	3.87

OUTDOOR UNITS		PUMY-P112VKM6
CAPACITY (kW)	Heating (nominal)	14.0
	Cooling (nominal)	12.5
	Heating (UK)	14.0
	Cooling (UK)	9.8
POWER INPUT (kW)	Heating (nominal)	3.49
	Cooling (nominal)	4.34
	Heating (UK)	4.48
	Cooling (UK)	2.08
COP / EER (nominal)		4.01 / 2.88
SCOP / SEER		-

A.3 ASHP

Details of ASHP efficiency used in model.

SCOP Official (Reg. 813/2013 EU)		
LOW TEMPERATURE		
Type climate		Average
Temperature application	°C	35
Type flow		Variable
Type Temperature		Variable
Bivalent temperature	°C	-7.0
PDesign	kW	80.4
Qhe	kWh	38629
SCOP		4.30
Performance ηs	%	169
Seasonal efficiency class		-
MEDIUM TEMPERATURE		
Type climate		Average
Temperature application	°C	55
Type flow		Variable
Type Temperature		Variable
Bivalent temperature	°C	-7.0
PDesign	kW	82.3
Qhe	kWh	50140
SCOP		3.39
Performance ηs	%	133

Appendix B - District Heat Network Correspondence

Atelier Ten have continued to pursue with Equans and VBEN the feasibility of connecting to/or creating a district heat network, in parallel with the ASHP solution outlined in the energy statement. See end of email chain below for latest correspondence.

From: Mark.Anderson@equans.com <Mark.Anderson@equans.com>
Sent: 01 February 2023 14:57
To: Joseph Lazell <joseph.lazell@atelierten.com>
Subject: [EXTERNAL] RE: RE: [External] RE: 6892 - Battersea Park Rd - District Heating Workshop

Hi Joe,

It was good to speak to you yesterday. I've followed up with some colleagues and this email is to confirm what we've discussed regarding the Watkin Jones development on Battersea Park Road.

Firstly we do not yet have clarity on whether there will be a connection south of the A3205, which would allow your development to connect to the Battersea District Heat Network. We still hope that this will be done in the future and are continuing in discussions with Battersea Power Station. However, I appreciate your timelines and at this stage confirm we cannot give you certainty that the connection is possible.

We also touched on potential alternatives to your fall-back plan, of installing ASHPs to serve your plot alone. EQUANS would be keen to discuss these possibilities with yourselves and Watkin Jones, which might range from a link between your development and Peabody to provide backup and resilience, through to EQUANS playing a much larger role and investing in an energy centre which could serve both developments on one or other site, or a virtual energy centre split between. We believe there could be a real win-win here, as nobody (planners, Peabody, BPS) wants the social housing excluded from the DHN but the challenges of crossing the main road are very real. I'm keen to discuss this with you soon but I appreciate you are working towards a planning submission in April. Please let me know when would be convenient for you to get our teams together and test whether this scenario can be created.

Thanks, Mark

RE: RE: [External] RE: 6892 - Battersea Park Rd - District Heating Workshop

Joseph Lazell
To Mark.Anderson@equans.com
Cc Zac Vandevoir; Bernie Carr; Joseph Lazell

Reply | Reply All | Forward

Fri 21/06/2024 15:51

[EXTERNAL] RE: 6892 - Battersea Park Rd - District Heating Workshop
Outlook item

Hi Mark,

I hope you're well? You might remember that we discussed the feasibility of connecting our site (Battersea Park Road) to the VNEB network around a year ago.

The project has been on hold but is now gaining traction again, so I wanted to check if there had been any change to the viability of a connection?

From memory there were technical issues preventing the network crossing Battersea Park Rd onto Sleaford St. Is this still the case? I've also been told a connection to the neighbouring Peabody site is no longer being progressed?

However, the GLA energy officer would like more clarity from us on the viability on connecting to the DHN (Either via BPS or the embassy) and have made the comment below:

"The applicant has provided evidence of correspondance with EQUANS. This is assumed to be referncing the Peabody heat network. It seems unlikely that connection will be possible in the short-term due to timescales and feasibility of connecting over the road. The applicant should continue to pursue this avenue as reccomended by EQUANS. Further correspondance should be provided.

The application also appears to be nearby the proposed VNEB heat network. The applicant should explore future connection to this site. Connection to the network should continue to be prioritised and evidence of active two-way correspondence with the network operator should be provided. This must include confirmation or otherwise from the network operator that the network has the capacity to serve the new development, together with supporting estimates of the CO2 emission factor, installation cost and timescales for connection."

Are you able to provide an update and potential next steps so we can respond to the comment above? Please work on the assumption that heat-on would be needed toward the end of 2025.

It would also be useful if you could advise if you have been able to refine or reduce the carbon factor associated with the network? Giles had previously advised 0.378 kgCO2/kWh (See attached email), which would be higher than grid elec.

Thanks in advance,

Joseph Lazell
Director

As I tend to check my e-mails intermittently, e-mail should be used for non-time-sensitive communications and routine requests. For urgent, or complex matters, a phone call is the best way to reach me.

Atelier Ten

RE: RE: [External] RE: 6892 - Battersea Park Rd - District Heating Workshop

Joseph Lazell
To Mark.Anderson@equans.com
Cc Zac Vandevoir; Bernie Carr

Reply | Reply All | Forward

Wed 03/07/2024 00:00

Hi Mark,

I just wanted to follow-up on the email below to see if you've had chance to look into this?

Kind regards,

Joseph Lazell
Director

As I tend to check my e-mails intermittently, e-mail should be used for non-time-sensitive communications and routine requests. For urgent, or complex matters, a phone call is the best way to reach me.

Atelier Ten
Building Services Engineers + Environmental Design Consultants
Fire Engineers + Lighting Designers

The ambitious Eden Project Dundee has been approved for planning. This transformative project will initiate a new chapter in the site's history that aims to set a new precedent for regenerative design. Atelier Ten is delivering the building services, environmental design and strategic fire engineering.

RE: [External]Battersea Park Rd - DHN

JL Joseph Lazell
To Henry Duff; Simon Lovell; Mark Anderson; Luca Giunta
Cc Zac Vandevoir

Reply | Reply All | Forward

Thu 24/10/2024 12:3

From: Simon Lovell <Simon.Lovell@WatkinJones.com>
Sent: Friday, August 30, 2024 8:08 AM
To: Mark Anderson <mark.anderson@bringenergy.com>; Luca Giunta <luca.giunta@bringenergy.com>
Cc: Joseph Lazell <joseph.lazell@atelierten.com>
Subject: [External]Battersea Park Rd - DHN

Some people who received this message don't often get email from simon.lovell@watkinjones.com. Learn why this is important

[External] is automatically added to emails originating from outside of the organization. Be extra careful with hyperlinks and attachments. Do not scan QR codes from external emails.

Hi Mark/Luca

Please see attached my email sent yesterday - is this something you are still involved with?

Regards

Simon Lovell
Development Director

T: 03309124262
M: 07738 195448
Kingsfield Court, Chester Business Park, Chester, CH4 9RE

The linked image cannot be displayed. The file may have been moved, renamed, or deleted. Verify that the link points to the correct file and location.

RE: [External]Battersea Park Rd - DHN

Joseph Lazell
To Henry Duff; Simon Lovell; Mark Anderson; Luca Giunta
Cc Zac Vandevoir
Reply | Reply All | Forward
Thu 24/10/2024 12:35

From: Mark Anderson <mark.anderson@bringenergy.com>
Sent: Thursday, September 5, 2024 7:25 PM
To: Simon Lovell <Simon.Lovell@WatkinJones.com>; Luca Giunta <luca.giunta@bringenergy.com>
Cc: Joseph Lazell <joseph.lazell@atelierten.com>; Henry Duff <henry.duff@bringenergy.com>
Subject: RE: [External]Battersea Park Rd - DHN

[EXTERNAL SENDER]

Hi Simon,

Good to hear from you. As it happens, we have a call booked to discuss BPR with Joseph in about 10 days' time. I think you were meant to be included on the invitation, if you are available – I'll follow up and make sure you receive it.

Thanks, Mark

Bring Energy

Mark Anderson
Concession Director

e mark.anderson@bringenergy.com

RE: [External]Battersea Park Rd - DHN

Joseph Lazell
To Henry Duff; Simon Lovell; Mark Anderson; Luca Giunta
Cc Zac Vandevoir
Reply | Reply All | Forward
Thu 24/10/2024 12:35

From: Simon Lovell <Simon.Lovell@WatkinJones.com>
Sent: Thursday, October 10, 2024 11:14 AM
To: Mark Anderson <mark.anderson@bringenergy.com>; Luca Giunta <luca.giunta@bringenergy.com>
Cc: Joseph Lazell <joseph.lazell@atelierten.com>; Henry Duff <henry.duff@bringenergy.com>
Subject: RE: [External]Battersea Park Rd - DHN

Some people who received this message don't often get email from simon.lovell@watkinjones.com. Learn why this is important

Hi Mark

I think you or your colleague were going to do us a note on the current status of the DHN following our recent meeting?

Regards

Simon Lovell
Development Director

T: 03309124262
M: 07738 195448
Kingsfield Court, Chester Business Park, Chester, CH4 9RE

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RE: [External]Battersea Park Rd - DHN

Joseph Lazell
To Henry Duff; Simon Lovell; Mark Anderson; Luca Giunta
Cc Zac Vandevoir
Reply | Reply All | Forward
Thu 24/10/2024 12:35

From: Henry Duff <henry.duff@bringenergy.com>
Sent: 10 October 2024 18:32
To: Simon Lovell <Simon.Lovell@WatkinJones.com>; Mark Anderson <mark.anderson@bringenergy.com>; Luca Giunta <luca.giunta@bringenergy.com>
Cc: Joseph Lazell <joseph.lazell@atelierten.com>
Subject: RE: [External]Battersea Park Rd - DHN

This Message Is From an Untrusted Sender

You have not previously corresponded with this sender.

Apologies Simon, we had been looking further into the ETS situation and exploring the potential to cross Battersea Park Road, as the situation is less clear cut than we thought.

However, I can confirm at this time there is not currently a DHN connection available or confirmed plans to create an available connection to your site.

Best regards
Henry

Bring Energy

Henry Duff

RE: [External]Battersea Park Rd - DHN

JL Joseph Lazell
To Henry Duff; Simon Lovell; Mark Anderson; Luca Giunta
Cc Zac Vandevoir

Reply | Reply All | Forward | ...

Thu 24/10/2024 12:35

your system. Each year with Clear, we offset our expected CO_2 emissions. Company Registration Number: 255 2224. Company Registered Address: 19 Perseverance Works, 38 Kingsland Road, London, E2 8DD

From: Joseph Lazell <joseph.lazell@atelierten.com>
Sent: 11 October 2024 13:22
To: Henry Duff <henry.duff@bringenergy.com>; Simon Lovell <Simon.Lovell@WatkinJones.com>; Mark Anderson <mark.anderson@bringenergy.com>; Luca Giunta <luca.giunta@bringenergy.com>
Subject: RE: [External]Battersea Park Rd - DHN

Hi Henry,

Many thanks for following-up with the email below.

I know we discussed this on the call but just to confirm and for the avoidance of doubt, when we are asked by the planners, this includes both Battersea Power Station and the network from the embassy? i.e. a connection to either DHN is not currently feasible?

Kind regards,

Joseph Lazell
Director

As I tend to check my e-mails intermittently, e-mail should be used for non-time-sensitive communications and routine requests. For urgent, or complex matters, a phone call is the best way to reach me.

Atelier Ten
Building Services Engineers + Environmental Design Consultants
Fire Engineers + Lighting Designers

RE: [External]Battersea Park Rd - DHN

JL Joseph Lazell
To Henry Duff; Simon Lovell; Mark Anderson; Luca Giunta
Cc Zac Vandevoir

Reply | Reply All | Forward | ...

Thu 24/10/2024 12:35

Hi Henry,

Apologies to chase but we are due to reply to the planners within the next day or two. Could you confirm the below is correct?

Kind regards,

Joseph Lazell
Director

As I tend to check my e-mails intermittently, e-mail should be used for non-time-sensitive communications and routine requests. For urgent, or complex matters, a phone call is the best way to reach me.

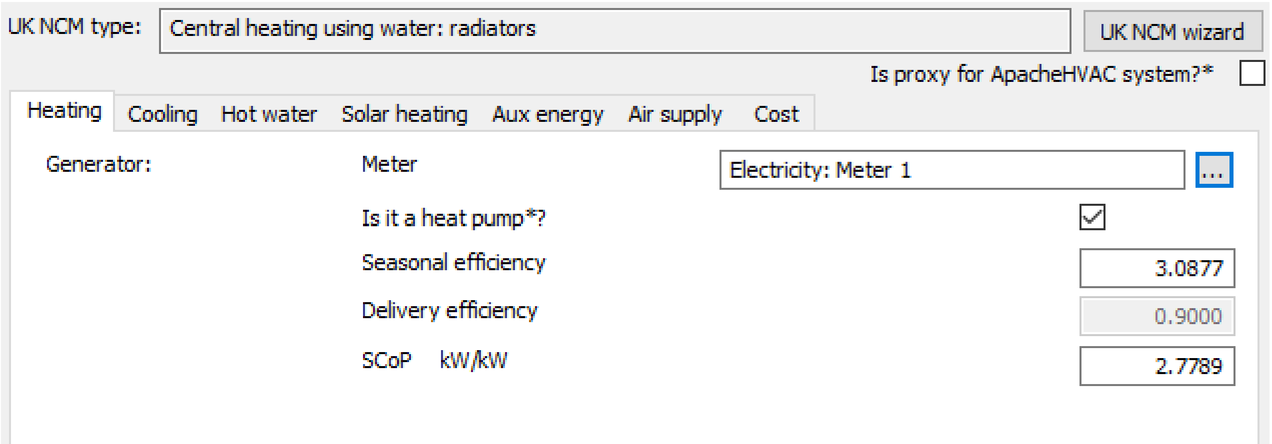
Atelier Ten
Building Services Engineers + Environmental Design Consultants
Fire Engineers + Lighting Designers

We are delighted to announce that planning for the National Centre for Music (NCM) has been approved! The new NCM will become the main tenant of the former Royal High School, and manage it as a cultural institution. Atelier Ten is delivering the MEP, environmental design and energy analysis.

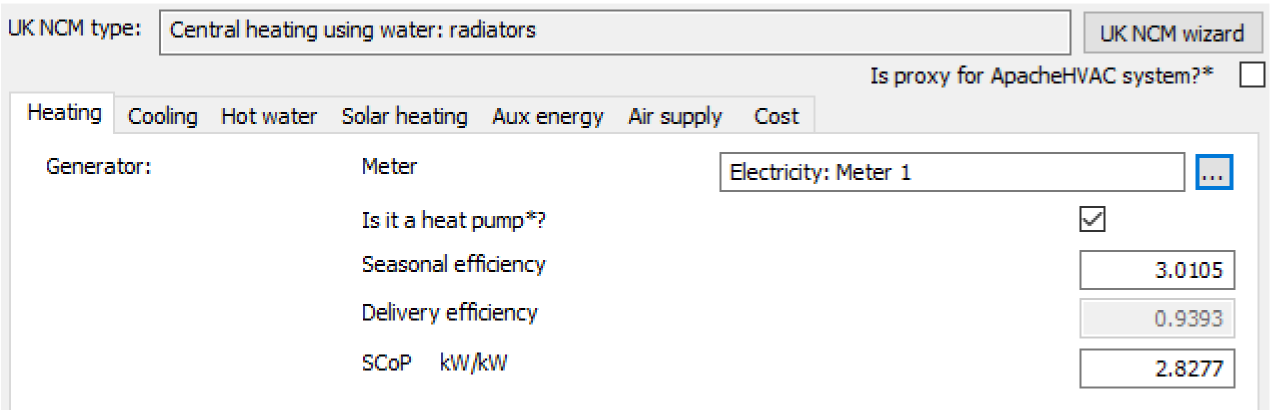
LONDON | MANCHESTER | GLASGOW | EDINBURGH | NEW YORK | NEW HAVEN | SAN FRANCISCO | BANGKOK | SINGAPORE | MELBOURNE | SYDNEY

Appendix C - Lean Systems Modelled

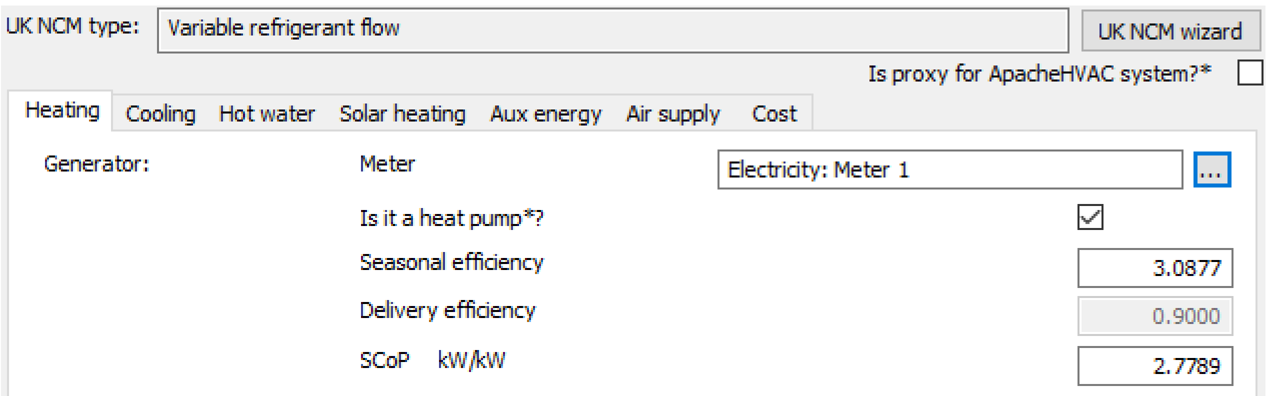
C.1 Space Heating



C.2 DHW



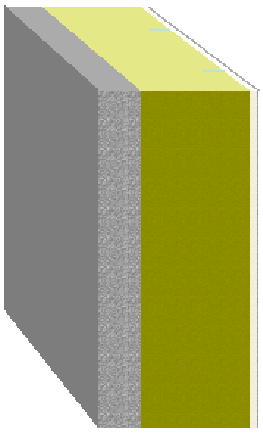
C.3 VRF



Appendix D - Wall U-value Build-Up

Documentation of the component
Thermal transmittance (U-value) according to Digest 465
Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

OUTSIDE INSIDE



This illustration of inhomogeneous layers is provided only to assist in visualising the arrangement.

Assignment: External wall

		Manufacturer	Name	Thickness [m], number	Lambda [W/(mK)]	Q	R [m²K/W]
		Rse					0.0400
☑	1	Own catalogue	Precast Concrete	0.1500	2.000	E	0.0750
☑	2	Own catalogue	Rainscreen Duo-Slab (100-225mm)	0.1500	0.035	E	4.2857
		Fixings	Generic Non Thermally Broken Fasteners No./m²:	8/m²	51.900	E	-
		Fixings	equivalent diameter: 0.0048 m / alpha: 0.800				
		Air gaps	Level 0: dU'' = 0.00 W/(m²K)				
☑	3	Own catalogue	Rainscreen Duo-Slab (100-225mm)	0.1500	0.035	E	4.2857
		Fixings	Generic Non Thermally Broken Fasteners No./m²:	8/m²	51.900	E	-
		Fixings	equivalent diameter: 0.0048 m / alpha: 0.800				
		Air gaps	Level 0: dU'' = 0.00 W/(m²K)				
☑	4	Light steel-frame	consisting of:	0.0700	ø 0.188		0.3726
	4a	Own catalogue	ROCKWOOL Flexi	99.70 %	0.038	E	-
		Air gaps	Level 1: dU'' = 0.01 W/(m²K)				
	4b	BS EN 12524	Steel	00.30 %	50.000	D	-
☑	5	BS EN 12524	Polyethylene 0.15 mm	0.0002	0.170	D	0.0009
☑	6	Generic Building Materials	Standard wallboard (plasterboard up to 700kg/m³)	0.0125	0.210	D	0.0595
☑	7	Generic Building Materials	Standard wallboard (plasterboard up to 700kg/m³)	0.0125	0.210	D	0.0595
☑	8	BS EN 12524	Gypsum plastering	0.0030	0.570	D	0.0053
		Rsi					0.1300
				0.5482			

$R_T = p*R_T' + (1-p)*R_T'' = 10.46\ m^2K/W$

Correction to U-value for	according to	delta U [W/(m²K)]
Mechanical fasteners	Digest 465	0.0269
Air gaps	BS EN ISO 6946 Annex F	0.0000
		0.0269

$U = 1/R_T + \Sigma\Delta U = 0.12\ W/(m^2K)$

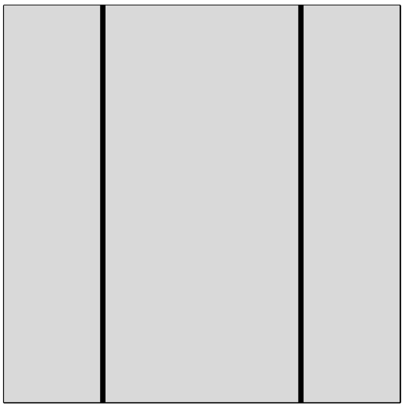
Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following
A .. A: Data is entered and validated by the manufacturer or supplier. Data is continuously tested by 3rd party.
B .. B: Data is entered and validated by the manufacturer or supplier. Data is certified by 3rd party
C .. C: Data is entered and validated by the manufacturer or supplier.
D .. D: Information is entered by BuildDesk without special agreement with the manufacturer, supplier or others.
E .. E: Information is entered by the user of the BuildDesk software without special agreement with the manufacturer, supplier or others.

U = **0.12** W/(m²K) R_T= **10.46** m²K/W

Source: **own catalogue - External walls**

Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Steel percentage: 0.30 %



Light steel-frame sections
The portion is given in %.

A	consisting of material layers: 1, 2, 3, 4a, 5, 6, 7, 8	= 99.70%
B	consisting of material layers: 1, 2, 3, 4b, 5, 6, 7, 8	= 0.30%

Upper limit of the thermal transfer resistance R

U_A [W/(m²K)] = $\frac{1}{(\Sigma R_{i,A}) + R_{si} + R_{se}} = \frac{1}{10.61 + 0.13 + 0.04}$ = 0.09

U_B [W/(m²K)] = $\frac{1}{(\Sigma R_{i,B}) + R_{si} + R_{se}} = \frac{1}{8.77 + 0.13 + 0.04}$ = 0.11

$$R_T' = \frac{1}{A * U_A + B * U_B} = 10.78 \text{ m}^2\text{K/W}$$

Lower limit of the thermal transfer resistance R

R_{se} [m²K/W]		= 0.04
R_1" [m²K/W] = d_1/λ_1=	0.1500 / 2.000	= 0.08
R_2" [m²K/W] = d_2/λ'_2=	0.1500 / 0.035	= 4.29
R_3" [m²K/W] = d_3/λ'_3=	0.1500 / 0.035	= 4.29
R_4" [m²K/W] = $d_4/(\lambda_{4a} * A + \lambda_{4b} * B)$ =	0.0700 /(0.038 * 99.70% + 50.000 * 0.30%)	= 0.37
R_5" [m²K/W] = d_5/λ_5=	0.0002 / 0.170	= 0.00
R_6" [m²K/W] = d_6/λ_6=	0.0125 / 0.210	= 0.06
R_7" [m²K/W] = d_7/λ_7=	0.0125 / 0.210	= 0.06
R_8" [m²K/W] = d_8/λ_8=	0.0030 / 0.570	= 0.01
R_{si} [m²K/W]		= 0.13

$$R_T'' = \Sigma R_i'' + R_{si} + R_{se} = 9.31 \text{ m}^2\text{K/W}$$

Kind of frame:	Hybrid frame
Flange width:	known not to exceed 50 mm
Stud spacing s [m]:	0.600
Stud depth d [m]:	0.070
Web thickness t [m]:	0.00180
Steel percentage [%]:	0.30

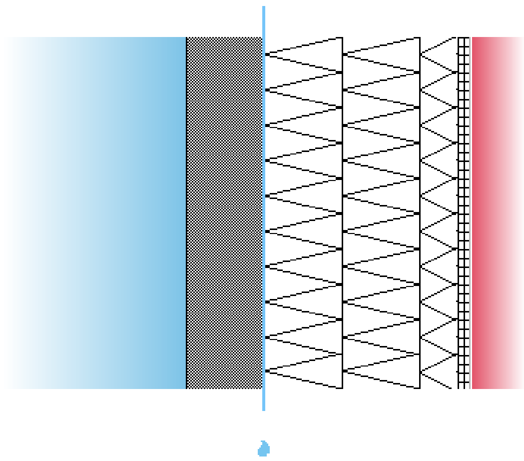
Weight factor p

Formula: $p = 0,8 * (R_T''/R_T') + 0,32 - 0,2 * (0,6/s) - 0,04 * (d/0,1)$ =**0.783**

$$R_T = p*R_T' + (1-p)*R_T'' = 10.46 \text{ m}^2\text{K/W}$$

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

OUTSIDE INSIDE



The list of material layers shown below may differ from those in the U-value calculation printout. Only material layers which are used in the Condensation Risk Analysis are listed.

This calculation of the Condensation risk analysis according to BS EN ISO 13788 has been performed on a construction containing inhomogeneous layers. This calculation is only valid through the selected section. It is advisable that you should also select the alternative position and recalculate the Condensation Risk Analysis for a more complete assessment of the construction. For further information the user is advised to follow the guidance in BS 5250:2021 Management of moisture in buildings

Assignment: External wall

Name	Thickn. [m]	lambda [W/(mK)]	Q	µ [-]	Q	sd [m]	R [m²K/W]
Precast Concrete	0.1500	2.000	E	80.00	E	12.00	0.0750
Rainscreen Duo-Slab (100-225mm)	0.1500	0.035	E	1.00	E	0.15	4.2857
Rainscreen Duo-Slab (100-225mm)	0.1500	0.035	E	1.00	E	0.15	4.2857
ROCKWOOL Flexi	0.0700	0.038	E	1.00	E	0.07	1.8421
Polyethylene 0.15 mm	0.0002	0.170	D	300000.00	D	45.00	0.0009
Standard wallboard (plasterboard up to 700kg/m³)	0.0125	0.210	D	4.00	D	0.05	0.0595
Standard wallboard (plasterboard up to 700kg/m³)	0.0125	0.210	D	4.00	D	0.05	0.0595
Gypsum plastering	0.0030	0.570	D	6.00	D	0.02	0.0053

Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following
A .. A: Data is entered and validated by the manufacturer or supplier. Data is continuously tested by 3rd party.
B .. B: Data is entered and validated by the manufacturer or supplier. Data is certified by 3rd party
C .. C: Data is entered and validated by the manufacturer or supplier.
D .. D: Information is entered by BuildDesk without special agreement with the manufacturer, supplier or others.
E .. E: Information is entered by the user of the BuildDesk software without special agreement with the manufacturer, supplier or others.

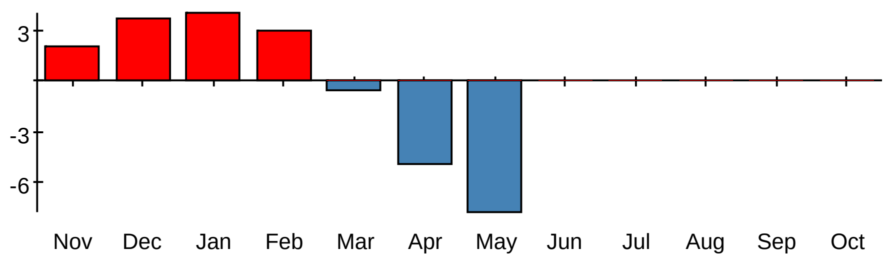
Condensation risk analysis - summary of main results
Calculation according BS EN ISO 13788

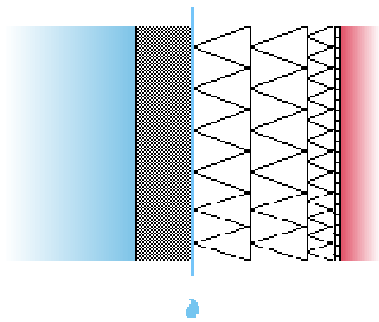
Surface temperature to avoid critical surface moisture:
No danger of mould growth is expected.

Interstitial condensation occurs, but all the condensate is predicted to evaporate during the summer months.

The risk of degradation of building materials and deterioration of thermal performance as a consequence of the calculated maximum amount of moisture shall be considered according to regulatory requirements and other guidance in product standards.

Interstitial condensation and evaporation per month gc [g/m²]





Component, condensation range

Condensation Risk Analysis calculations according to BS EN ISO 13788 are used as a guide in predicting interstitial condensation. This methodology uses some simplifications of the dynamic processes involved and subsequently does have some limitations. For further information the user is advised to follow the prescriptive guidance in BS 5250:2021 Management of moisture in buildings – Code of practice & BRE Information Paper:IP2/O5 (Feb. 2005) 'Modelling and controlling interstitial condensation

Surface temperature to avoid critical surface humidity Calculation according BS EN ISO 13788

Location: Stanstead; Humidity class according BS EN ISO 13788 annex A: 3 Buildings with unknown occupancy; Return period according BS 5250:2021 Once in 10 years (-1°C Ext Temp, +4% Ext RH)

		1	2	3	4	5	6	7	8	9	10	11	12
	Month	Te	phi_e	Ti	phi_i	pe	delta p	pi	ps(Tsi)	Tsi,min	fRsi	Tsi	Tse
		[°C]	---	[°C]	---	[Pa]	[Pa]	[Pa]	[Pa]	[°C]	---	[°C]	[°C]
I	January	2.7	0.910	20.0	0.594	675	714	1389	1736	15.3	0.728	19.6	2.8
	February	2.5	0.890	20.0	0.587	651	721	1372	1715	15.1	0.720	19.6	2.6
	March	4.5	0.840	20.0	0.581	707	650	1357	1697	14.9	0.673	19.6	4.6
	April	6.4	0.790	20.0	0.574	759	583	1342	1677	14.8	0.614	19.7	6.4
	May	10.0	0.790	20.0	0.610	970	455	1425	1781	15.7	0.568	19.8	10.0
	June	13.2	0.790	20.0	0.659	1198	341	1540	1924	16.9	0.544	19.8	13.2
	July	15.5	0.770	20.0	0.691	1355	260	1615	2019	17.7	0.479	19.9	15.5
	August	15.3	0.770	20.0	0.687	1338	267	1605	2006	17.6	0.480	19.9	15.3
	September	12.9	0.810	20.0	0.666	1205	352	1557	1946	17.1	0.588	19.8	12.9
	October	9.4	0.880	20.0	0.648	1037	476	1514	1892	16.6	0.682	19.8	9.4
	November	5.5	0.910	20.0	0.615	822	615	1436	1795	15.8	0.711	19.7	5.6
	December	3.9	0.920	20.0	0.605	743	672	1414	1768	15.6	0.725	19.6	4.0

- The critical month is January with $f_{Rsi,max}$ = 0.728
  f_{Rsi} = 0.977

$f_{Rsi} > f_{Rsi,max}$, the component complies.

Nr Explanation
1 External temperature
2 External rel. humidity
3 Internal temperature
4 Internal relative humidity
5 External partial pressure $p_e = \phi_e * p_{sat}(T_e)$; $p_{sat}(T_e)$ according formula E.7 and E.8 of BS EN ISO 13788
6 Partial pressure difference. The security factor of 1.10 according to BS EN ISO 13788, ch.4.2.4 is already included.
7 Internal partial pressure $p_i = \phi_i * p_{sat}(T_i)$; $p_{sat}(T_i)$ according formula E.7 and E.8 of BS EN ISO 13788
8 Minimum saturation pressure on the surface obtained by $p_{sat}(T_{si}) = p_i / \phi_{si}$,
where ϕ_{si} = 0.8 (critical surface humidity)
9 Minimum surface temperature as function of $p_{sat}(T_{si})$, formula E.9 and E.10 of BS EN ISO 13788
10 Design temperature factor according 3.1.2 of BS EN ISO 13788
11 Internal surface temperature, obtained from $T_{si} = T_i - R_{si} * U * (T_i - T_e)$
12 External surface temperature, obtained from $T_{se} = T_e + R_{se} * U * (T_i - T_e)$

Interstitial condensation - main results
Calculation according BS EN ISO 13788

Interstitial condensation occurs but all the condensate is predicted to evaporate during the summer months.

The risk of degradation of building materials and deterioration of thermal performance as a consequence of the calculated maximum amount of moisture shall be considered according requirements and other guidance in product standards.

Climatic conditions
Location: Stanstead; Humidity class according BS EN ISO 13788 annex A: 3 Buildings with unknown occupancy; Return period according BS 5250:2021 Once in 10 years (-1°C Ext Temp, +4% Ext RH)

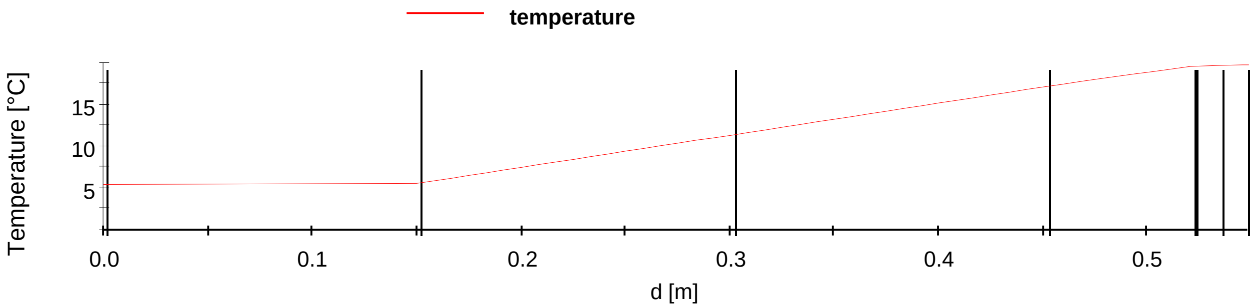
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Internal temperature [°C]	Ti	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Internal rel. humidity [%]	phi_i	59.4	58.7	58.1	57.4	61.0	65.9	69.1	68.7	66.6	64.8	61.5	60.5
External temperature [°C]	Te	2.7	2.5	4.5	6.4	10.0	13.2	15.5	15.3	12.9	9.4	5.5	3.9
External rel. humidity [%]	phi_e	91.0	89.0	84.0	79.0	79.0	79.0	77.0	77.0	81.0	88.0	91.0	92.0

Monthly moisture content per area gc [g/m²]
Accumulated moisture content per area Ma [g/m²]

		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Precast Concrete / Rainscreen	gc	2	4	4	3	0	-5	-8	---	---	---	---	---
Duo-Slab (100-225mm)	Ma	2	6	10	13	12	8	---	---	---	---	---	---

Vapour pressure distribution
Calculation according BS EN ISO 13788

1. Month of balance: November	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.615	5.5	0.910



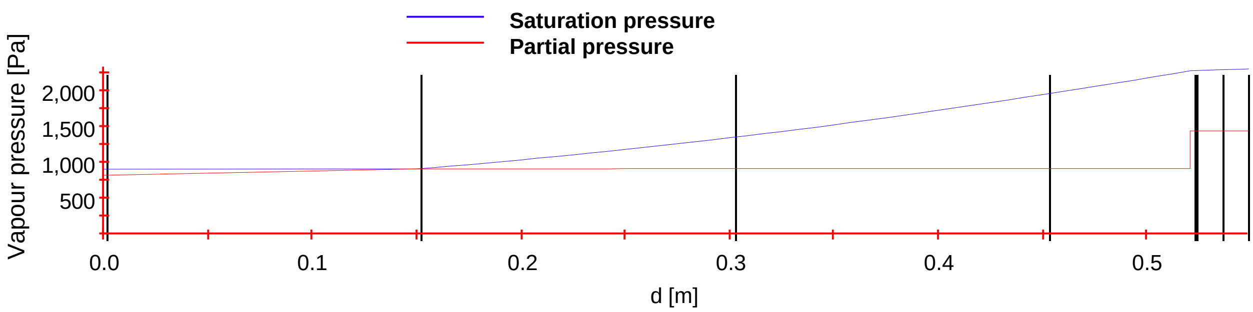


Table of month November:

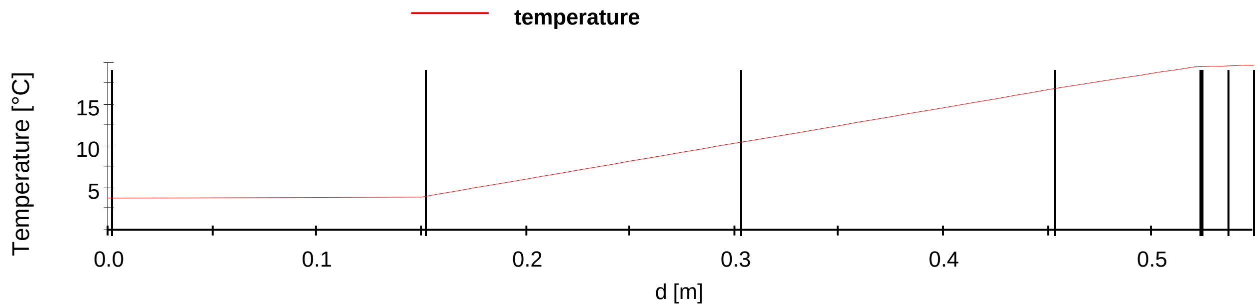
	Name	T[°C]	d[m]	psat[Pa]	p[Pa]
	External / Precast Concrete	5.6	0.548	906	822
I	Precast Concrete / Rainscreen Duo-Slab (100-225mm)	5.7	0.398	912	912
	Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	11.4	0.248	1343	914
	Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	17.1	0.098	1943	916
	ROCKWOOL Flexi / Polyethylene 0.15 mm	19.5	0.028	2266	917
	Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.5	0.028	2266	1435
	Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.6	0.016	2277	1435
	Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.7	0.003	2288	1436
	Gypsum plastering / Internal	19.7	0.000	2289	1436

I Interface with condensation

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

2. Month of balance: December	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.605	3.9	0.920



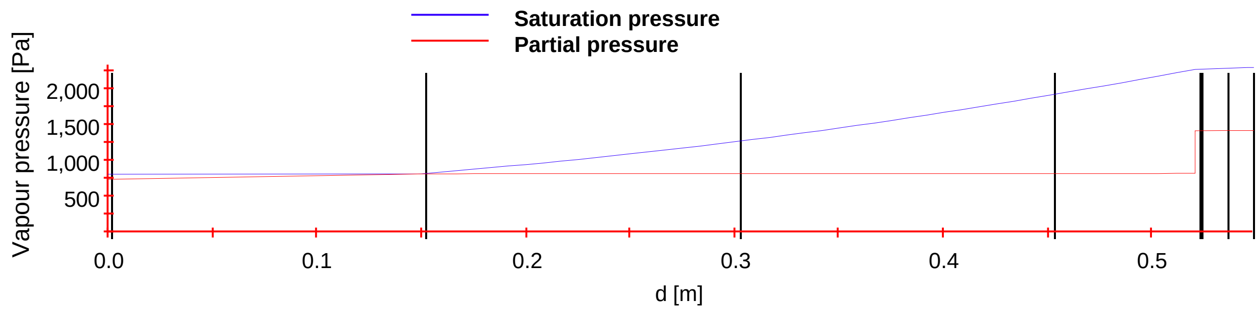


Table of month December:

	Name	T[°C]	d[m]	psat[Pa]	p[Pa]
	External / Precast Concrete	4.0	0.548	811	743
I	Precast Concrete / Rainscreen Duo-Slab (100-225mm)	4.1	0.398	817	817
	Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	10.4	0.248	1260	819
	Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	16.7	0.098	1903	821
	ROCKWOOL Flexi / Polyethylene 0.15 mm	19.4	0.028	2258	822
	Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.4	0.028	2258	1413
	Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.5	0.016	2271	1413
	Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.6	0.003	2283	1414
	Gypsum plastering / Internal	19.6	0.000	2284	1414

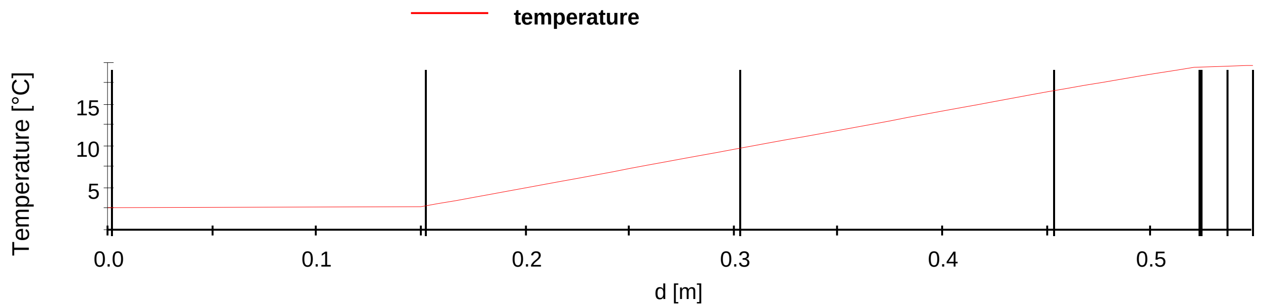
I Interface with condensation

Source: **own catalogue - External walls**

Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

3. Month of balance: January	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.594	2.7	0.910



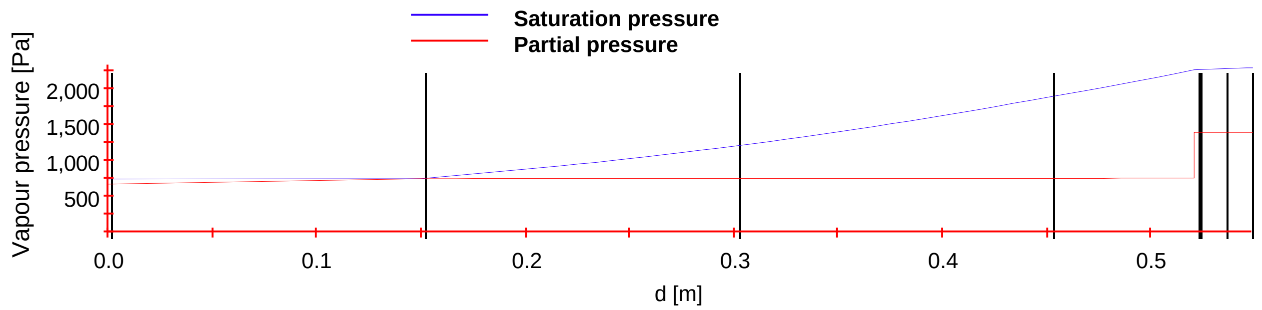


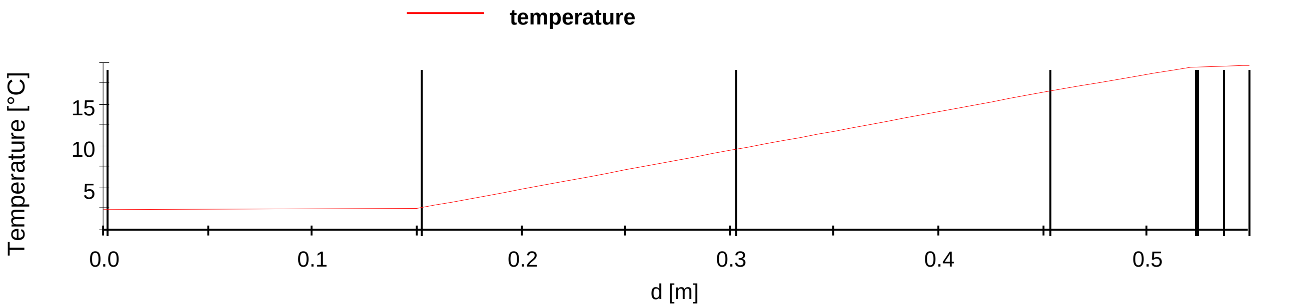
Table of month January:

	Name	T[°C]	d[m]	psat[Pa]	p[Pa]
	External / Precast Concrete	2.8	0.548	745	675
I	Precast Concrete / Rainscreen Duo-Slab (100-225mm)	2.9	0.398	751	751
	Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	9.7	0.248	1201	753
	Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	16.5	0.098	1874	755
	ROCKWOOL Flexi / Polyethylene 0.15 mm	19.4	0.028	2252	756
	Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.4	0.028	2252	1387
	Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.5	0.016	2266	1388
	Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.6	0.003	2279	1389
	Gypsum plastering / Internal	19.6	0.000	2280	1389

I Interface with condensation

Vapour pressure distribution
Calculation according BS EN ISO 13788

4. Month of balance: February	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.587	2.5	0.890



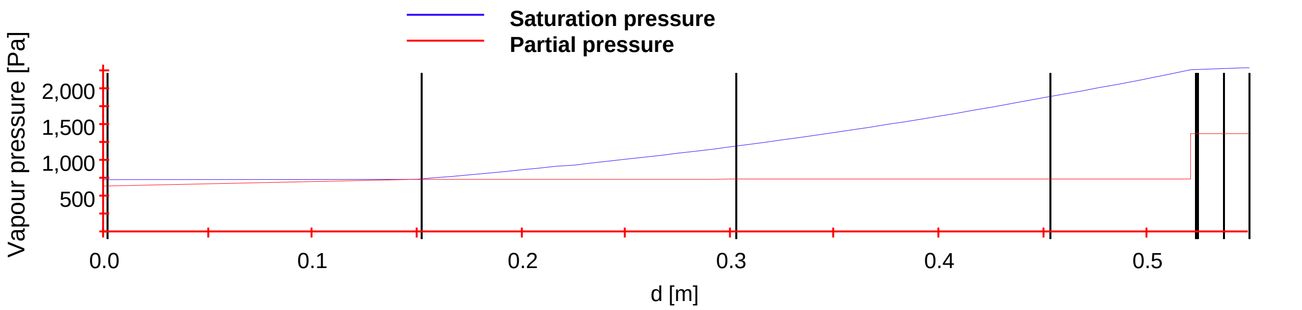


Table of month February:

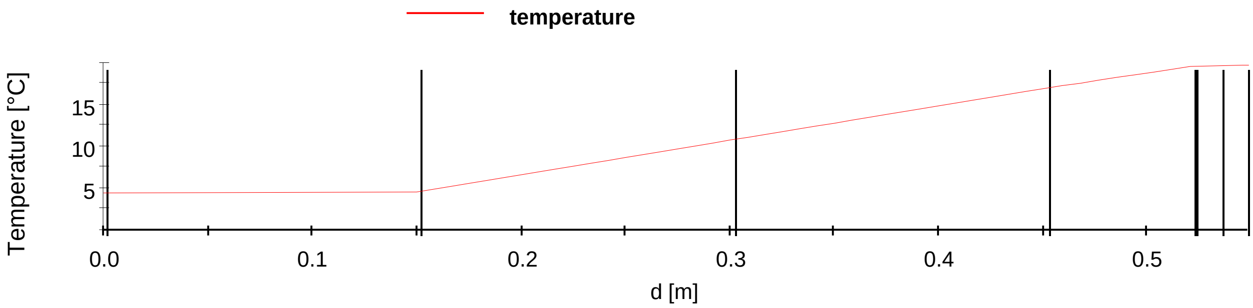
	Name	T[°C]	d[m]	psat[Pa]	p[Pa]
	External / Precast Concrete	2.6	0.548	734	651
I	Precast Concrete / Rainscreen Duo-Slab (100-225mm)	2.7	0.398	741	741
	Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	9.6	0.248	1192	743
	Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	16.4	0.098	1869	745
	ROCKWOOL Flexi / Polyethylene 0.15 mm	19.4	0.028	2251	746
	Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.4	0.028	2251	1370
	Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.5	0.016	2265	1371
	Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.6	0.003	2278	1372
	Gypsum plastering / Internal	19.6	0.000	2280	1372

I Interface with condensation

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

5. Month of balance: March	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.581	4.5	0.840



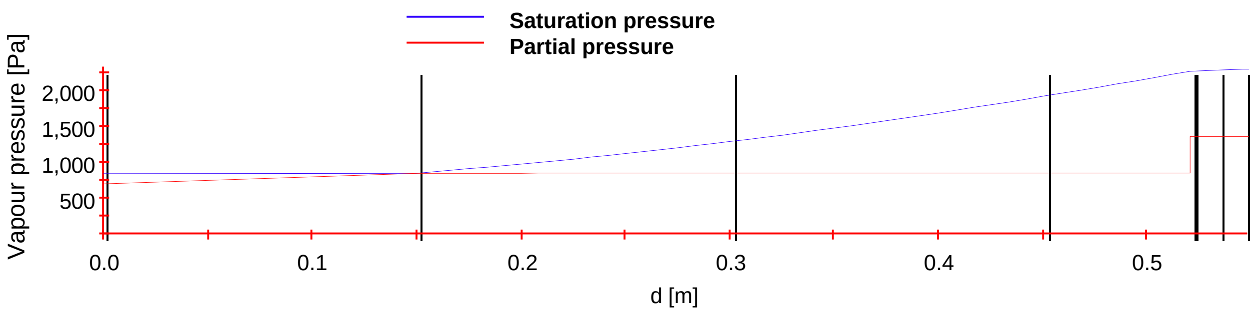


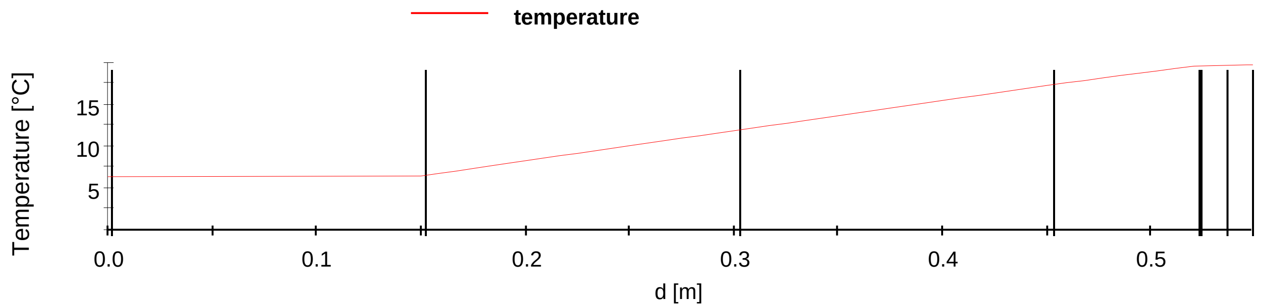
Table of month March:

	Name	T[°C]	d[m]	psat[Pa]	p[Pa]
	External / Precast Concrete	4.6	0.548	845	707
I	Precast Concrete / Rainscreen Duo-Slab (100-225mm)	4.7	0.398	852	852
	Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	10.8	0.248	1291	853
	Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	16.8	0.098	1918	855
	ROCKWOOL Flexi / Polyethylene 0.15 mm	19.5	0.028	2261	856
	Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.5	0.028	2261	1356
	Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.6	0.016	2273	1357
	Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.6	0.003	2285	1357
	Gypsum plastering / Internal	19.6	0.000	2286	1357

I Interface with condensation

Vapour pressure distribution
Calculation according BS EN ISO 13788

	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
6. Month of balance: April	20.0	0.574	6.4	0.790



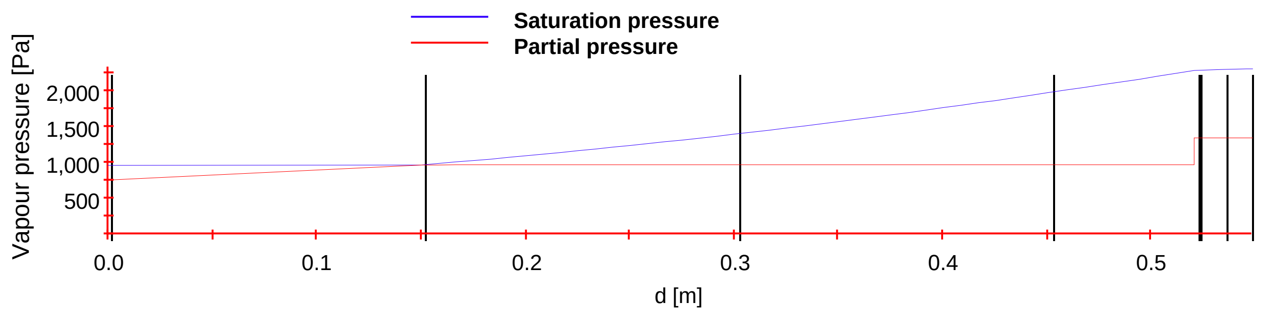


Table of month April:

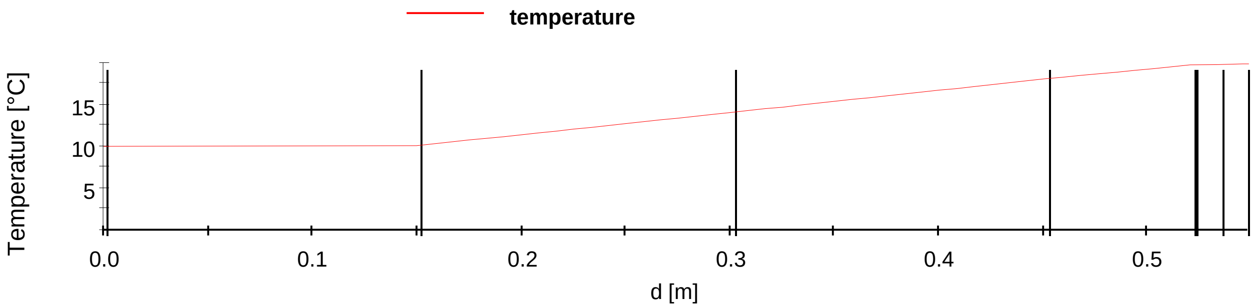
	Name	T[°C]	d[m]	psat[Pa]	p[Pa]
	External / Precast Concrete	6.4	0.548	964	759
I	Precast Concrete / Rainscreen Duo-Slab (100-225mm)	6.5	0.398	970	970
	Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	11.9	0.248	1392	972
	Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	17.2	0.098	1966	973
	ROCKWOOL Flexi / Polyethylene 0.15 mm	19.5	0.028	2270	973
	Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.5	0.028	2270	1341
	Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.6	0.016	2281	1341
	Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.7	0.003	2291	1342
	Gypsum plastering / Internal	19.7	0.000	2292	1342

I Interface with condensation

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
7. Month of balance: May	20.0	0.610	10.0	0.790



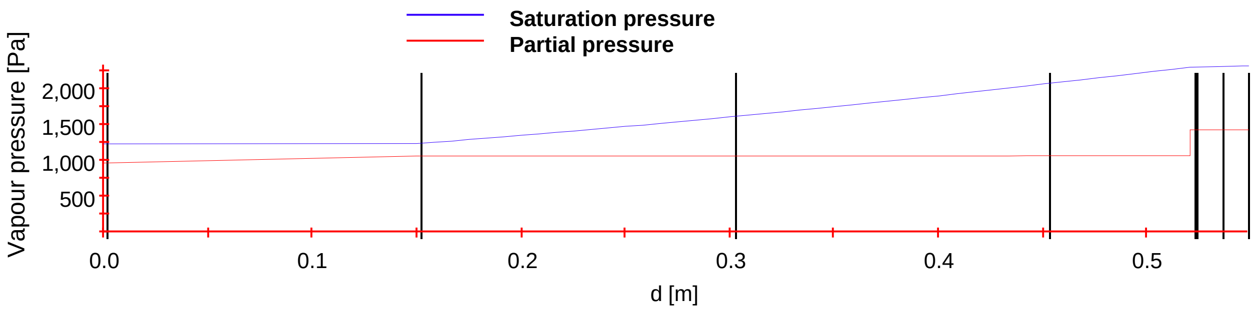


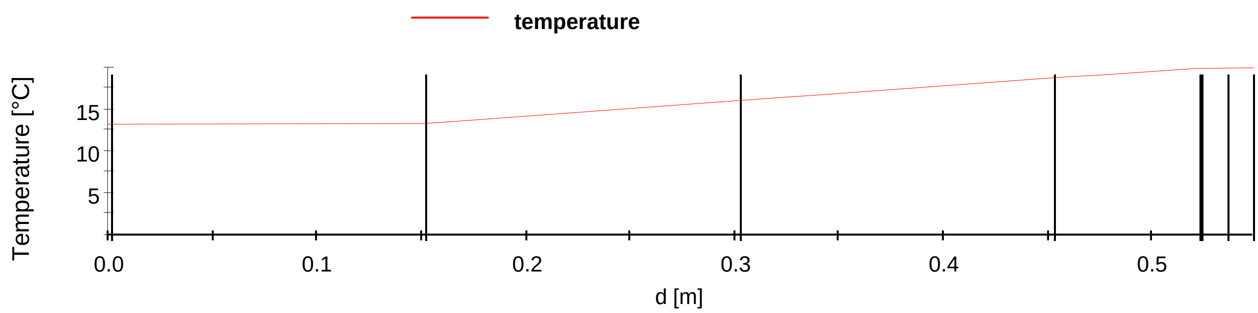
Table of month May:

Name	T[°C]	d[m]	psat[Pa]	p[Pa]
External / Precast Concrete	10.0	0.548	1230	970
Precast Concrete / Rainscreen Duo-Slab (100-225mm)	10.1	0.398	1236	1065
Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	14.0	0.248	1601	1066
Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	18.0	0.098	2058	1067
ROCKWOOL Flexi / Polyethylene 0.15 mm	19.7	0.028	2288	1067
Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.7	0.028	2288	1424
Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.7	0.016	2296	1424
Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.8	0.003	2303	1424
Gypsum plastering / Internal	19.8	0.000	2304	1425

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

8. Month of balance: June	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.659	13.2	0.790



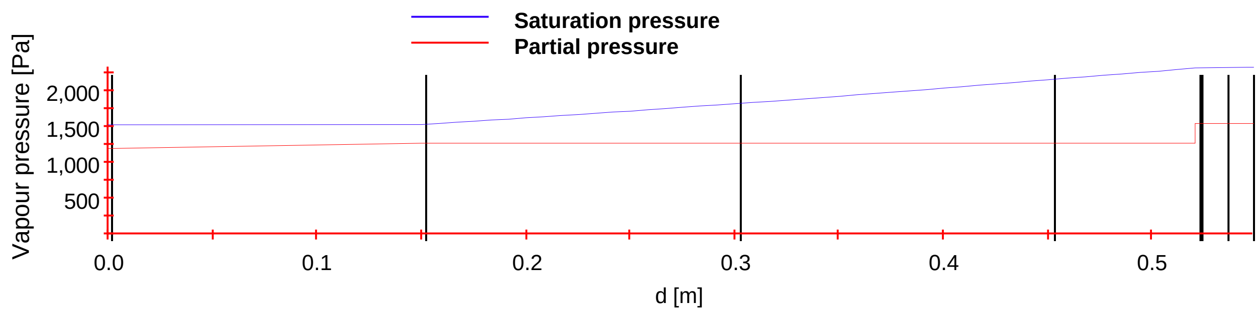


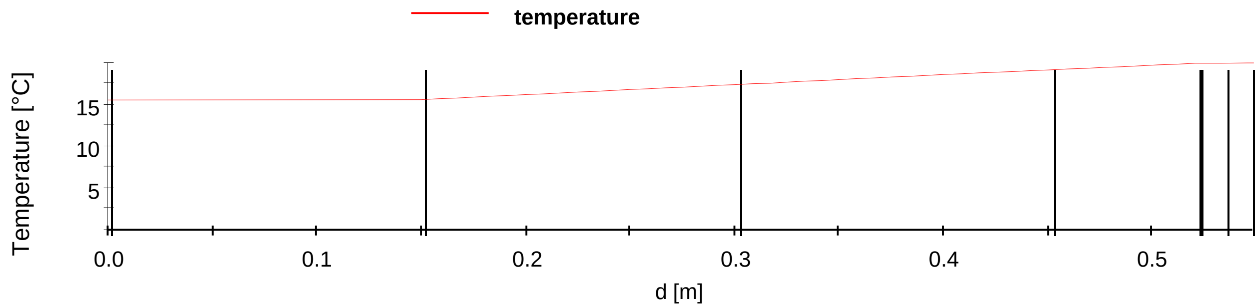
Table of month June:

Name	T[°C]	d[m]	psat[Pa]	p[Pa]
External / Precast Concrete	13.2	0.548	1519	1198
Precast Concrete / Rainscreen Duo-Slab (100-225mm)	13.3	0.398	1524	1269
Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	15.9	0.248	1811	1270
Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	18.6	0.098	2144	1271
ROCKWOOL Flexi / Polyethylene 0.15 mm	19.8	0.028	2303	1272
Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.8	0.028	2303	1539
Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.8	0.016	2309	1539
Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.8	0.003	2314	1539
Gypsum plastering / Internal	19.8	0.000	2314	1540

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

9. Month of balance: July	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.691	15.5	0.770



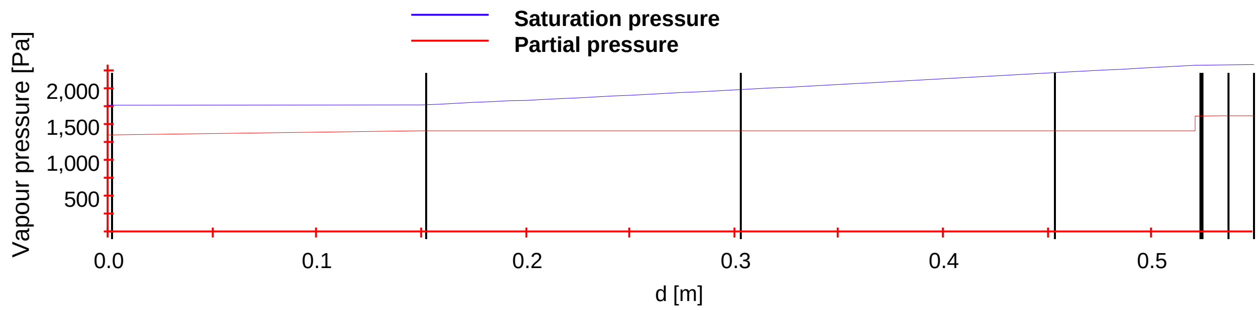


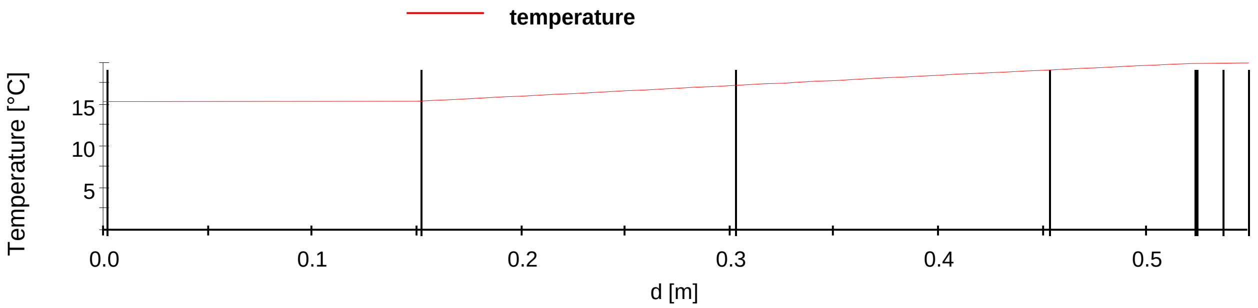
Table of month July:

Name	T[°C]	d[m]	psat[Pa]	p[Pa]
External / Precast Concrete	15.5	0.548	1762	1355
Precast Concrete / Rainscreen Duo-Slab (100-225mm)	15.5	0.398	1765	1409
Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	17.3	0.248	1976	1410
Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	19.1	0.098	2208	1411
ROCKWOOL Flexi / Polyethylene 0.15 mm	19.8	0.028	2315	1411
Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.8	0.028	2315	1614
Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.9	0.016	2318	1615
Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.9	0.003	2322	1615
Gypsum plastering / Internal	19.9	0.000	2322	1615

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
10. Month of balance: August	20.0	0.687	15.3	0.770



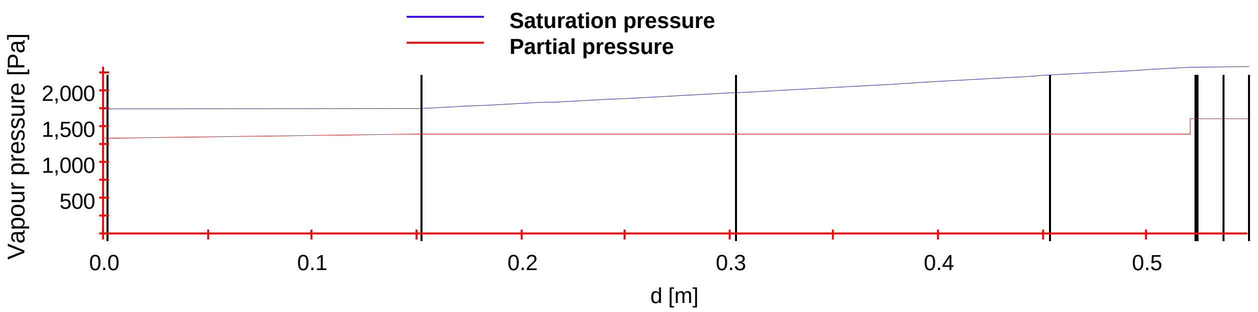
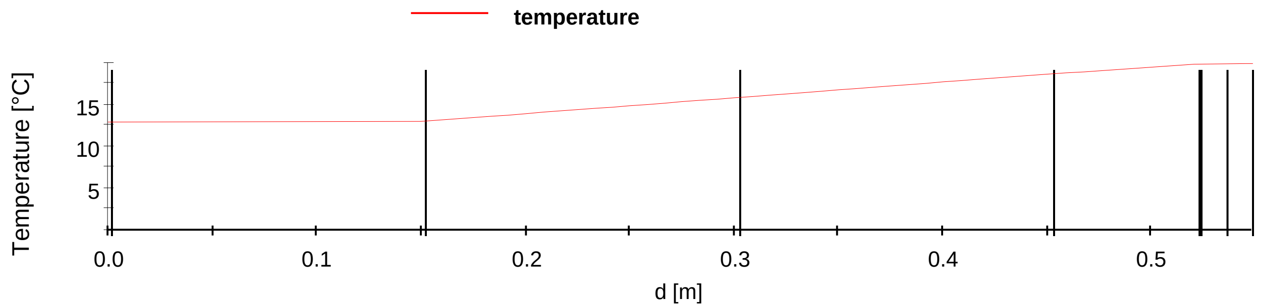


Table of month August:

Name	T[°C]	d[m]	psat[Pa]	p[Pa]
External / Precast Concrete	15.3	0.548	1740	1338
Precast Concrete / Rainscreen Duo-Slab (100-225mm)	15.3	0.398	1743	1394
Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	17.2	0.248	1961	1394
Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	19.0	0.098	2202	1395
ROCKWOOL Flexi / Polyethylene 0.15 mm	19.8	0.028	2314	1395
Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.8	0.028	2314	1604
Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.9	0.016	2317	1604
Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.9	0.003	2321	1605
Gypsum plastering / Internal	19.9	0.000	2321	1605

Vapour pressure distribution
Calculation according BS EN ISO 13788

11. Month of balance: September	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
	20.0	0.666	12.9	0.810



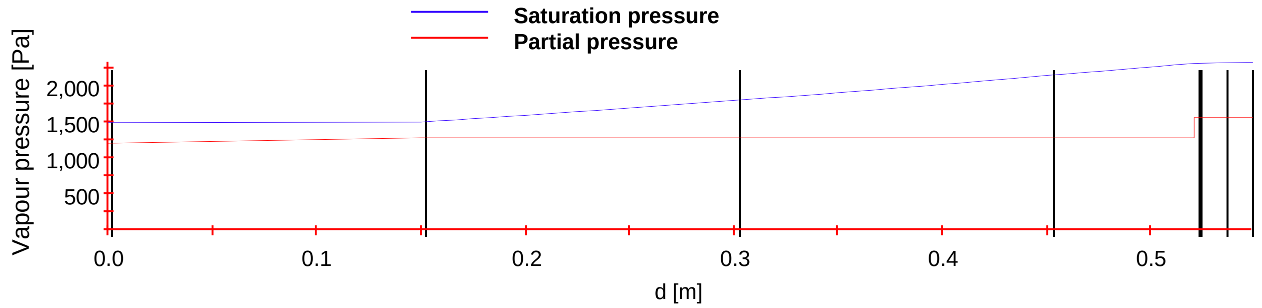


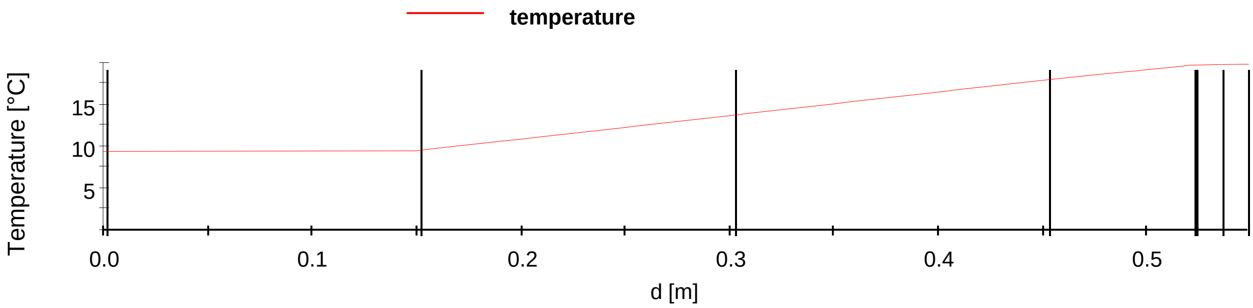
Table of month September:

Name	T[°C]	d[m]	psat[Pa]	p[Pa]
External / Precast Concrete	12.9	0.548	1490	1205
Precast Concrete / Rainscreen Duo-Slab (100-225mm)	13.0	0.398	1494	1278
Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	15.8	0.248	1790	1279
Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	18.6	0.098	2136	1280
ROCKWOOL Flexi / Polyethylene 0.15 mm	19.8	0.028	2302	1280
Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.8	0.028	2302	1556
Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.8	0.016	2307	1556
Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.8	0.003	2313	1557
Gypsum plastering / Internal	19.8	0.000	2314	1557

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

Vapour pressure distribution
Calculation according BS EN ISO 13788

	Ti [°C]	phi_i [-]	Te [°C]	phi_e [-]
12. Month of balance: October	20.0	0.648	9.4	0.880



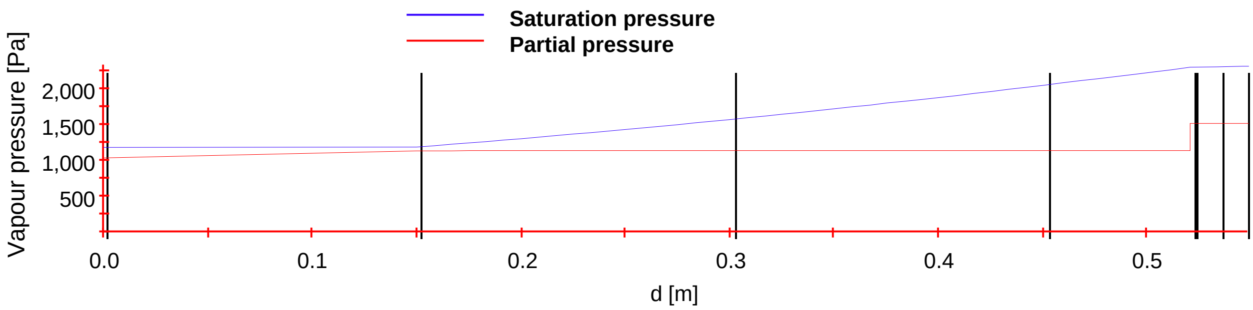


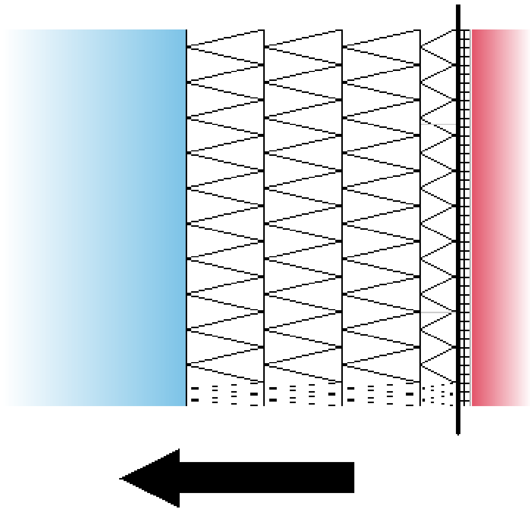
Table of month October:

Name	T[°C]	d[m]	psat[Pa]	p[Pa]
External / Precast Concrete	9.4	0.548	1182	1037
Precast Concrete / Rainscreen Duo-Slab (100-225mm)	9.5	0.398	1188	1137
Rainscreen Duo-Slab (100-225mm) / Rainscreen Duo-Slab (100-225mm)	13.7	0.248	1565	1138
Rainscreen Duo-Slab (100-225mm) / ROCKWOOL Flexi	17.8	0.098	2043	1139
ROCKWOOL Flexi / Polyethylene 0.15 mm	19.6	0.028	2285	1140
Polyethylene 0.15 mm / Standard wallboard (plasterboard up to 700kg/m³)	19.6	0.028	2285	1513
Standard wallboard (plasterboard up to 700kg/m³) / Standard wallboard (plasterboard up to 700kg/m³)	19.7	0.016	2293	1513
Standard wallboard (plasterboard up to 700kg/m³) / Gypsum plastering	19.8	0.003	2301	1514
Gypsum plastering / Internal	19.8	0.000	2302	1514

Documentation of the component
Heat capacity

Source: **own catalogue - External walls**
Component: **NCDL8742-Battersea Park-H-WT 01-REF ONLY**

OUTSIDE INSIDE



The list of materials shown below may differ from those in the U-value calculation printout. Only material layers which are used in the heat capacity calculation are listed.

Single material layers shown in the U-value calculation printout may be separated to meet the exclusion criteria:

A .. The total thickness of the layers exceed 0.1 m.
B .. The mid point in the construction is reached.

For insulation layers the following criteria applies:

C .. An insulating layer is reached (defined as lambda <= 0.08 W/(mK)).

	Name	Thickness [m]	lambda [W/(mK)]	Q	Thermal capacity [kJ/(kgK)]	Q	Density [kg/m³]	Q	Thermal mass kJ/(m²K)	Criteria Exclusion
	End of calculation - Cold									
1	Precast Concrete	0.1500	2.000	E	1.00	E	2400.0	E	~~360.0~~	A, -, C
2	Rainscreen Duo-Slab (100-225mm)	0.1500	0.035	E	1.03	E	60.0	E	~~0.0~~	A, -, C
3	Rainscreen Duo-Slab (100-225mm)	0.1482	0.035	E	1.03	E	60.0	E	~~0.0~~	A, -, C
3	Rainscreen Duo-Slab (100-225mm)	0.0018	0.035	E	1.03	E	60.0	E	~~0.0~~	-, -, C
4	Light steel-frame consisting of:	0.0700							~~0.7~~	-, -, C
4a	ROCKWOOL Flexi	99.70%	0.038	E	1.03	E	28.0	E	~~2.0~~	-, -, C
4b	Steel	00.30%	50.000	D	0.45	D	7800.0	D	0.7	-, -, -
5	Polyethylene 0.15 mm	0.0002	0.170	D	2.20	D	920.0	D	0.3	-, -, -
6	Standard wallboard (plasterboard up to 700kg/m³)	0.0125	0.210	D	1.00	D	700.0	D	8.8	-, -, -
7	Standard wallboard (plasterboard up to 700kg/m³)	0.0125	0.210	D	1.00	D	700.0	D	8.8	-, -, -
8	Gypsum plastering	0.0030	0.570	D	1.00	D	1300.0	D	3.9	-, -, -
	Start of calculation - Warm									
		0.5482							**21.7**	

Heat capacity = 21.7 kJ/(m²K)

The following exclusion criteria apply:
A .. The total thickness of the layers exceed 0.1 m.
C .. An insulating layer is reached (defined as lambda <= 0.08 W/(mK)).

Q .. The physical values of the building materials has been graded by their level of quality. These 5 levels are the following
A .. A: Data is entered and validated by the manufacturer or supplier. Data is continuously tested by 3rd party.
B .. B: Data is entered and validated by the manufacturer or supplier. Data is certified by 3rd party
C .. C: Data is entered and validated by the manufacturer or supplier.
D .. D: Information is entered by BuildDesk without special agreement with the manufacturer, supplier or others.
E .. E: Information is entered by the user of the BuildDesk software without special agreement with the manufacturer, supplier or others.

Appendix E - Energy Centres & Future DHN Connection Point

E.1 Confirmation of Trench Pipework

From: Zac Vandevoir <zac.vandevoir@atelierten.com>
Sent: 25 October 2024 15:04
To: Simon Lovell <Simon.Lovell@WatkinJones.com>; Zelie Batchelor <zelie.batchelor@montagu-evans.co.uk>; Joseph Lazell <Joseph.Lazell@atelierten.com>; Bernie Carr <Bernie.Carr@atelierten.com>
Cc: Sam Stackhouse <sam.stackhouse@montagu-evans.co.uk>; Ben Wrighton <Ben.Wrighton@watkinjones.com>; Robert King <Robertk@howells.uk>; Alex Smith <Alextps@howells.uk>
Subject: RE: BPR - S106

[EXTERNAL SENDER]

Hi Simon, Zelie,

No problem, I'll get everything updated in one go. In that case, I think Wednesday should be achievable for updated reports, updated supporting documents, updated energy memo comment responses and it gives some time for the additional info to come through.

@Simon Lovell one bit I just noticed needs confirmation from you – we provided a drawing for potential trench routes for the future DHN connecting all blocks; after reading this again it seems like they want a commitment to actually installing the trench/pipework (see below). This will be an additional cost so up to you whether we respond in the memo to say we will, or whether to push back on it.

> The applicant is proposing block-by-block heat networks supplied by energy centres in each block. The applicant has provided drawings showing the space for PHX on the three plots and the potential trench routes to interconnect the blocks together with a potential point of connection. This is welcomed.
>
> The applicant is required to provide these trenches and pipes between blocks to enable all block-level heat networks to ultimately be connected into a single site-wide network. **This item is outstanding.**

RE: BPR - S106

Simon Lovell <Simon.Lovell@WatkinJones.com>
To Zac Vandevoir
Cc Joseph Lazell; Bernie Carr

Reply | Reply All | Forward

Tue 29/10/2024 09:43

If there are problems with how this message is displayed, click here to view it in a web browser.

From: Simon Lovell <Simon.Lovell@WatkinJones.com>
Sent: 25 October 2024 15:17
To: Zac Vandevoir <zac.vandevoir@atelierten.com>; Zelie Batchelor <zelie.batchelor@montagu-evans.co.uk>; Joseph Lazell <Joseph.Lazell@atelierten.com>; Bernie Carr <Bernie.Carr@atelierten.com>
Cc: Sam Stackhouse <sam.stackhouse@montagu-evans.co.uk>; Ben Wrighton <Ben.Wrighton@watkinjones.com>; Robert King <Robertk@howells.uk>; Alex Smith <Alextps@howells.uk>
Subject: RE: BPR - S106

Hi Zac

On the basis the attached is what you are referring to, this is fine - we normally commit to provide the on-site pipework, and they can connect at the site boundary.

Regards

Simon Lovell
Development Director

T: 03309124262
M: 07738 195448
Kingsfield Court, Chester Business Park, Chester, CH4 9RE

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E.2 Drawings

Plot 1 - Ground Floor

Plot 1 - Mezzanine

FOR COMMENT

STAGE 2 ISSUE

NOTES

1. THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION OR INSTALLATION PURPOSES UNLESS EXPRESSLY STATED.
2. DO NOT SCALE OFF THIS DRAWING. ALWAYS WORK TO NOTED DIMENSIONS.
3. ALL DIMENSIONS MUST BE VERIFIED ON SITE BEFORE COMPLETING SHOP DRAWINGS OR SETTING OUT THE WORK.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE TECHNICAL SPECIFICATION AND ASSOCIATED EQUIPMENT SCHEDULES AS PREPARED BY ATELIER TEN.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND STRUCTURAL ENGINEER'S DRAWINGS AND ASSOCIATED ATELIER TEN DRAWINGS.

Rev.	Description	Date	Chkd.	Approv.
P01	STAGE 2 ISSUE	JUL' 24	NH	JL

PROJECT **BATTERSEA PARK ROAD**
ARCHITECT **GLENN HOWELLS**

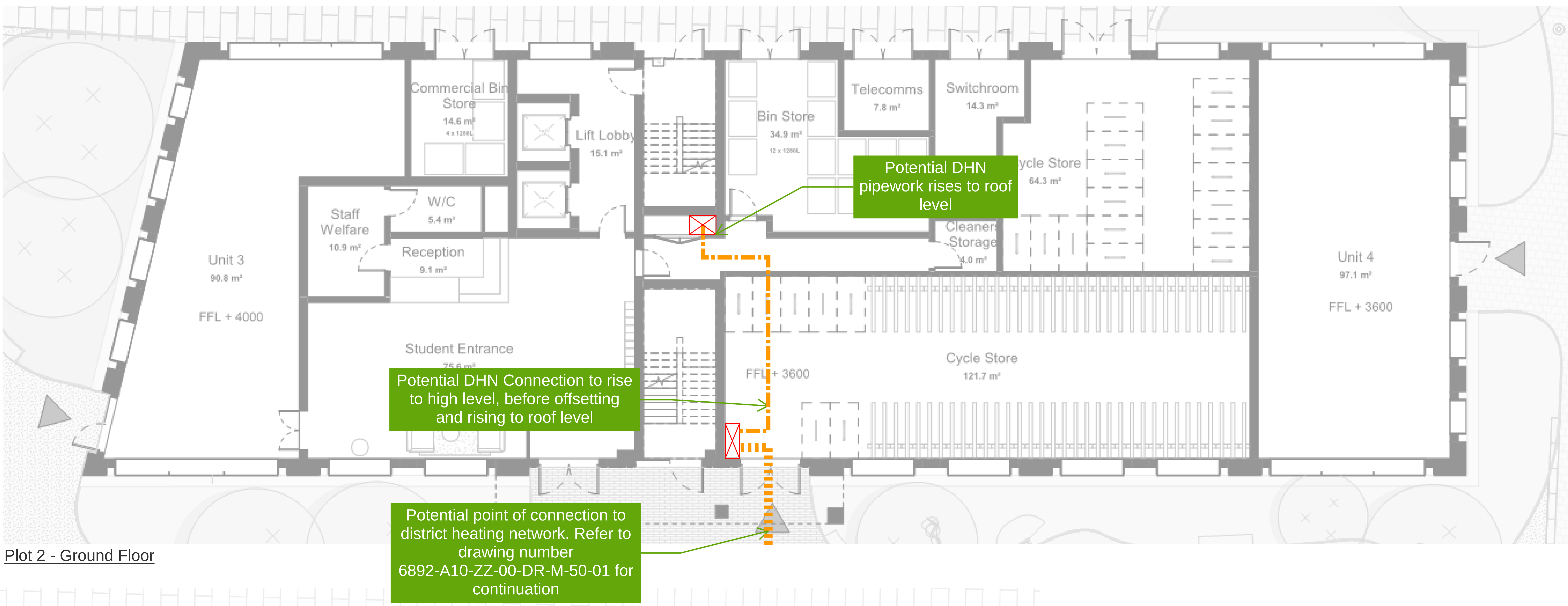
TITLE **PLOT 1 INDICATIVE DHN PROVISIONS**

DRAWN **CAD** DESIGNED **LH** CHECKED **NH** APPROVED **JL** DATE **MAY 22** SCALE **NTS** Rev. **P01**

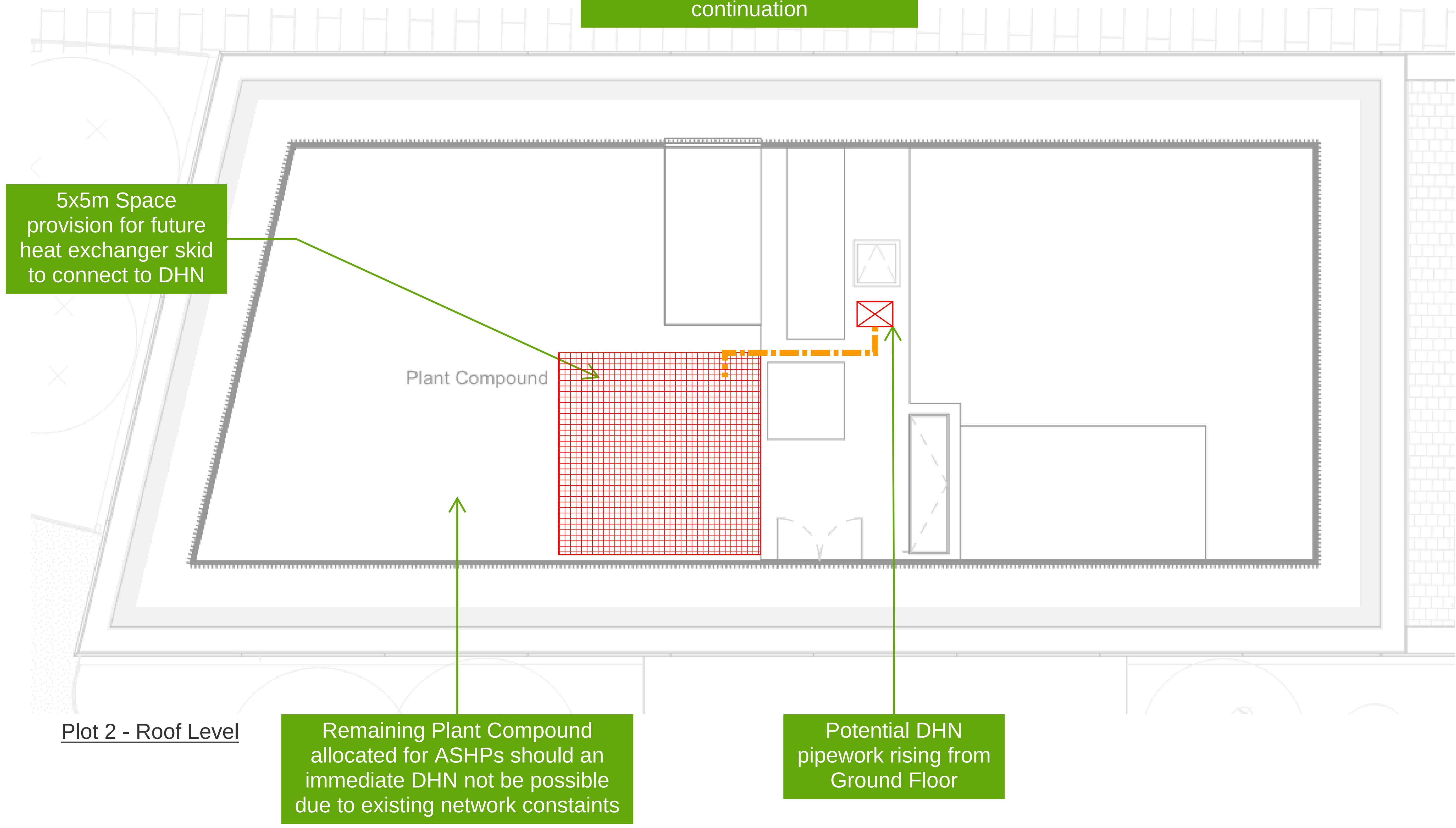
atelier ten
Environmental Design Consultants + Building Services Engineers
www.atelierten.com

DRAWING No. **6892-A10-01-ZZ-DR-M-50-01**

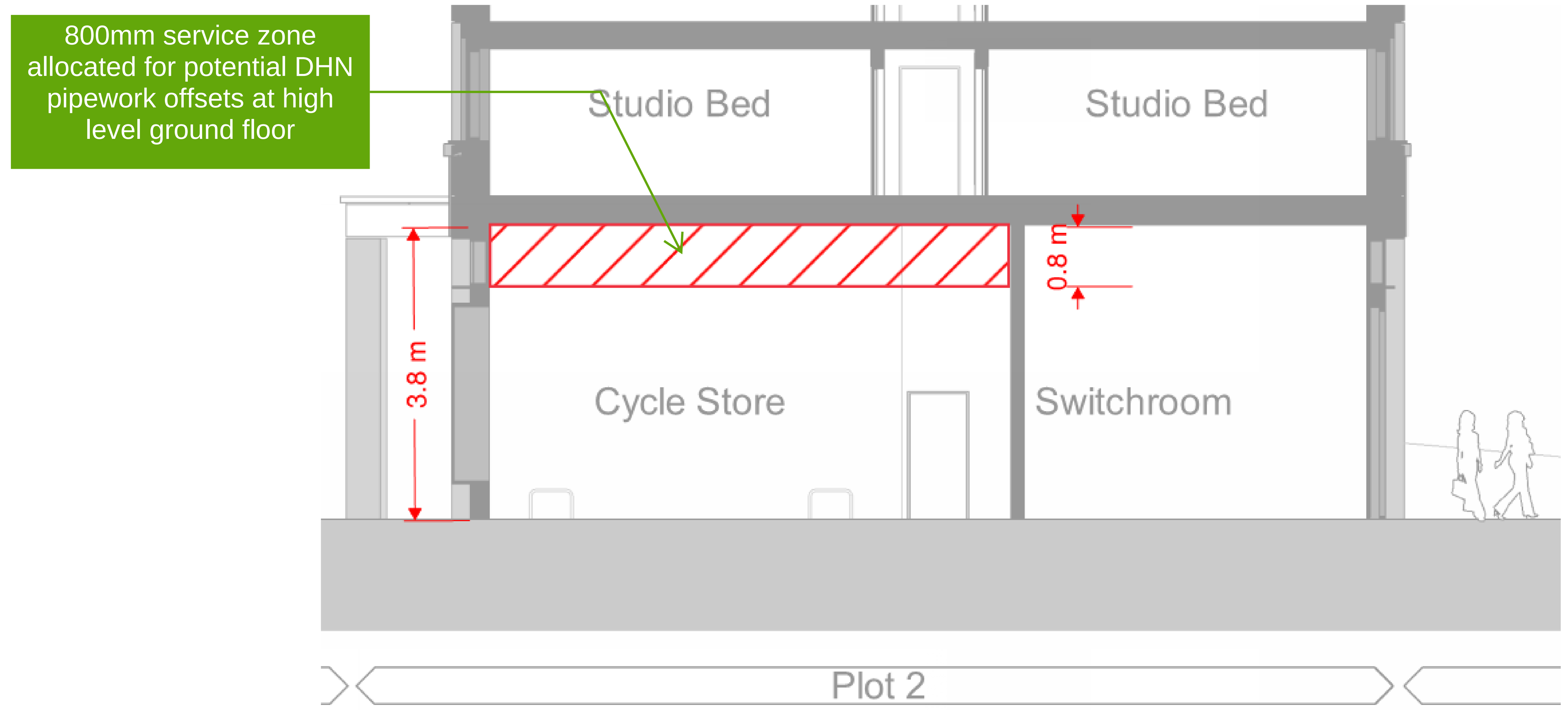
Atelier Ten Ltd, 299 West George Street, Glasgow, G2 4LF
T: +44 (0)141 333 0499 E-mail: glasgow@atelierten.com



Plot 2 - Ground Floor



Plot 2 - Roof Level



Plot 2 - Section

FOR COMMENT

STAGE 2 ISSUE

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Rev.	Description	Date	Chkd.	Approv.
P01	STAGE 2 ISSUE	JUL' 24	NH	JL

PROJECT **BATTERSEA PARK ROAD**
ARCHITECT **GLENN HOWELLS**

TITLE **PLOT 2**
INDICATIVE DHN PROVISIONS

DRAWN **CAD** DESIGNED **LH** CHECKED **NH** APPROVED **JL** DATE **MAY 22** SCALE **NTS** Rev. **P01**

DRAWING No. **6892-A10-02-ZZ-DR-M-50-01**

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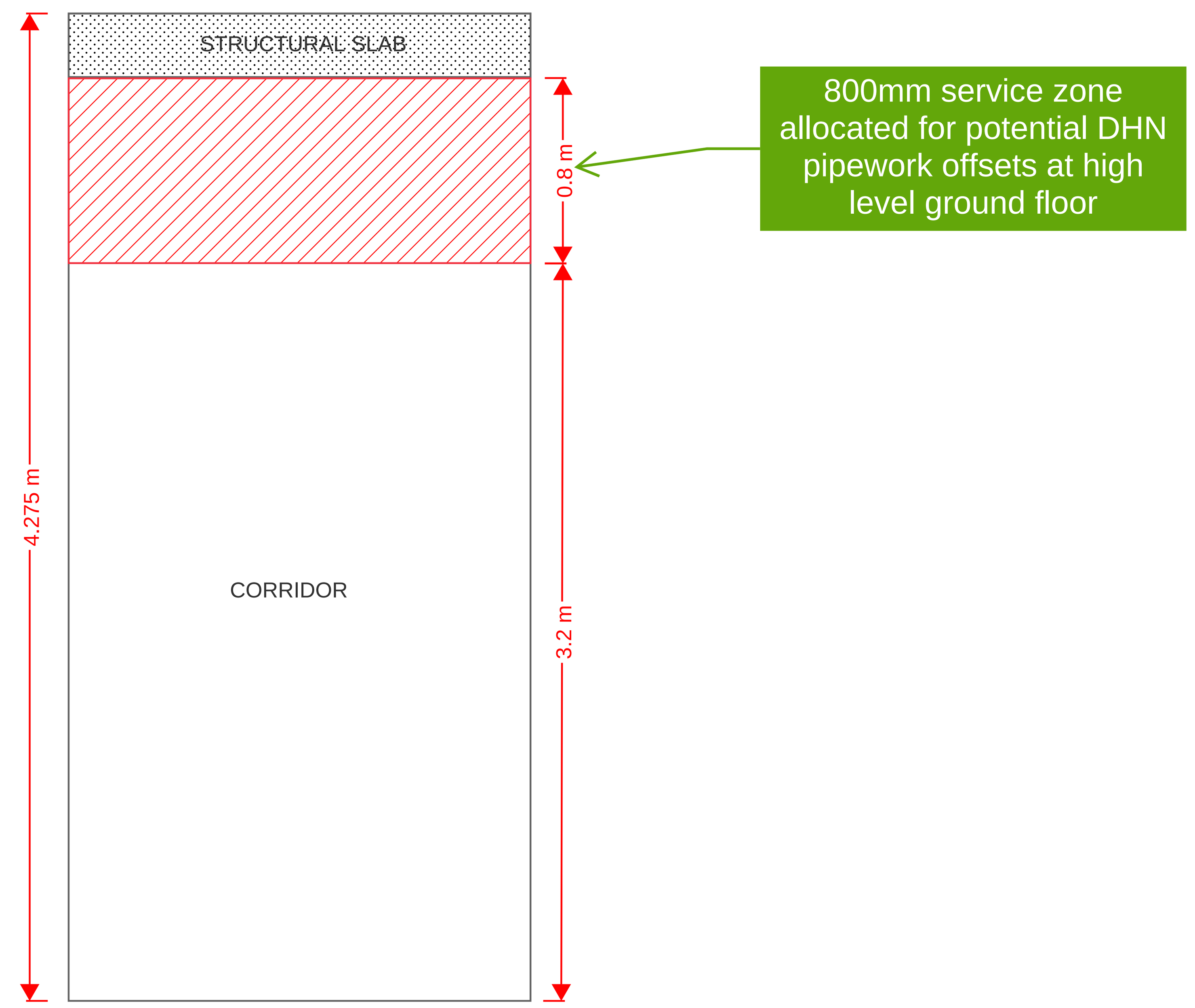
Plot 3 - Ground Floor



Plot 3 - Ground Floor Section

FOR COMMENT

STAGE 2 ISSUE

NOTES

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Rev.	Description	Date	Chkd.	Approv.
P01	STAGE 2 ISSUE	JUL' 24	NH	JL

PROJECT **BATTERSEA PARK ROAD**
ARCHITECT **GLENN HOWELLS**

TITLE **PLOT 3 INDICATIVE DHN PROVISIONS**

DRAWN **CAD** DESIGNED **LH** CHECKED **NH** APPROVED **JL** DATE **MAY 22** SCALE **NTS** Rev. **P01**

DRAWING No. **6892-A10-03-ZZ-DR-M-50-01**

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FOR COMMENT

STAGE 2 ISSUE

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Rev.	Description	Date	Chkd.	Approv.
P01	STAGE 2 ISSUE	MAR' 23	NH	JL

PROJECT **BATTERSEA PARK ROAD**
ARCHITECT **GLENN HOWELLS**

TITLE **INDICATIVE TRENCH ROUTES TO CONNECT ALL PLOTS INTO A DHN**

DRAWN **CAD** DESIGNED **LH** CHECKED **NH** APPROVED **JL** DATE **MAY 22** SCALE **NTS** Rev. **P01**

DRAWING No. **6892-A10-ZZ-00-DR-M-50-01**

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Appendix F - PV Array (Roof Plan)

Notes & Key

DIMENSIONS NOT TO BE SCALED FROM THIS DRAWING. CONTRACTORS TO NOTIFY ARCHITECTS OF SITE VARIATIONS AFFECTING INFORMATION ON THIS DRAWING. THIS DRAWING IS COPYRIGHT OF GLENN HOWELLS ARCHITECTS.

AREAS GIVEN ON THIS SCHEDULE ARE INDICATIVE, A SPECIALIST SURVEYOR SHOULD BE ENGAGED IF DEFINITIVE AREAS ARE REQUIRED. AREAS EASURED IN ACCORDANCE WITH RICS "CODE OF MEASURING PRACTICE - 6TH EDITION".

ALL MEASUREMENTS HAVE BEEN TAKEN IN CAD SOFTWARE IN M² (SQFT ARE PROVIDED ONLY WHERE SPECIFICALLY LABELLED). CONVERSION TO SQFT IS ACHIEVED BY MULTIPLYING M² BY 10.764.

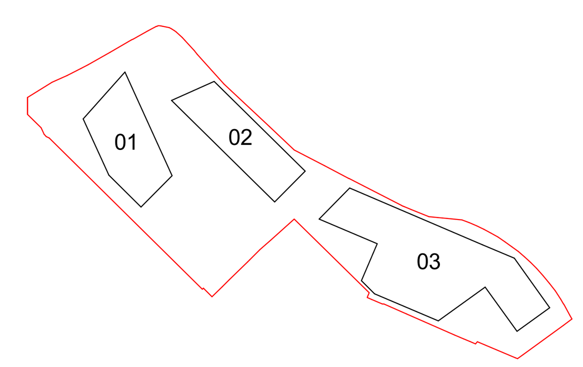
FIGURES EXCLUDE ROOF TERRACES, BALCONIES, DECK AMENITY, AND OTHER NON HABITABLE ROOMS. STUDIO AREAS INCLUDE EN-SUITE AND WALL CONSTRUCTION, BUT EXCLUDE EN-SUITE RISER.

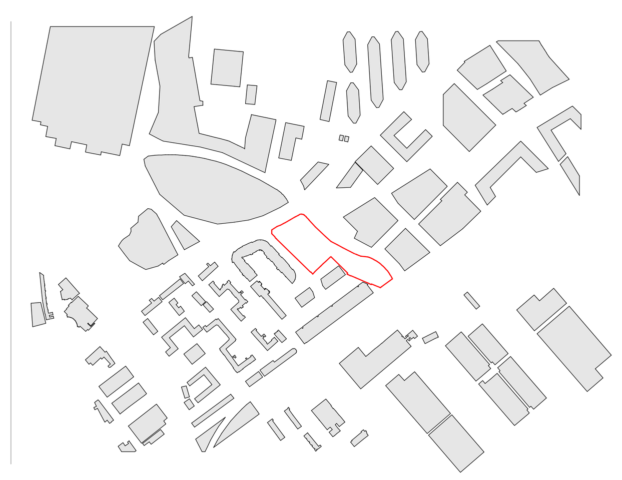
Site Ownership Boundary

RED LINE BOUNDARY ISINDICATIVE AND BASED ON OS INFORMATION, SUBJECT TO FINAL CONFIRMATION FROM WATKIN JONES REGARDINGITS RELATIONSHIP WITH THE LAND REGISTRY BOUNDARY.

GLENN HOWELLS ARCHITECTS TAKES NO RESPONSIBILITY FOR THE LOCATION OF LEGAL BOUNDARIES INDICATED IN THIS DRAWING.

METRES @ 1: 250 — 0, 2.5, 5.0, 10.0, 25.0 m





Revisions

Date	Rev	By	Details
WIP - 28/02/2023			

DRAFT-

Project
41-59 Battersea Park Road

Client
Watkin Jones

Drawing Title
RL GA Roof Plan

Drawing No.
2278-GHA-ZZ-RL-DR-A-05122

Revision

Scale
Scale - 1 : 250@A1

Date
28/02/2023

Checked
AS

Glenn Howells Architects
London Birmingham glennhowells.co.uk

Appendix G - Energy Memo Responses

Compliance Schedule - To be completed by the GLA Energy Officer

Policy	Policy Sub-Area	Required Data (In line with EAG)	Status	Policy Compliance	GLA Comment Reference
SI 1 - Improving Air Quality (relating only to air quality impacts of energy systems; separate air quality officer consultation required)	Measures/design features to reduce exposure to air pollution	Measures to minimise NOx emissions from energy systems	N/A	Compliant	
SI 2 - Minimising Greenhouse Gas Emissions (excluding SI-2-F- WLC; separate WLC consultation required)	Be Lean emissions reduction	Details of energy efficiency measures	Received but items still outstanding	Potential Compliance-Pending Information	Detailed comment 3, 4
		Alignment with Cooling and Overheating	Received but items still outstanding		Detailed comment 6, 7
		Be Lean 10% and/or 15% reduction achieved	Received but items still outstanding		Detailed comment 2, 3, 4
	Be Clean	SI 3 - Energy Infrastructure data provided (see below)	Not yet received - applicant to submit and provide reference --->		Detailed comment 8
	Be Green Renewable generation maximisation	Roof Layout detailing maximised PV proposal	Received and nothing further required		Detailed comment 10
		PV array metrics provided	Received and nothing further required		Detailed comment 10
		Heat Pump arrangement confirmed	Received but items still outstanding		Detailed comment 9, 11
	Total carbon reduction on-site	Confirmation of carbon emission factors used	Received; SAP 10 proposed and nothing further required		
		GLA carbon emission reporting spreadsheet v1.2	Not yet received - applicant to submit and provide reference --->		Detailed comment 2
		Supporting Modelling Ouputs (BRUKLs/DER Worksheets)	Received but items still outstanding		Detailed comment 15
		On-site minimum met	Received but items still outstanding		
	Carbon offset payment confirmed	Draft S106 wording of carbon offset (from borough)	Not yet received - applicant to submit and provide reference --->		Detailed comment 14
	Be Seen commitment provided	Written confirmation/understanding of data requirements	Not yet received - applicant to submit and provide reference --->		Detailed comment 13
		Confirmation of Planning Stage 1 submission	Not yet received - applicant to submit and provide reference --->		Detailed comment 13
SI 3 - Energy Infrastructure	Aligned with heating hierarchy	Applicant/Heat Network Stakeholder correspondence	Received but items still outstanding	Potential Compliance-Pending Information	Detailed comment 8
		Heating system details provided	Received but items still outstanding		Detailed comment 9, 11
	Acceptable Design	Futureproofed DHN connection drawings	Received but items still outstanding		Detailed comment 9
		Site heat network drawings	Not yet received - applicant to submit and provide reference --->		Detailed comment 9
		Details of management measures proposed	Received but items still outstanding		Detailed comment 5, 9
SI 4 - Managing Heat Risk	Aligned with cooling hierarchy	Completed GHA overheating tool	Received and nothing further required	Potential Compliance-Pending Information	Detailed comment 16
		CIBSE dynamic overheating analysis	Received but items still outstanding		Detailed comment 6, 7
		Confirmation that cooling criteria have been met	Received but items still outstanding		Detailed comment 6, 7

Application Metrics	Outline Value (if applicable)	Detailed Stage 1 Value	Detailed Final Value
Domestic carbon emissions		63%	
Non-domestic carbon emissions		33%	
Carbon offset payment amount		£180,975	
kWp renewable generation capacity		66	
kWh annual renewable energy generation		52780	
Sqm of proposed PV array		340	
Calculated SCOP of heat pumps		3.39 (resi+sa), 4.01 (commercial)	
Heat fraction provided by heat pumps		TBC	
Flow/Return temperatures proposed		TBC	
Distribution loss assumption		TBC	
Whole Life Carbon Assessment		Received and Under Separate Consultation	
Innovative Features			

Detailed Comments - Applicant MUST provide detailed responses to the below items

Comment No.	GLA Stage I Date: 20/06/22	Applicant's Stage I response Date:	GLA Post Stage I response Date: 28/05/2024	Applicant's Post Stage I response Date:	GLA Post Stage I response Date: 21/08/2024	
Documents to be secured						
	Energy Statement & Overheating Assessment (29/04/22 & 22/04/22)					
General compliance comments						
1	The energy strategy could be compliant with the London Plan 2021 policies however, the applicant is required to submit the additional information to demonstrate policy compliance which has been requested below. The applicant's response to GLA's energy comments should be provided directly within this Energy Memo. Any wider supporting material submitted should be referenced within the applicant's memo response.	**The applicant provided an update to the energy memo within their new energy strategy. In future, memo responses should be provided directly within this document to keep track of progress.**	-	Response provided within the updated energy statement.	As per previous GLA comment, the applicant has provided an update to the energy memo within their new energy statement report. **The applicant's response to GLA's energy comments should be provided directly within this Energy Memo to streamline the process and to keep track of the progress and the Energy Memo response should be submitted back in excel format.** Any wider supporting material submitted should be referenced within the applicant's memo response.	
2	The applicant should submit the GLA's Carbon Emission Reporting spreadsheet in excel format; this has been developed to allow the use of the updated SAP 10 emission factors alongside the SAP 2012 emission factors. [The link to the spreadsheet can be found here: https://www.london.gov.uk/what-we-do/planning/planning-applications-and-decisions/pre-planning-application-meeting-service-0] The applicant has included the reduction from air source heat pumps in the Be Clean stage. The heat pumps should be included at the Be Green stage of the energy hierarchy as per GLA's energy Assessment Guidance.	No response provided.	The applicant has provided the heat pump savings as part of the be green stage as requested. The applicant should provide the carbon reporting spreadsheet in excel format. This could not be located within the uploaded documents. **This item remains outstanding.**		The applicant has provided the GLA carbon emission spreadsheet in excel format, however on the residential element the baseline should be taken from the Be Green TER final proposed building specification rather than the Be Lean TER. Furthermore, on the non-domestic element the BRUKL displaced electricity column F is for the baseline notional building which appears to be 0 for the three Plot models. Furthermore, both residential and non-residential modelling and figures should be updated in line with comments below. **This item is outstanding.**	Be Green TERs used for baseline. See 6892 BPR Part_l_2021_gla_carbon_emission_reporting_spreadsheet_v2.0_0 REVS2G 2024.11.12 The BRUKL displaced electricity has been ameded. See 6892 BPR Part_l_2021_gla_carbon_emission_reporting_spreadsheet_v2.0_0 REVS2G 2024.11.12
Be Lean						
3	Based on the information provided, the domestic element of the proposed development is estimated to achieve a reduction of 14.5 tonnes per annum (17%) in regulated CO2 emissions compared to a 2013 Building Regulations compliant development. It is unclear whether the Energy Assessment Guidance methodology has been used for the Be Lean case that requires the heating to be provided by gas boilers and that any active cooling would be provided by electrically powered equipment. The applicant should clarify and submit supporting modelling outputs as per comments below.	Response provided within new energy statement.	Based on the information provided, the domestic element of the proposed development is estimated to achieve a reduction of 11 tonnes per annum (21%) in regulated CO2 emissions compared to a 2021 Building Regulations compliant development. This is welcomed. The applicant should submit the full SAP modelling sheets for all models, for both the be lean (TER and DER) and green (DER) stages of the enerhy heirarchy for the GLA to review. No pages should be left out from this submission and they should be provided in PDF format. **This item remains outstanding.**		Based on the information provided, the domestic element of the proposed development is estimated to achieve a reduction of 14.8 tonnes per annum (27%) in regulated CO2 emissions compared to a 2021 Building Regulations compliant development. The applicant is proposing an external wall U-Value of 0.13W/m2K. They should provide the construction detail that demonstrate that this performance is achievable and confirm this is coordinated with the design team. The applicant proposes a thermal bridging y-value of 0.04W/m2K which is considered to be low. The applicant should confirm the construction type proposed for the residential building and confirm that the y-value level assumed is achievable, detailing previous experience delivering the assumed level of thermal bridging performance for a similar construction type. **This item is outstanding.**	For external wall buildup achieving 0.12, see: 6892 Battersea Park Road Energy Statement 2024.11.12 RevS2G Appendix D At this stage, the 0.04 y-value was targeted based on LETI standards. As there is currently no way to demonstrate that this will be achieved, this value has been raised to 0.08. The value of 0.08 is a reasonable assumption for modern construction methods

4	Based on the information provided, the non-domestic element of the proposed development is estimated to achieve a reduction of 31.4 tonnes per annum (17%) in regulated CO_2 emissions compared to a 2013 Building Regulations compliant development. It is unclear whether the Energy Assessment Guidance methodology has been used for the Be Lean case that requires the heating to be provided by gas boilers and that any active cooling would be provided by electrically powered equipment. Furthermor the use class selected for the Student Accommodation is Residential Spaces rather than the C2 Residential Institutions use that should be used for Part L calculations. The applicant should clarify and submit supporting modelling outputs as per comments below.	Response provided within new energy statement.	Based on the information provided, the non-domestic element of the proposed development is estimated to achieve a reduction of 12.7 tonnes per annum (19%) in regulated CO2 emissions compared to a 2021 Building Regulations compliant development. This is welcomed. The applicant should submit the full BRUKLS modelling sheets for all models, for both the be lean and green stages of the enerhy heirarchy for the GLA to review. No pages should be left out from this submission and they should be provided in PDF format. **This item remains outstanding.**		The reduction will be changed considerably when the displaced electricity is correctly being input to zero. The applicant should note that the London Plan includes a target of a minimum 15% improvement on 2021 Building Regulations from energy efficiency which applicants should target. The applicant should therefore consider modelling additional energy efficiency measures to meet the EE target. From the Be Lean BRUKL it can be seen that the applicant has not followed the Energy Assessment Guidance June 2022 methodology as per paragraphs 7.9-7.11. The Heat SSEEF on the HVAC Systems performance table should be equal between actual and notional building. This should be amended. **This item is outstanding.**	All available passive measures have been explored at this stage; further changes will have negative impacts on architecture, daylighting, overheating or costs. The efficiencies in the updated Be Lean modelling have been corrected match the notional.
5	The applicant should consider and minimise the estimated energy costs to occupants and outline how they are committed to protecting the consumer from high prices. This should cover the parameters set out in the guidance and include a confirmation of the quality assurance mechanisms that will be considered as part of the strategy. See GLA Energy Assessment Guidance April 2020 paragraphs 7.13-7.16 for further details.	Response provided within new energy statement.	The applicant should consider and minimise the estimated energy costs to occupants and outline how they are committed to protecting the consumer from high prices. This should cover the parameters set out in the guidance and include a confirmation of the quality assurance mechanisms that will be considered as part of the strategy. See GLA Energy Assessment Guidance April 2020 paragraphs 7.13-7.16 for further details. **This item remains outstanding.**		The applicant has confirmed that CIBSE CP1 will be one of quality assurance mechanisms that will be considered as part of the strategy. They should confirm at least one more QA mechanism from paragraph 7.18 of GLA Energy Assessment Guidance June 2022. **This item is outstanding.**	Further quality assurance mechanisms have been included in the 6892 Battersea Park Road Energy Statement 2024.11.12 RevS2G (Be Seen section).
Overheating						
6	The results of the Dynamic Overheating Analysis, using the CIBSE TM59 methodology, demonstrate that all sample units comply with DSY1 assuming a g-value of 0.45 for the residential affordable housing part and 0.28 for student accommodation, natural ventilation and trim cooling. The applicant should submit the detailed results of the rooms rather than the percentage passing. The applicant should also investigate the risk of overheating using the DSY 2 & 3 weather files. The applicant has confirmed that blinds have not been modelled. They should also confirm the window opening assumption is aligned with recommendations of any air quality and acoustic reports. The applicant has proposed active cooling to the windows without clarifying the reason for active cooling needed and natural ventilation not being adequate. If windows are required to be assumed closed or restricted as part of the suggestions of air quality or noise reports, the applicant should present one version of overheating assessment with windows open (to demonstrate that the passive design could achieve compliance in the absence of external constraints which is the expectation for residential developments) and another with windows closed. The applicant is required to investigate and adopt further passive measures (in line with the Cooling Hierarchy) to avoid the risk of overheating now and under future climate scenarios.	Response provided within new overheating strategy.	The applicant has provided a new overheating assessment. They are proposing a purge fan system in the residential and student accomadation with no reliance on trim cooling assuming a g-value of 0.28 (N/E) and 0.35 (S/W). The results of the overheating assessment are however unclear. The applicant should detail weather a MVHR system is being provided alongside this system. The applicant has provided two sets of results one labelled natural ventilation overheating criteria and one mechanical ventilation overheating criteria. The applicant should explain what has been modelled in each of these scenarios. They should also confirm the window opening assumption is aligned with recommendations of any air quality and acoustic reports. If windows are required to be assumed closed or restricted as part of the suggestions of air quality or noise reports, the applicant should present one version of overheating assessment with windows open (to demonstrate that the passive design could achieve compliance in the absence of external constraints which is the expectation for residential developments) and another with windows closed. **This item remains outstanding.**		The applicant has provided an updated Overheating assessment. Within the document and as per the response tables 3.2, 4.2 and 5.2 indicate what has been modelled however only the final iteration detailed results seemed to have been shared at the moment. The applicant is proposing to use exposed thermal mass to all plots which is welcomed. The applicant has outlined that windows will not be relied upon for ventilation they should provide the exact excerpt of the overheating report that suggests this should affect all facades at all times. The openable window scenario should achieve full compliance to demonstrate that the passive design could achieve compliance in the absence of external constraints which is the expectation for residential developments. The applicant should outline what is required to achieve 100% pass rate under this 'openable window' scenario where natural ventilation assumed and should the measures be feasible then it is expected that these are adopted. A purge fan solution would only be accepted when it is clearly demonstrated that passive measures are sufficient to mitigate overheating in the absence of environmental constraints on the use of windows opened The analysis demonstrates that there are a significant number of failures under the DSY 2 and DSY 3 weather files. The applicant should commit to providing guidance to occupants on future minimising future dwelling overheating risk in line with the cooling hierarchy. **This item is outstanding.**	Full results for all cooling hierarchy iteratons are included in the supporting documents. See section 6.2 of the acoustic report contained in the appendix - "This would therefore indicate that all facades would exceed the requirements for an open window or open louvre. Therefore in order to comply with the requirements of ADO, alternative means than an unattenuated opening within the façade would be required to control of overheating." Full compliance with the natural ventilation scenario has been demonstrated by removing certain external constraints. The high internal gains and high temperatures in the weather files make it difficult to achieve TM59 compliance under climate change weather files. There is no change to these pass rates but further measures are due to be investigated at the next detailed design stage in parallel with daylighitng and energy.
7	For the mechanically controlled non residential element, the area weighted average (MJ/m2) and total (MJ/year) cooling demand for the actual and notional building should be provided and the applicant should demonstrate that the actual building's cooling demand is lower than the notional.	Response provided within new energy statement.	The area weighted average (MJ/m2) and total (MJ/year) cooling demand for the actual and notional building has been provided however the notional building demand is lower than the actual. The applicant should explore further measures at this stage to reduce the cooling demand to lower than that of the notional. **This item remains outstanding.**		The applicant should still seek to adopt further passive measures (in line with the Cooling Hierarchy) to reduce the actual cooling demand including reducing the g-value and the glazing ratio. In terms of the commercial viability and the active frontages analysis of how they will be impacted should be provided and other areas that is not on the ground floor could also be targeted. In terms of the daylight for the student accommodation, the applicant should reduce the glazed area where feasible to reduce the overheating risk and improve the energy efficiency. They should consider reducing glazing from areas which don't help with daylighting, such as in the corner of rooms and less than 700mm above the floor. **This item is outstanding.**	Active frontage was encouraged by the planners throughout a series of architectural meetings. Iterative modelling was carried out to decrease the solar gain in these areas as far as possible with the glazing ratios agreed. Similarly, the L07 amenity on Plots 2 & 3 were agreed with the local authority as they wanted a clear divide in the building and views out. g-values for these heavily glazed areas has now been dropped to 0.21.
Be Clean						
8	The applicant has carried out an investigation and there are no existing or planned district heating networks within the vicinity of the proposed development. The London Heat map shows the proposed VNEB DHN within the close proximity of the site. onnection to the network should continue to be prioritised and evidence of active two-way correspondence with the network operator should be provided. This must include confirmation or otherwise from the network operator that the network has the capacity to serve the new development, together with supporting estimates of the CO2 emission factor, installation cost and timescales for connection. They should also contact relevant stakeholders including the borough energy officer, local heat network operators and nearby developers and ask whether they know of any local heat network connection opportunities. Evidence of the correspondence should be submitted.	Response provided within new energy statement.	The applicant has provided evidence of correspondance with EQUANS. This is assumed to be referncing the Peabody heat network. It seems unlikely that connection will be possible in the short-term due to timescales and feasibility of connecting over the road. The applicant should continue to pursue this avenue as reccomended by EQUANS. Further correspondance should be provided. The application also appears to be nearby the proposed VNEB heat network. The applicant should explore future connection to this site. Connection to the network should continue to be prioritised and evidence of active two-way correspondence with the network operator should be provided. This must include confirmation or otherwise from the network operator that the network has the capacity to serve the new development, together with supporting estimates of the CO2 emission factor, installation cost and timescales for connection. **This item remains outstanding.**		It is unclear how Equans as a network operator is involved with the VNEB potential DHN. For clarity, the applicant should also contact the borough energy officer to discuss about the nearby DHN opportunities. The email correspondence in Appendix A.3 should be reprovided as some text appears to be missing. **This item is outstanding.**	Further correspondance has occurred which has been included in Appendix B of 6892 Battersea Park Road Energy Statement 2024.11.12 RevS2G

9	The applicant is proposing block-by-block heat networks supplied by energy centres in each block. The applicant should demonstrate that the number of energy centres has been minimised. It should be confirmed that all apartments and non-domestic building uses will be connected to the heat networks. The applicant is required to provide trenches and pipes between blocks to enable all block-level heat networks to ultimately be connected into a single site-wide network. A drawing showing the route of the heat networks linking all buildings/uses on the site should be provided alongside a drawing indicating the floor area, internal layout and location of the energy centres. The applicant has provided a commitment that the development is designed to allow future connection to a district heating network. This should include a single point of connection to the district heating network. Drawings should be provided demonstrating space for heat exchangers in the energy centre, and a safe-guarded pipe route to the site boundary, and sufficient space in cross section for primary district heating pipes where proposed routes are through utility corridors. This requirement is to be secured through a **suitable condition or legal wording.**	Response provided within new energy statement.	The applicant is suggesting they are now proposing a communal system. The applicant should confirm this and detail the design of this network. The drawing provided however seems to be suggesting a block by block network with energy centres in each block. The applicant should demonstrate that the number of energy centres has been minimised. It should be confirmed that all apartments and non-domestic building uses will be connected to the heat networks. The applicant has provied a drawing detailing trenches and pipes between blocks to enable all block-level heat networks to ultimately be connected into a single site-wide network. A drawing showing the route of the heat networks linking all buildings/uses on the site should be provided alongside a drawing indicating the floor area, internal layout and location of the energy centres. The applicant has provided a commitment that the development is designed to allow future connection to a district heating network. This should include a single point of connection to the district heating network. Drawings should be provided demonstrating space for heat exchangers in the energy centre, and a safe-guarded pipe route to the site boundary, and sufficient space in cross section for primary district heating pipes where proposed routes are through utility corridors. This requirement is to be secured through a suitable condition or legal wording. **This item remains outstanding.**		The applicant is proposing block-by-block heat networks supplied by energy centres in each block. The applicant has provided drawings showing the space for PHX on the three plots and the potential trench routes to interconnect the blocks together with a potential point of connection. This is welcomed. The applicant is required to provide these trenches and pipes between blocks to enable all block-level heat networks to ultimately be connected into a single site-wide network. **This item is outstanding.**	Separate energy centres have been provided to allow separate ownership – the residential block will be owned/managed by an RP and the student elements are large blocks that could easily be owned and operated separately. The client has agreed to provide these trenches and pipes to connect all blocks, see 6892 Battersea Park Road Energy Statement 2024.11.12 RevS2G Appendix E.
Be Green						
11	Heat pumps are being proposed in the form of a (centralised) ASHP system to deliver space heating, cooling and DHW. The applicant is proposing VRF served from ASHP Chillers for the Non-residential spaces.The DHW source for the non-domestic units should be confirmed. They should confirm the reason for the non-domestic uses not being served by the network. They should maximise the heat loads that are connected to the site-wide heat network and any divergences from policy should be robustly justified. Commercial units should be provided with capped-off connections from the communal heating distribution circuit to offer future tenant flexibility on heating source. Further information on the heat pumps should be provided including: a. An estimate of the heating and/or cooling energy (MWh/annum) the heat pumps would provide to the development and the percentage of contribution to the site's heat loads. They should demonstrate how the heat fraction from heat pump technologies has been maximised. b. Details of the Seasonal Coefficient of Performance (SCOP) and/or Seasonal Energy Efficiency ratio (SEER) and how these have been calculated. This should incorporate the expected heat source and heat distribution temperatures (for space heat and hot water)and the distribution loss factor, which should be calculated based on the above information and used for calculation purposes.	Response provided within new energy statement.	Heat pumps are being proposed in the form of a (centralised) ASHP system to deliver space heating, cooling and DHW. The applicant is proposing VRF served from ASHP Chillers for the Non-residential spaces. They should confirm the reason for the non-domestic uses not being served by the network. They should maximise the heat loads that are connected to the site-wide heat network and any divergences from policy should be robustly justified. Commercial units should be provided with capped-off connections from the communal heating distribution circuit to offer future tenant flexibility on heating source. The applicant has provided the relevent SCOP and SEER calculation sheets within the new submission. This is welcomed. The applicant should also provide: a) An estimate of the heating and/or cooling energy (MWh/annum) the heat pumps would provide to the development and the percentage of contribution to the site's heat loads. They should demonstrate how the heat fraction from heat pump technologies has been maximised. b)Explain how the SCOP and SEER calculations have included: the expected heat source and heat distribution temperatures (for space heat and hot water)and the distribution loss factor, which should be calculated based on the above information and used for calculation purposes. **This item remains outstanding.**		Clarifications and additional information is welcomed. The applicant has provided estimate of the heating and/or cooling energy (MWh/annum) the heat pumps. For the residential element the SCOP of 3.39 is considered considerably high and the applicant should provide detailed calculations of how this has been estimated including expected heat source and heat distribution temperatures (for space heat and hot water) including the manufacturer datasheet. The distribution loss factor of 1.10 also appears to be low. The applicant should robustly justify the use of this distribution loss factor with detailed calculations or use a more conservative value and update the energy modelling, CO2 emissions and carbon offset payment. **This item is outstanding.**	The ASHP data sheet has been provided in Appendix A showing that an SCoP of 3.39 is achived through distribution at 55°C. Distribution losses are now modelled at 85% for the student residential where WWHR is present and 90% for the lower floor commercial where the loop lengths are lower and WWHR is not present.
Whole Life-Cycle Carbon Assessment						
EUI and Space Heat Demand						
13	EUI and space heating demands have been provided. The applicant has used the SAP 10.2 + Part l2 DSM methodology for these calculations. The applicant should report the EUI and space heating demand against the reference values in Table 4 of GLA guidance. The applicant should provide commentary if the expected performance differs from the reference values.	Response provided within new energy statement.	EUI and space heating demands have been provided. The applicant has used the SAP 10.2 + Part l2 DSM methodology for these calculations. The applicant should report the EUI and space heating demand against the reference values in Table 4 of GLA guidance. The applicant should provide commentary if the expected performance differs from the reference values. **This item remains outstanding.**		The applicant has provided the EUI and SH values. Nothing further is required.	
Be Seen Energy Monitoring						
14	A commitment should be provided that the development will be designed to enable post construction monitoring and that the information set out in the 'Be Seen' guidance is submitted to the GLA's portal at the appropriate reporting stages. This will be secured through **suitable legal wording.** The 'Be Seen' reporting spreadsheet has been developed to enable development teams to capture all data offline before this is submitted via the webform. The applicant should confirm that the planning stage data has been submitted to GLA.	No response provided.	A commitment should be provided that the development will be designed to enable post construction monitoring and that the information set out in the 'Be Seen' guidance is submitted to the GLA's portal at the appropriate reporting stages. This will be secured through **suitable legal wording.** The 'Be Seen' reporting spreadsheet has been developed to enable development teams to capture all data offline before this is submitted via the webform. The applicant should confirm that the planning stage data has been submitted to GLA. **This item remains outstanding.**		This is welcomed, once the planning stage CO2 emissions have been agreed with GLA, the applicant should confirm / has confirmed that the planning stage data has been submitted to GLA. **This item is outstanding.**	Understood
Other points						
15	The applicant has confirmed the carbon shortfall in tonnes CO2 and the associated carbon offset payment that will be made to the borough. The **draft s106 agreement** should be submitted when available to evidence the carbon offset agreement with the borough.	No response provided.	The applicant has confirmed the carbon shortfall in tonnes CO2 and the associated carbon offset payment that will be made to the borough. The **draft s106 agreement** should be submitted when available to evidence the carbon offset agreement with the borough. **This item remains outstanding.**		The draft s106 agreement should be submitted when available for review. **This item is outstanding.**	Understood
16	The applicant should provide the full relevant modellings output sheets (i.e. TER, DER, BRUKL) for all the different stages of the energy hierarchy.	Response provided within new energy statement.	The applicant should provide the full relevant modellings output sheets (i.e. TER, DER, BRUKL) for all the different stages of the energy hierarchy as per above comments. **This item remains outstanding.**		Supporting modelling has been provided this should change in lien with comments above.	Understood
Move resolved comments under this section						

10	The applicant is proposing 66m² of PV which is consider low for the scale of the application. A detailed roof layout should be provided demonstrating that the roof's potential for a PV installation has been maximised and clearly outlining any constraints to the provision of further PV, such as plant space or solar insolation levels. The applicant is expected to situate PV on any green/brown roof areas using biosolar arrangement and should indicate how PV can be integrated with any amenity areas. The on-site savings from renewable energy technologies should be maximised regardless of the London Plan targets having been met. The applicant should provide the capacity (kWp), total net area (m2) and annual output (kWh) of the proposed PV array.	Response provided within new energy statement.	The drawing and upgraded PV is welcomed. The applicant appears to have maximised the roof space available. **Nothing further required.**
12	The applicant has submitted a WLC assessment which will be reviewed separately; comments will be provided. The WLC assessment should be presented separately in excel using the GLA's WLC assessment template and should follow the GLA WLC guidance. The template and guidance are available here: https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/london-plan-guidance/whole-life-cycle-carbon-assessments-guidance. Applicants will also be conditioned to submit a post-construction assessment to report on the development's actual WLC emissions.	-	**No further action required.**
17	The applicant should complete and submit the Good Homes Alliance Early Stage Overheating Risk Tool.	Response provided within new energy statement.	Received. **No further action required.**

Received; SAP 10 proposed and nothing further required
Received; SAP 2012 proposed and nothing further required
Received; SAP 10 proposed but items still outstanding
Received; SAP 2012 proposed but items still outstanding
Not yet received - applicant to submit and provide reference --->
N/A

Appendix H - Sitewide Façade Optimisation

Sitewide Facade Optimisation

Battersea Park Road

Revision 0, August 2022

Document information

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Project name:	Battersea Park Road
Project number:	6892
Digital file name:	6892 Battersea Park Road Sitewide Façade Optimisation Rev00
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Revisions

No	Date	Approved
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Contents

Executive summary

This design note has been prepared in response to the planning comments received in relation to the Battersea Park Road planning submission; in particular, the environmental design of the façade and the lack of variation on different levels and orientations. This report will address the solar exposure on different levels and orientations and different blocks with the goal of varying certain parameters like glazing percentage, solar shading and glazing properties for an environmentally reactive façade design.

1 Analysis of Current Design

This section will look at the current design in terms of solar exposure to the façade, current proposed conditioning strategy, daylighting, solar gain and the elements of the cooling hierarchy applied as the previous passive design measures for Stage 2.

1.1 Solar Exposure

The first step in the façade optimisation is to group the areas with different solar exposure. To do this, a SunCast simulation in IESVE 2022 has been run and the relative solar exposure has then been grouped.

Figure 1 to Figure 4, adjacent, show the typical contouring on a 1m grid for all blocks to demonstrate the areas receiving the most and least solar exposure.

Figure 5 to Figure 7 have then been grouped in bandings of 200kWh of solar exposure between May-September with the view that these will be translated into elevational markups by the architects. This could be made more granular in later RIBA stages.

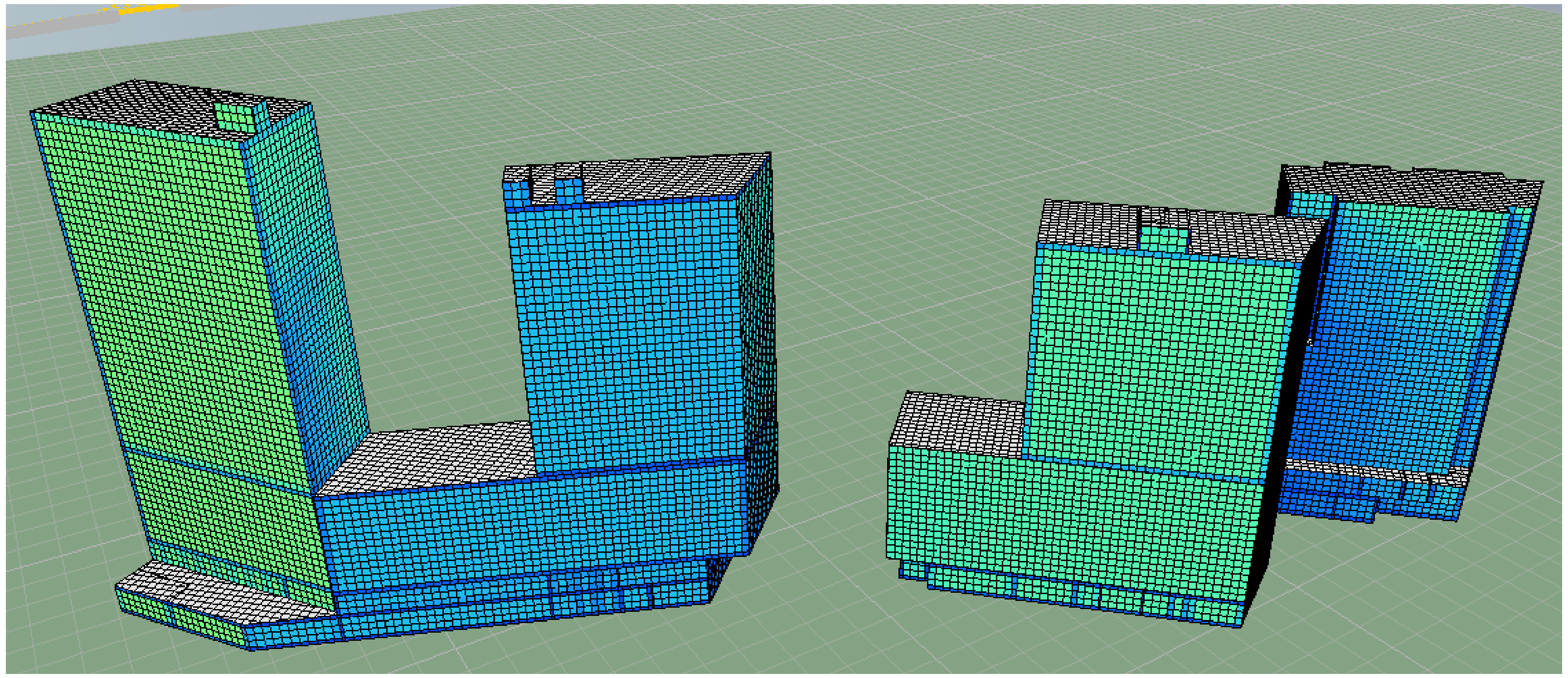


Figure 1 - Solar Exposure, view from NW

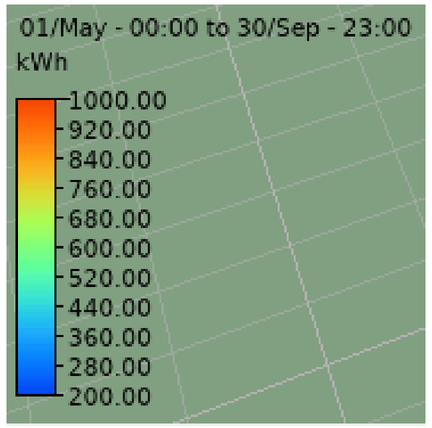


Figure 2 - Irradiance Display Shading Key

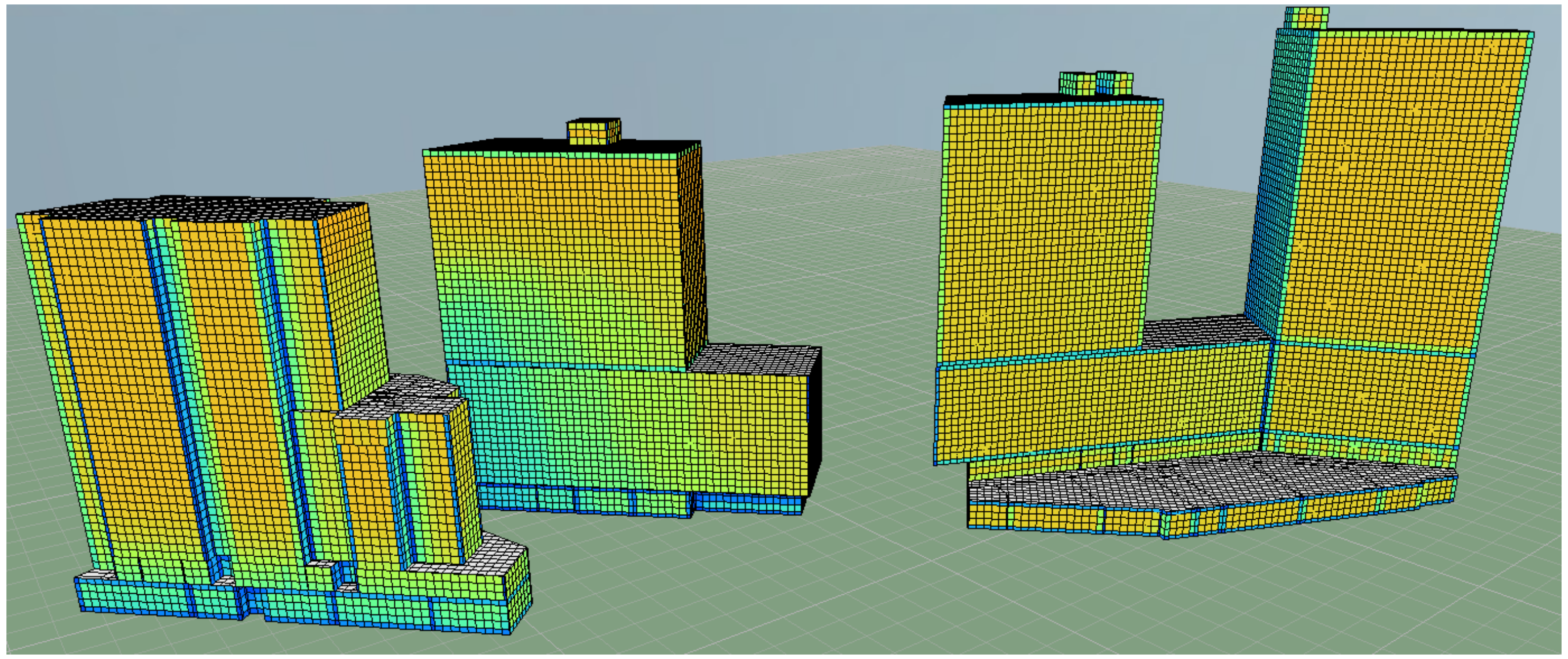


Figure 4 - Solar Exposure, view from S

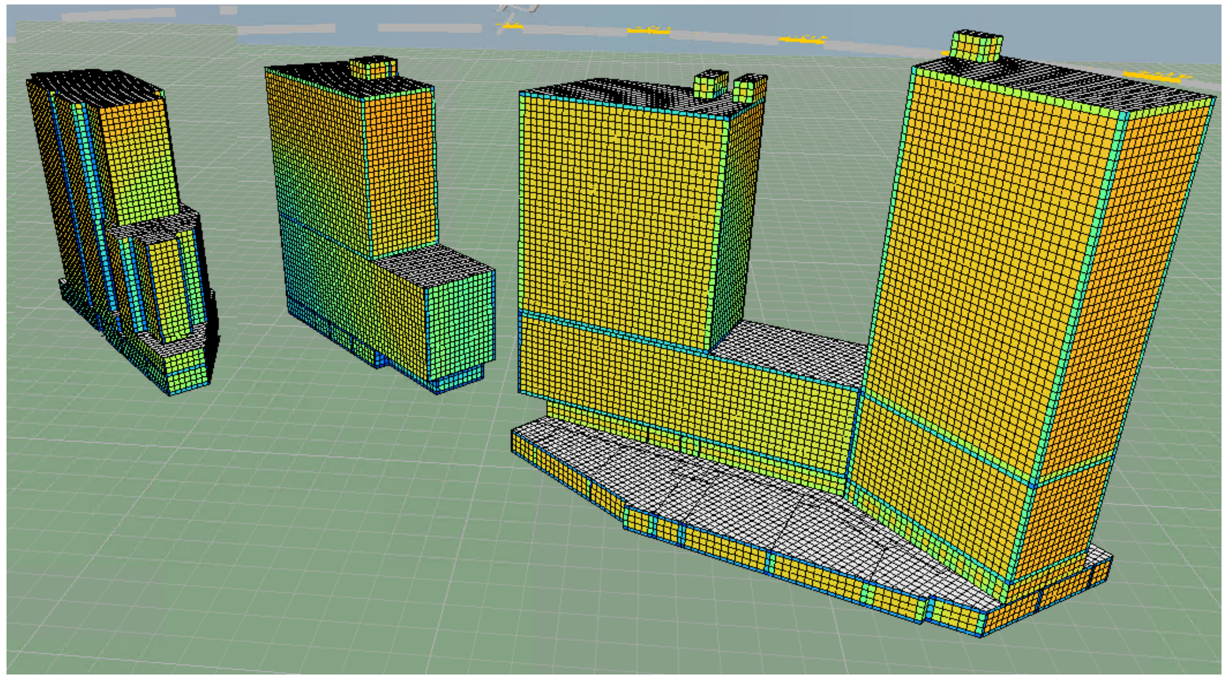


Figure 3 - Solar Exposure, view from SE

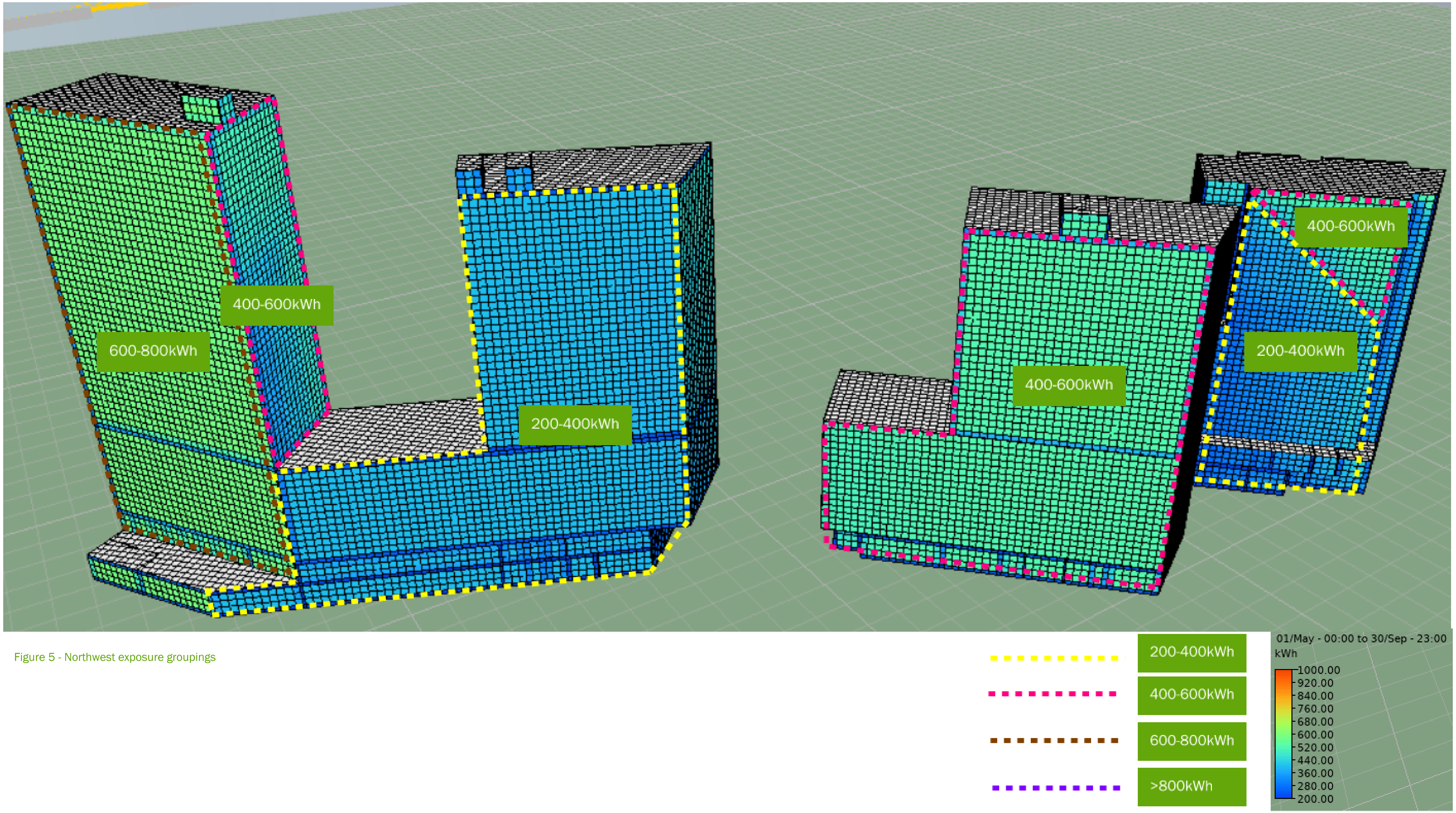


Figure 5 - Northwest exposure groupings

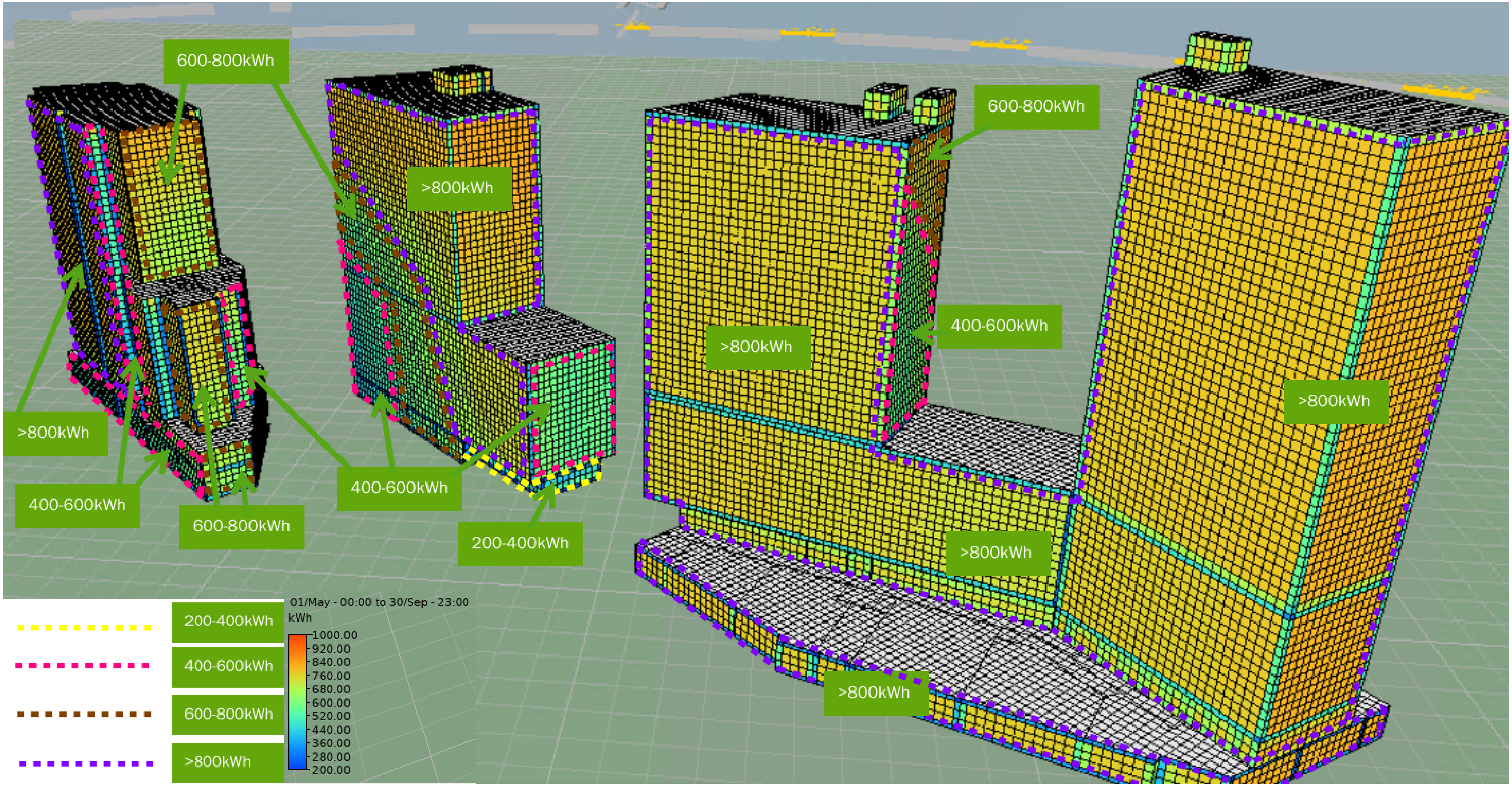


Figure 6 - South exposure groupings

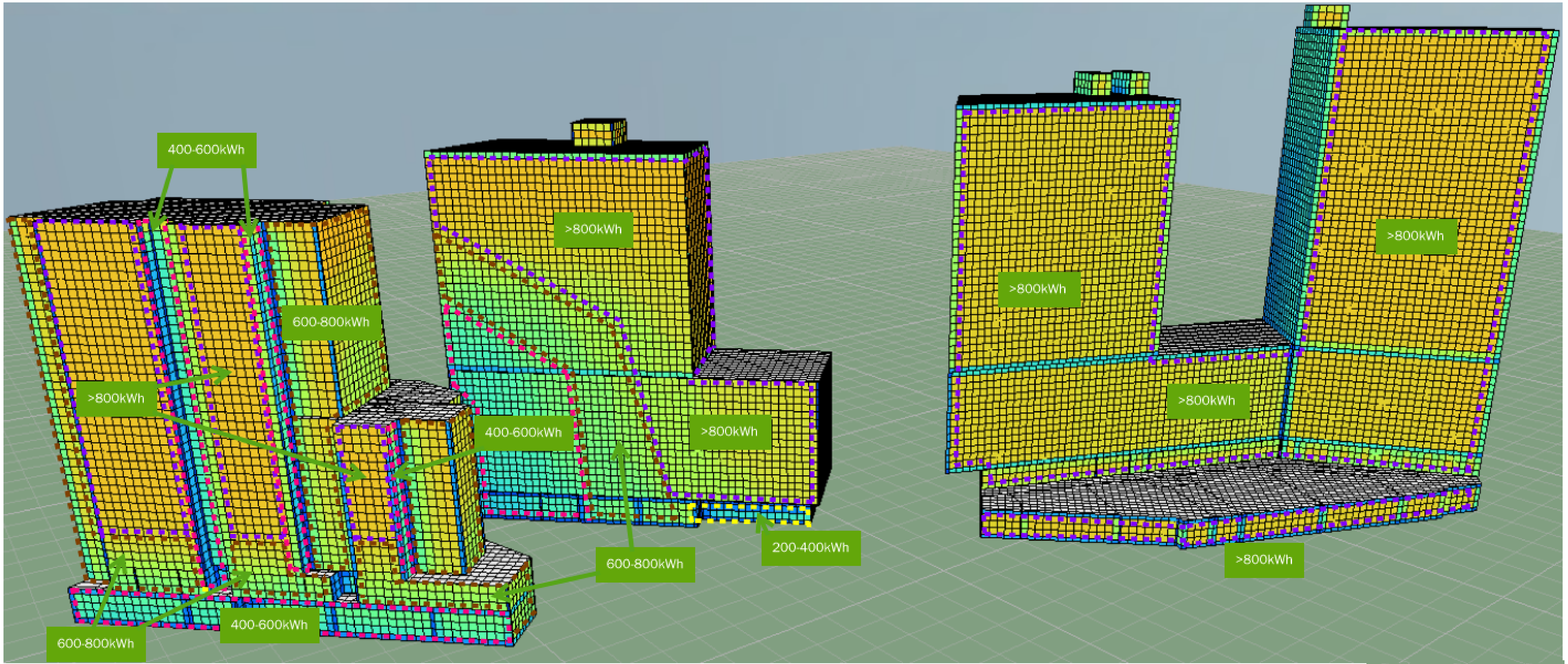
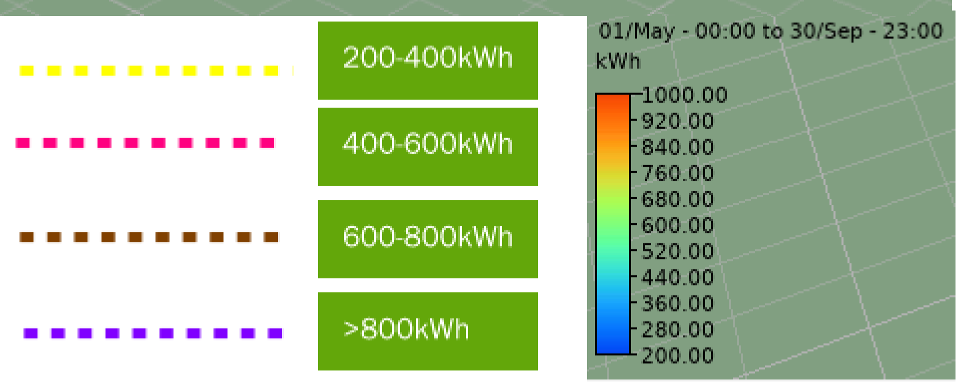


Figure 7 - Southwest exposure groupings



1.2 Current Typical Layouts

This section will look into the current layouts, façade design and natural ventilation provision for typical space types within the current model. Occupied space types include:

- Student accommodation
  - Cluster bedrooms
  - Studios
  - Cluster Living/Kitchen
- Residential
  - Bedrooms
  - 1 Bed Living/Kitchen
  - 2 Bed Living/Kitchen
  - 3 Bed Living/Kitchen

These metrics will be useful later on in the design note, where these average space types will be tested with different variables changed and assessed via CIBSE TM59.

Table 1.1 Average Occupied Space Type Properties

Modelled	Average Floor Area	Average W:WR	Average Nat Vent Free Area	Free Area as % of Floor Area	Comments
Student Accommodation					
Cluster Bedrooms	12.8	40%	(From louvres) 0.52m^2	4.1%	Found on nearly all orientations and heights, mainly single sided but some corners
Studios	23.3	38%	(From louvres) 1.13m^2	4.8%	Found on nearly all orientations and heights, single sided and corners
Cluster Living/Kitchen	36.7	38%	(From louvres) 2.50m^2	6.8%	Found on nearly all corner orientations and heights
Plot A Residential					
Bedrooms	13.3	34%	(From 15% window) 0.72m^2	5.4%	Mainly located on SW or N orientations, single sided, at all heights
1 Bed Living/Kitchen	39.6	43%	(From 15% window & 30% door) 2.40m^2	6.1%	Mainly located on SW or N orientation with recessed bit at all heights
2 Bed Living/Kitchen	40.3	42%	(From 15% window & 30% door) 2.96m^2	7.3%	Mainly N/NW, E or S orientation, largely corners, at all heights
3 Bed Living/Kitchen	48.8	38%	(From 15% window & 30% door) 2.45m^2	5.0%	All SW orientation on corners at all heights

1.3 Current Profiles and Conditioning Strategy

Below in Table 1.2 are the general inputs for occupancy, equipment and ventilation that achieved full TM59 compliance with the current layouts. Note that this strategy is a result of following the GLA cooling hierarchy where passive measures and thermal mass were applied, along with a reduced g-value for the student accommodation. This therefore represents the strategy for the worst-case spaces (i.e., south/southwest/west exposed orientations). These inputs provide the starting point for further façade optimising iterations.

Table 1.2 Occupied Space Profiles and Conditioning Strategy

Modelled	Occupancy (75W/person sensible, 55W/person latent)	Equipment Load (plus 2W/m² lighting 18:00-23:00)	Natural Ventilation	Mechanical Ventilation	Trim Cooling Capacity
Student Accommodation					
Cluster Bedrooms	2 people @ 70% (11pm – 8am) 2 people @ 100% (8am – 9am, 10pm – 11pm) 1 person @ 100% (9am – 10pm)	Peak Load of 80W (8am – 11pm) Base Load = 10W (11pm – 8am)	Louvres open when internal dry resultant temperature >22°C day and night	2ACH (~19l/s)	340W
Studios	1 person continuous	Peak Load of 900W (6pm – 8pm) 400W (8pm – 10pm) 220W (9am – 6pm, 10pm – 12pm) Base Load = 85W	Louvres open when internal dry resultant temperature >22°C day and night	2ACH (~35l/s)	630W
Cluster Living/Kitchen	6 people (9am – 10pm)	Peak Load of 450W (6pm – 8pm) 200W (8pm – 10pm) 110W (9am – 6pm, 10pm – 12pm) Base Load = 85W	Louvres open when internal dry resultant temperature >22°C day and night	3ACH (~54l/s)	960W
Plot A Residential					
Bedrooms	2 people @ 70% (11pm – 8am) 2 people @ 100% (8am – 9am, 10pm – 11pm) 1 person @ 100% (9am – 10pm)	Peak Load of 80W (8am – 11pm) Base Load = 10W (11pm – 8am)	Windows and doors open in the day (07:00-23:00) when internal dry resultant temperature >22°C. Just windows allowed to open at night (23:00-07:00)	40l/s	740W
1 Bed Living/Kitchen	1 people (9am – 10pm)	Peak Load of 450W (6pm – 8pm) 200W (8pm – 10pm) 110W (9am – 6pm, 10pm – 12pm) Base Load = 85W	Windows and doors open in the day (07:00-23:00) when internal dry resultant temperature >22°C. Just windows allowed to open at night (23:00-07:00)	20l/s	360W
2 Bed Living/Kitchen	2 people (9am – 10pm)	Peak Load of 450W (6pm – 8pm) 200W (8pm – 10pm) 110W (9am – 6pm, 10pm – 12pm) Base Load = 85W	Windows and doors open in the day (07:00-23:00) when internal dry resultant temperature >22°C. Just windows allowed to open at night (23:00-07:00)	20l/s	360W
3 Bed Living/Kitchen	3 people (9am – 10pm)	Peak Load of 450W (6pm – 8pm) 200W (8pm – 10pm) 110W (9am – 6pm, 10pm – 12pm) Base Load = 85W	Windows and doors open in the day (07:00-23:00) when internal dry resultant temperature >22°C. Just windows allowed to open at night (23:00-07:00)	20l/s	360W

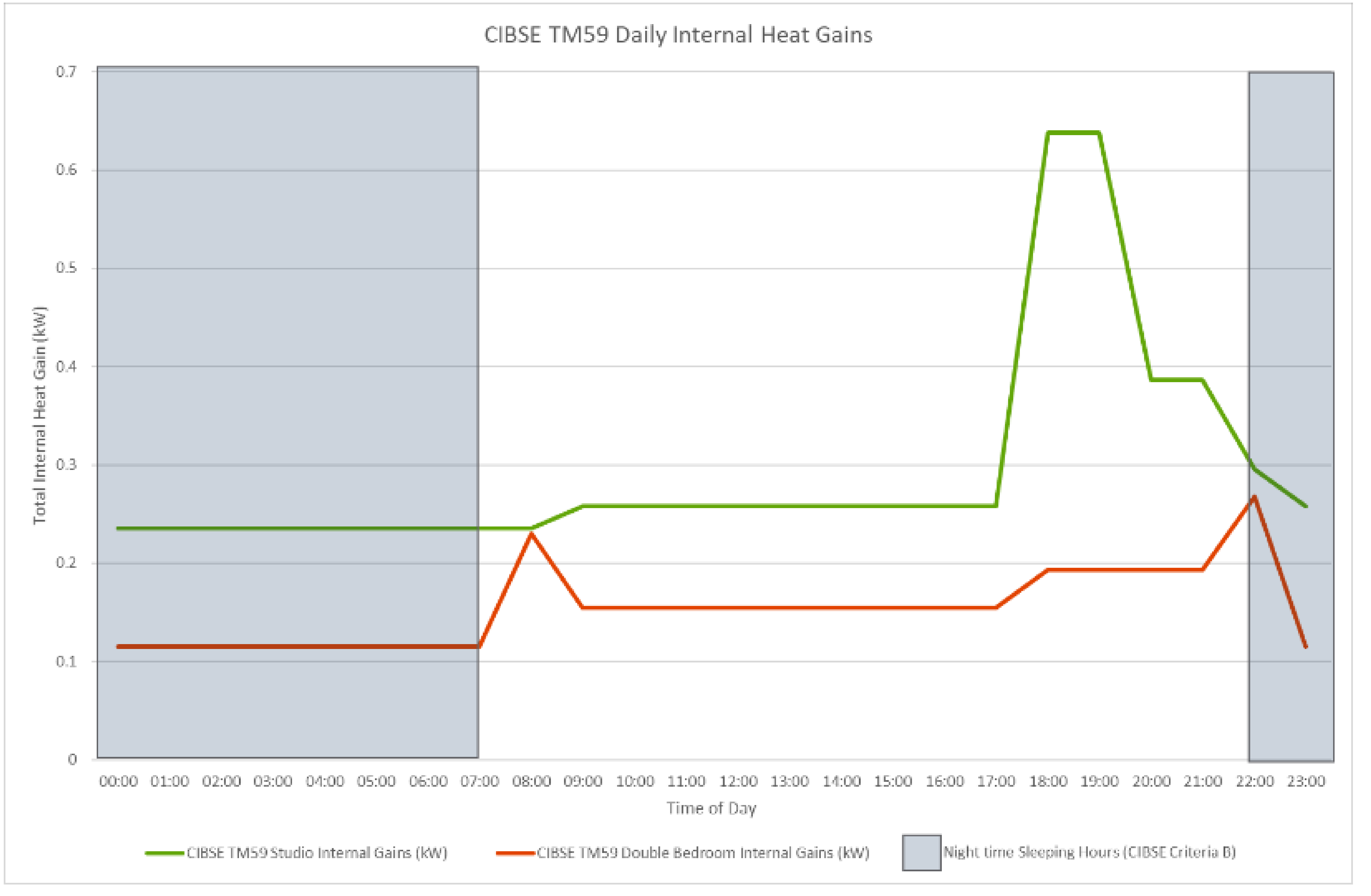


Figure 8 - Graph of sleeping space internal gains and when sleeping hours are assumed

2 Analysis of Weather Data

2.1 London Heathrow DSY12020High50

CIBSE TM49 Design Summer Years for London addresses the impacts of both urban heat island effect and future climate. All overheating modelling is conducted using, and expected to comply with:

- DSY1 (Design Summer year) for the 2020, high emission, 50% percentile scenario

Additional testing is encouraged using the 2020 versions of more extreme weather files:

- DSY2 – 2003: a year with a very intense single warm spell
- DSY3 – 1976: a year with a prolonged period of sustained warmth

Where compliance is not achieved under the more extreme weather files, the applicant should outline a strategy for residents to cope with extreme weather events and commit to providing guidance to residents on reducing summertime temperatures in line with the cooling hierarchy. The locality of the development is taken into account through the use of three different locations that are adjusted for future climate effects (the most applicable to the development is used):

Table 2.1 Location Weather Data

Location	Weather File
High density urban	London Weather Centre
Low density urban and suburban	London Heathrow
Rural and peri-urban	Gatwick Airport

The weather file used for the main CIBSE TM59 analysis for the Battersea Park Road development is London Heathrow DSY1 2020High50 which has the following statistics:

- 95% percentile = 26.4°C
- 97% percentile = 27.4°C
- 99% percentile = 29.5%
- Maximum temperature = 34.6°C

These are shown graphically in Figure 9 and Figure 10 to demonstrate the implications of using natural ventilation or unconditioned mechanical ventilation.

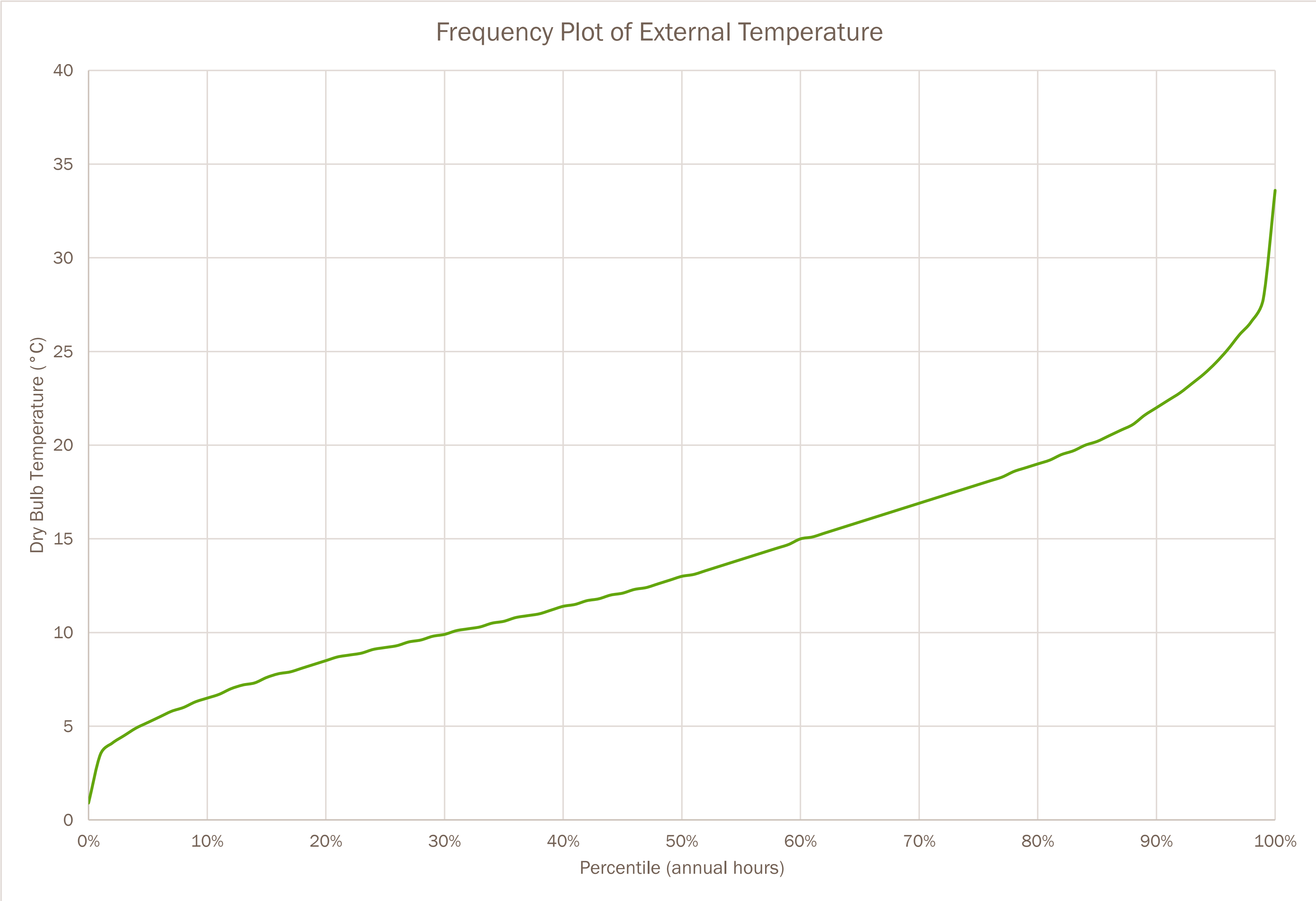


Figure 9 - Frequency Plot of the External Dry Bulb Temperature in the London Heathrow DSY1 2020High50 weather file

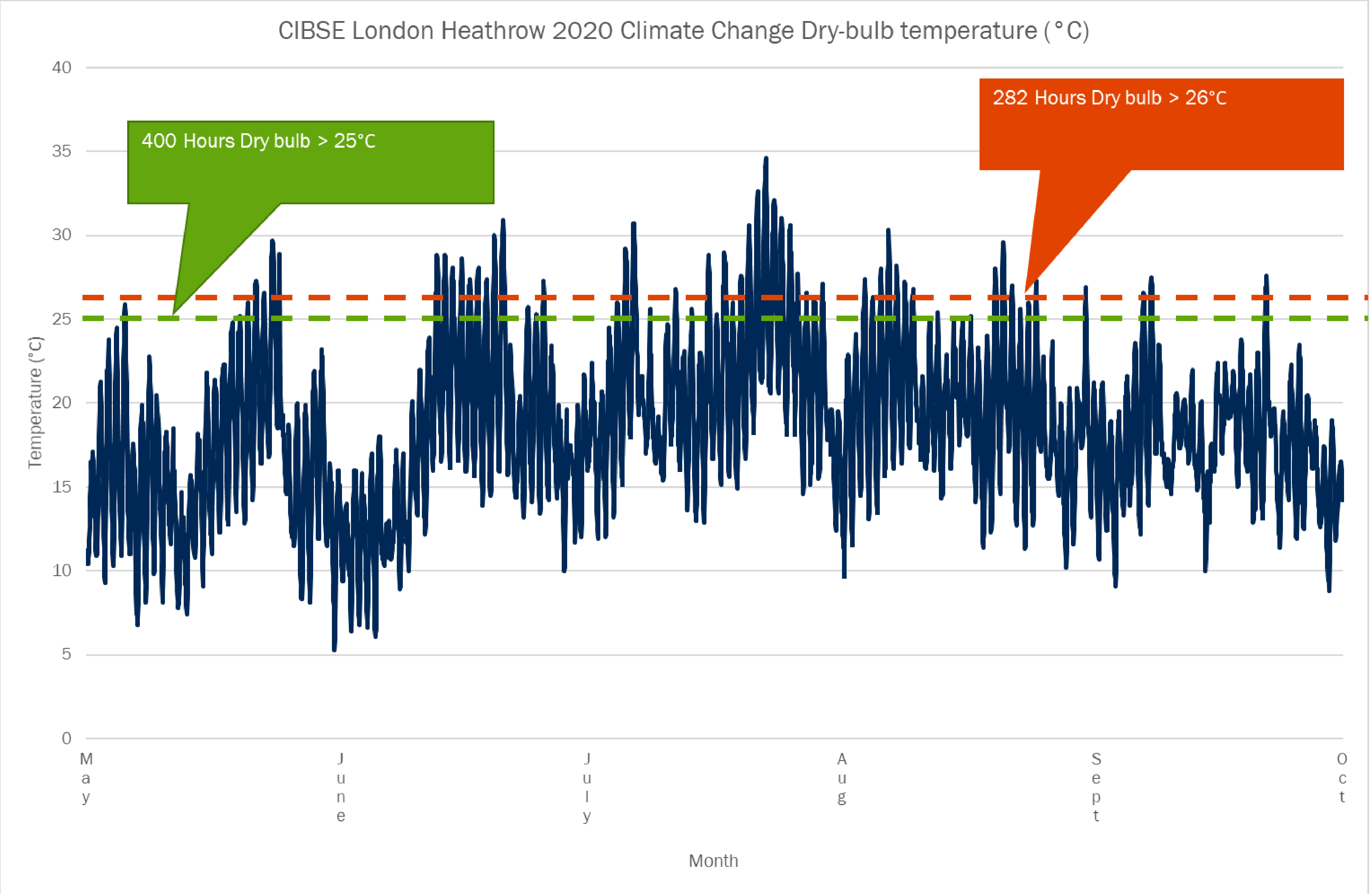


Figure 10 - May to September Dry Bulb Temperatures (400 hours represents 10.9% of May to September, 282 hours represents 7.7% of May to September)

3 Representative Sample Spaces

Based on the above, an average sample space has been created for each of the 7 occupied space types:

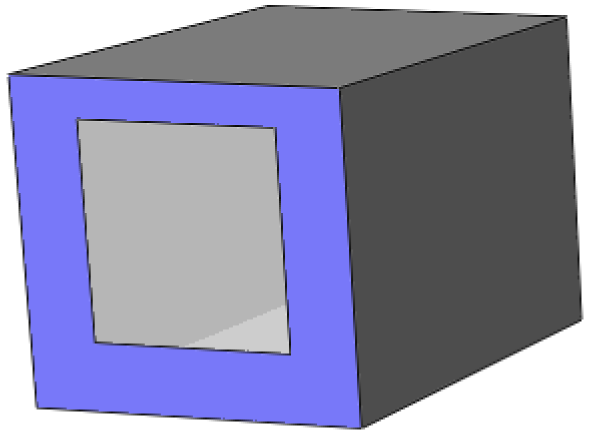


Figure 11 - Representative Cluster Bed

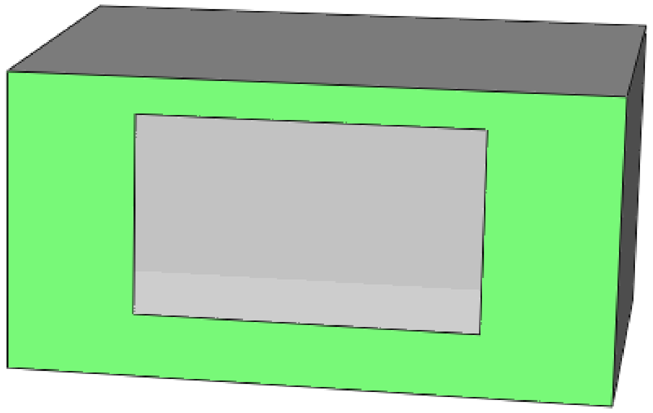


Figure 12 - Representative Studio

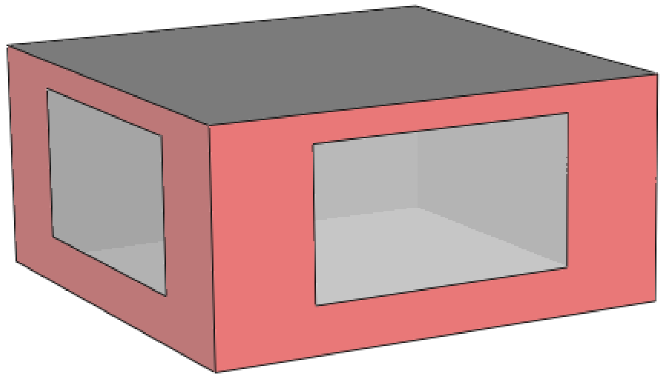


Figure 13 - Representative Cluster Living/Kitchen

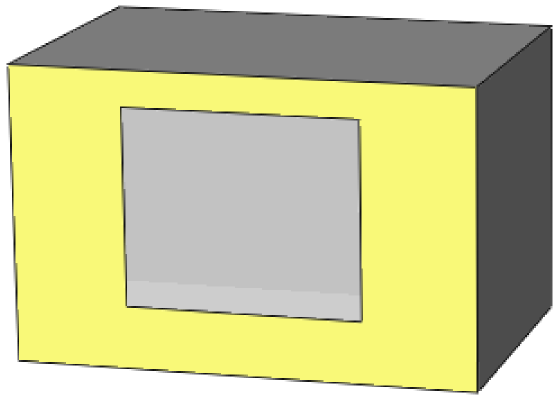


Figure 14 - Representative Plot A Bed

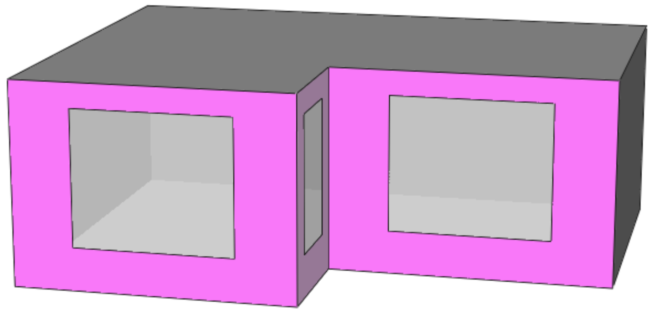


Figure 15 - Representative Plot A 1B Living/Kitchen

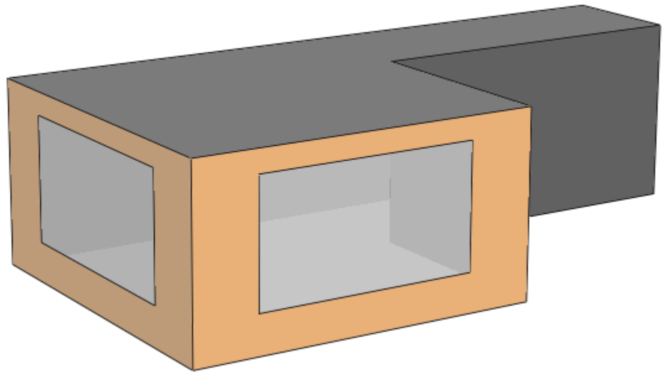


Figure 16 - Representative Plot A 2B Living/Kitchen

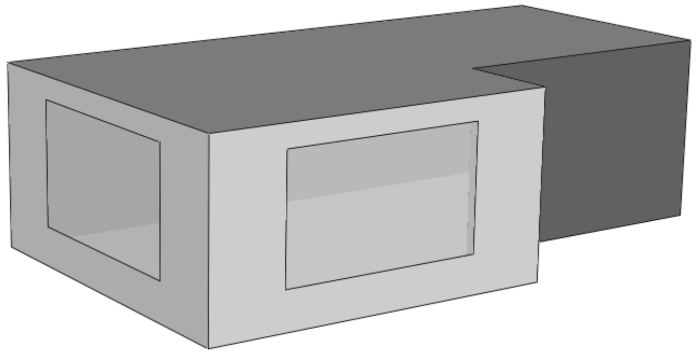


Figure 17 - Representative Plot A 3B Living/Kitchen

These sample spaces have the average floor area, external wall area and window area as per Table 1.1. Glazing has been modelled using a sill height of 0.6m and 1.9m height (with the percentage glazed equal to the average W:WR of that type). They have also been assigned the same profiles and conditioning strategy as Table 1.2.

These sample spaces do not reflect each individual layout (e.g., not all 2-bed living/kitchens are corners, but most are) and glazing is modelled on a percentage basis, therefore, results should be inferred, when possible, where a layout/window arrangement differs.

These sample spaces will be used to determine average daylight factors on different orientations and levels, as well as being used to test CIBSE TM59 compliance with various façade and conditioning strategy iterations.

3.1 Sample Average Daylight Factors & Solar Gain

Using the sample apartments shown above, daylight factors have been calculated first in isolation (100% exposed no adjacent buildings) on eight different orientations with 300mm fins & overhang (fins and overhang represent the window reveal depth). It can be assumed that these reasonably represent the façade where there is no overshading, and so the glazing can be proportioned down from whatever ADF it achieves to an ADF of around 2% - any higher than this is increased solar gain when reasonable daylight factors are already achieved.

Visible light transmittance of 0.7 is used for Plot A and 0.55 used for the Student Accommodation. 70% reflectance used for walls and ceilings, 20% reflectance used for floors.

The daylight modelling has been completed against the guidance set out in the Building Research Establishment's (BRE) 'Site Layout Planning for Daylight and Sunlight' by Paul Littlefair in terms of average daylight factors. Average Daylight Factor (ADF) calculations have been completed with the results compared against the BRE Guide for daylight levels to living rooms, bedrooms and kitchens (bedrooms >1%, living rooms >1.5% and kitchens >2%).

Once ADF figures have been produced with no overshading to give an idea where the glazing can be reduced in the >800kWh areas of the façade (Section 1), the façade areas in the lower grouping schemes in Section 1 (200-400, 400-600 and 600-800kWh) will have a sample space positioned within the bulk geometry of the Battersea Park Road IES model and tested to see the effect of the overshading.

These results in Table 3.1 demonstrate that glazing can be reduced in some of these areas to reduce solar gain without impacting comfortable lighting levels within the space; each of the seven space types could have glazing reduced by approximately half in areas with no overshading.

The north and northwest faces of the student accommodation blocks have little to no overshading (as shown in Figure 5) but also do not have as much of a problem with solar exposure/gain.

In Table 3.1, areas with an ADF >3% have been highlighted and glazing reduction to these space types should be made the priority.

Table 3.1 Average Daylight Factor (no adjacent building overshading)

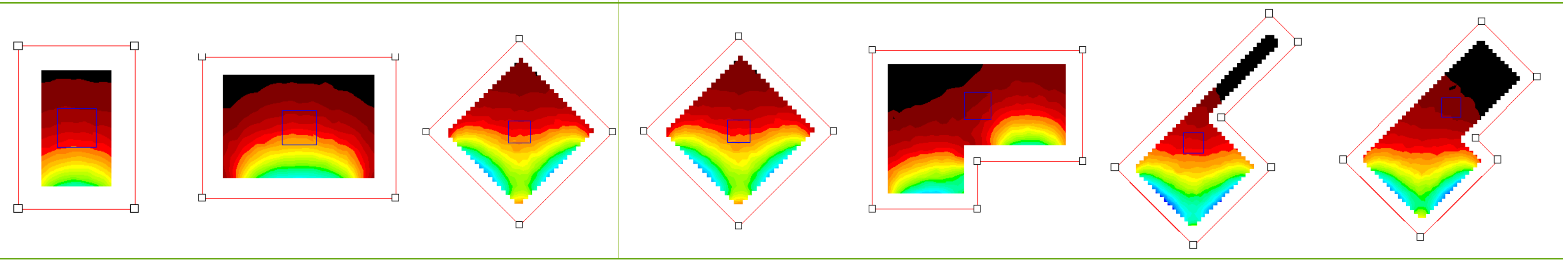
	Student Accommodation			Plot A			
	Cluster Bed	Studio	Cluster Living	Plot A Bed	1B Living	2B Living	3B Living
Southeast	2.9%	3.6%	4.5%	4.2%	2.9%	4.3%	3.0%
East	2.9%	3.4%	4.5%	4.1%	2.9%	4.3%	3.1%
Northeast	2.9%	3.6%	4.5%	4.1%	2.9%	4.3%	3.1%
North	3.0%	3.5%	4.5%	4.1%	2.9%	4.4%	3.1%
South	3.0%	3.5%	4.5%	4.1%	2.8%	4.3%	3.1%
Southwest	3.0%	3.4%	4.5%	4.1%	2.8%	4.3%	3.0%
West	2.9%	3.4%	4.5%	3.9%	2.9%	4.4%	3.1%
Northwest	3.0%	3.4%	4.5%	4.1%	2.8%	4.4%	3.1%
ADF Contours							

Table 3.2 Peak Solar Gain (no adjacent buildings overshading) W/m²

	Student Accomodation			Plot A			
	Cluster Bed	Studio	Cluster Living	Plot A Bed	1B Living	2B Living	3B Living
Southeast	63.9	63.7	53.2	77.5	53.1	49.1	38.4
East	64.8	63.8	53.8	78.4	53.2	49.1	37.2
Northeast	49.5	49.6	49.8	60.5	39.8	45.2	34.5
North	14.5	15.8	36.6	18.4	17.9	33.6	25.3
South	58.9	58.2	47.9	71.5	48.7	45.5	33.2
Southwest	61.1	60.2	49.0	73.9	50.2	45.8	34.1
West	60.0	59.1	48.0	72.5	49.2	44.1	33.4
Northwest	39.4	40.5	43.5	48.5	35.6	40.2	30.9

3.2 Sample Average TM59

The sample spaces as described in Section 3 have been tested with glazing percentages of ~40% (as per current design), 25% and 15% with the natural ventilation provision and mechanical flow rates as described in Table 1.1 and Table 1.2 but without the trim cooling (i.e., provided at external air temperatures). These are all modelled with a 0.35 g-value.

The results demonstrate that the bedrooms and studios do not pass the CIBSE TM59 criteria under these conditions (other than the NW facing Plot A Bedroom with 15% glazing).

This confirms the strategy as laid out in the Stage 2 Overheating Report and Energy Statement that trim cooling cannot be avoided to the sleeping spaces and solar gain is not the main factor contributing to the overheating.

While the results show that the living/kitchen spaces can pass without trim cooling, this does not take into account the internal conduction gains present when modelling the full building.

Despite this, glazing reduction to the kitchen/living spaces should be prioritised as this is where a reduction in solar gain does have a significant benefit.

Table 3.3 Average Sample Spaces - TM59 Results on Different Orientations

	Student Accommodation			Plot A			
	Cluster Bedrooms	Studios	Cluster Living/Kitchen	Plot A Bed	1B Living/Kitchen	2B Living/Kitchen	3B Living/Kitchen
~40% glazed N	Fail	Fail	Fail	Fail	Pass	Pass	Pass
~40% glazed NE	Fail	Fail	Fail	Fail	Pass	Pass	Pass
~40% glazed E	Fail	Fail	Fail	Fail	Pass	Fail	Fail
~40% glazed SE	Fail	Fail	Fail	Fail	Pass	Fail	Fail
~40% glazed S	Fail	Fail	Fail	Fail	Fail	Fail	Fail
~40% glazed SW	Fail	Fail	Fail	Fail	Fail	Fail	Fail
~40% glazed W	Fail	Fail	Fail	Fail	Fail	Fail	Fail
~40% glazed NW	Fail	Fail	Fail	Fail	Pass	Fail	Pass
~25% glazed N	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~25% glazed NE	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~25% glazed E	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~25% glazed SE	Fail	Fail	Fail	Fail	Pass	Pass	Pass
~25% glazed S	Fail	Fail	Fail	Fail	Pass	Pass	Pass
~25% glazed SW	Fail	Fail	Fail	Fail	Pass	Pass	Pass
~25% glazed W	Fail	Fail	Fail	Fail	Pass	Pass	Pass
~25% glazed NW	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed N	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed NE	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed E	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed SE	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed S	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed SW	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed W	Fail	Fail	Pass	Fail	Pass	Pass	Pass
~15% glazed NW	Fail	Fail	Pass	Pass	Pass	Pass	Pass

4 Daylight Factor and Solar Gain

4.1 Student Accommodation

A sample of zones from the student accommodation have been selected to check average daylight factor and solar gain on various levels and orientations. These results can be compared with the solar exposure screenshots to prioritise where glazing reductions will be the most beneficial.

Figure 18 - Student Accommodation L12

Figure 19 - Student Accommodation L02

Figure 22 - Student Accommodation L15

Figure 20 - Student Accommodation L05

Figure 25 - Student Accommodation L17

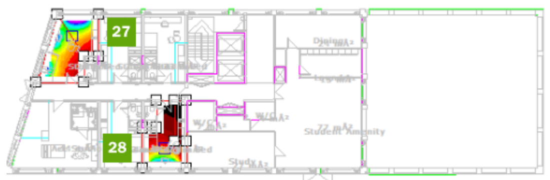


Figure 21 - Student Accommodation L07

Figure 24 - Student Accommodation L20

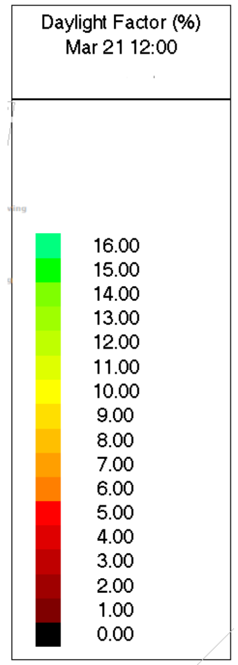


Figure 23 - ADF Contour Key

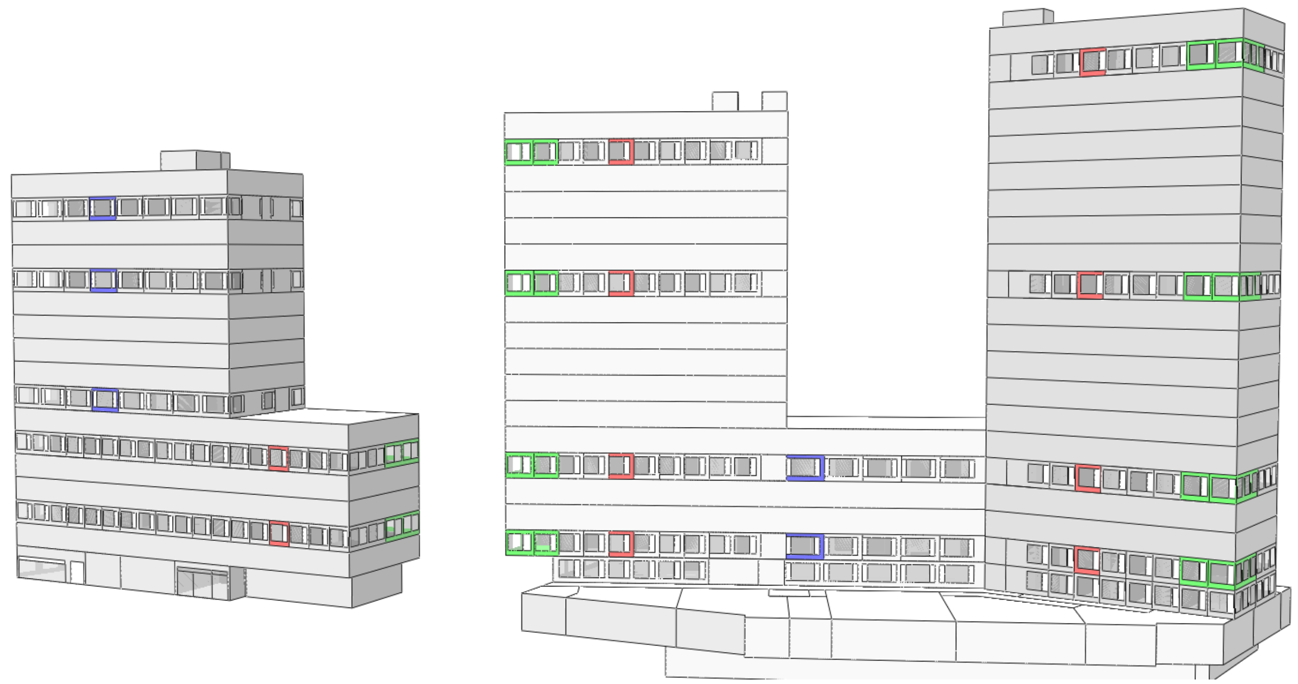


Figure 26 - Student Residential Sample, View from South

CLUSTER BED (20)
STUDIO (10)
CLUSTER LIVING (14)

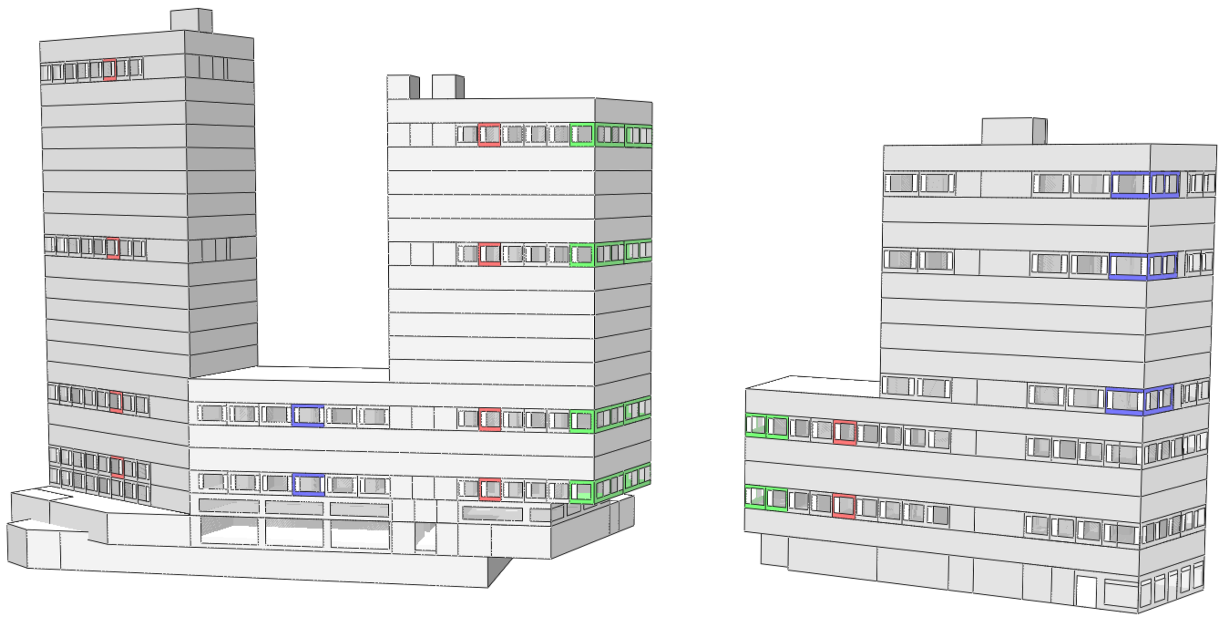


Figure 27 - Student Residential Sample, View from North

CLUSTER BED (20)
STUDIO (10)
CLUSTER LIVING (14)

Table 4.1Student Accommodation Sample Daylight Factors

Markup No.	Space	ADF
1	L02 SW Bedroom	1.9%
2	L02 NE Bedroom	3.5%
3	L02 SW Bedroom	3.6%
4	L02 NE Living	3.3%
5	L02 NE Living	3.1%
6	L02 W Living	4.2%
7	L02 NE Bedroom	3.5%
8	L02 S Bedroom	3.4%
9	L02 S Studio	3.5%
10	L02 NE Studio	3.3%
11	L02 NE Bedroom	3.3%
12	L02 SW Bedroom	4.1%
13	L02 SW Living	5.0%
14	L05 SW Bedroom	2.5%
15	L05 NE Bedroom	3.5%
16	L05 SW Bedroom	3.7%
17	L05 NE Living	3.3%
18	L05 NE Living	3.3%
19	L05 W Living	4.6%
20	L05 NE Bedroom	3.5%
21	L05 S Bedroom	3.6%
22	L05 S Studio	3.7%
23	L05 NE Studio	3.3%
24	L05 NE Bedroom	3.3%
25	L05 SW Bedroom	4.3%
26	L05 SW Living	5.1%
27	L07 NE Studio	5.7%
28	L07 SW Studio	2.6%
29	L12 NE Studio	5.7%
30	L12 SW Studio	3.1%
31	L12 NE Living	3.7%
32	L12 W Living	5.0%
33	L12 NE Bedroom	3.4%
34	L12 S Bedroom	3.5%
35	L12 NE Bedroom	3.2%
36	L12 SW Bedroom	4.3%
37	L12 SW Living	5.1%
38	L15 NE Bedroom	3.4%
39	L15 SW Bedroom	3.4%
40	L17 NE Living	5.2%
41	L17 W Living	5.2%
42	L17 NE Bedroom	3.4%
43	L17 S Bedroom	3.4%
44	L20 NE Bedroom	3.2%
45	L20 SW Bedroom	4.2%
46	L20 SW Living Room	5.0%

With glazing visible light transmittance of 0.55, wall and ceiling reflectance of 70% and floor reflectance of 20%, average daylight factors in Table 4.1 show that glazing could be decreased and still achieve the 1% ADF for bedrooms and 2% ADF for the studios and kitchen/living spaces. When compared with the solar exposure screenshots in Section 1, glazing reduction should be prioritised in the areas in the upper bandings.

4.2 Plot A

A sample of zones within the Plot A development have been selected. These are located on L02, L07, L08 & L14 to give a sample of each bedroom and each of the three living/kitchen types.

Figure 28 - Plot A Level 02

Figure 29 - Plot A Level 07

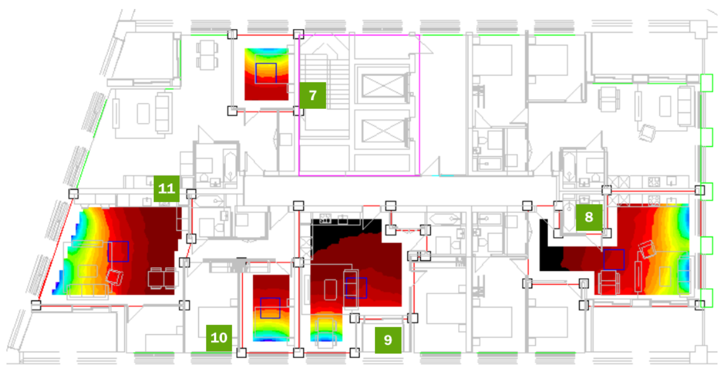


Figure 30 - Plot A Level 08

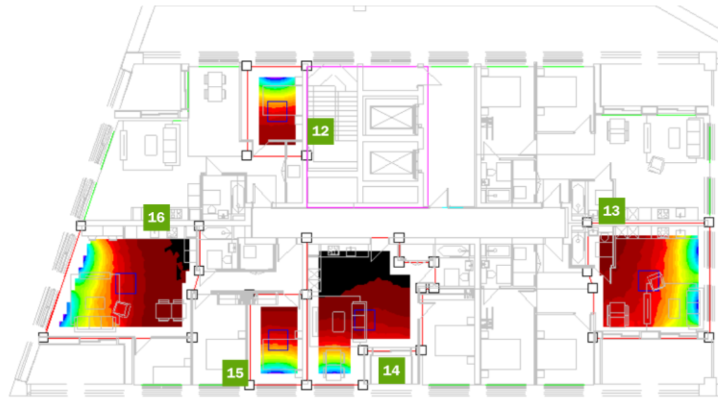


Figure 31 - Plot A Level 14

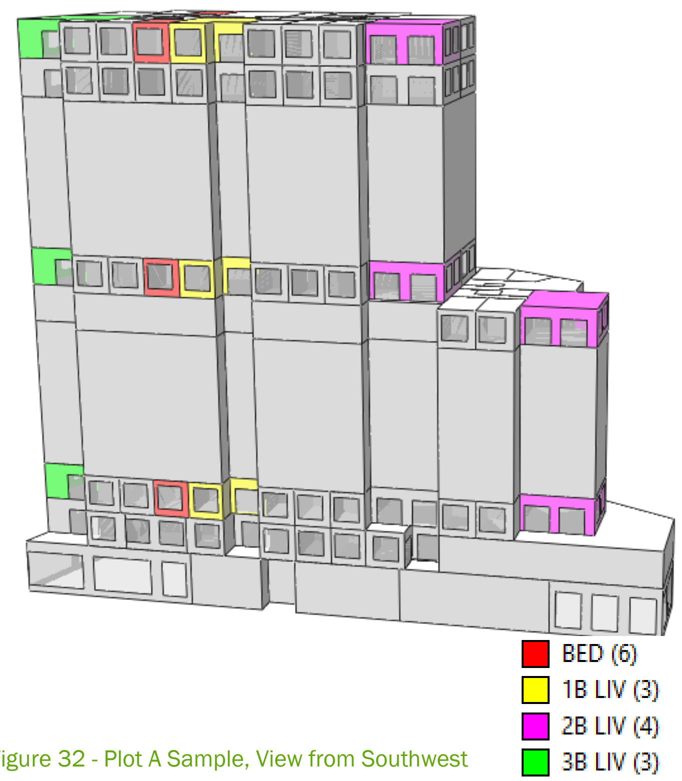


Figure 32 - Plot A Sample, View from Southwest

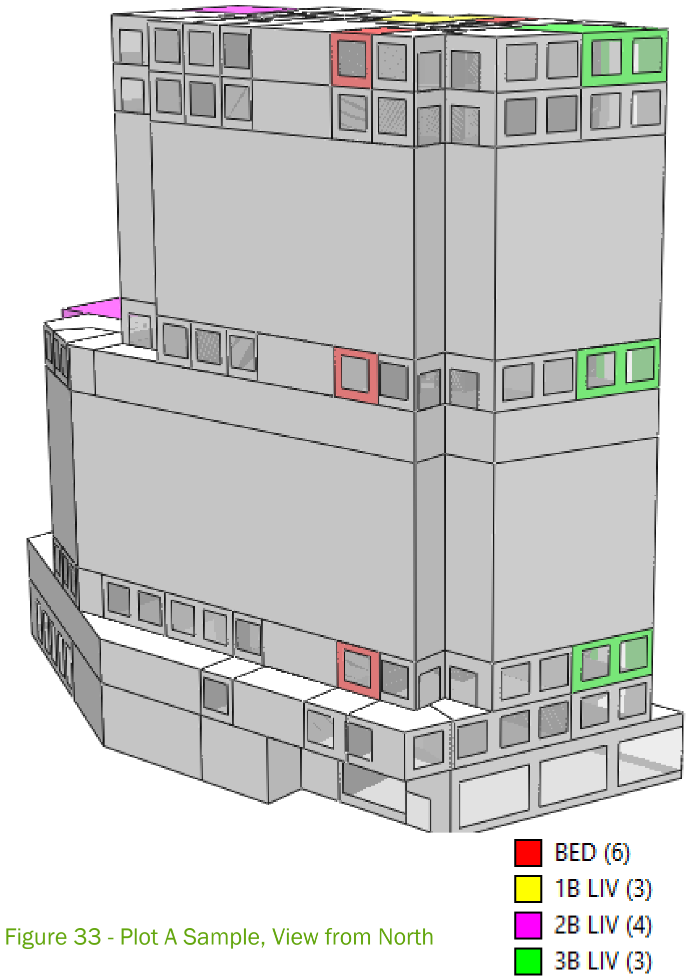


Figure 33 - Plot A Sample, View from North

Table 4.2 Plot A Sample Daylight Factors

Markup No.	Space	ADF
1	L02 NE Bed	4.1%
2	L02 SE 2B Living	5.5%
3	L02 SW 1B Living	2.5%
4	L02 SW Bed	2.6%
5	L02 NW 3B Living	4.5%
6	L07 SE 2B Living	5.4%
7	L08 NE Bed	4.1%
8	L08 SE 2B Living	5.7%
9	L08 SW 1B Living	2.7%
10	L08 SW Bed	4.0%
11	L08 NW 3B Living	4.6%
12	L14 NE Bed	3.9%
13	L14 SE 2B Living	5.7%
14	L14 SW 1B Living	2.5%
15	L14 SW Bed	3.9%
16	L14 NW 3B Living	4.3%

With glazing visible light transmittance of 0.7, wall and ceiling reflectance of 70% and floor reflectance of 20%, average daylight factors in Table 4.2 show that glazing could be decreased and still achieve the 1% ADF for bedrooms and 2% ADF for the kitchen/living spaces. When compared with the solar exposure screenshots in Section 1, glazing reduction should be prioritised in the areas in the upper bandings.

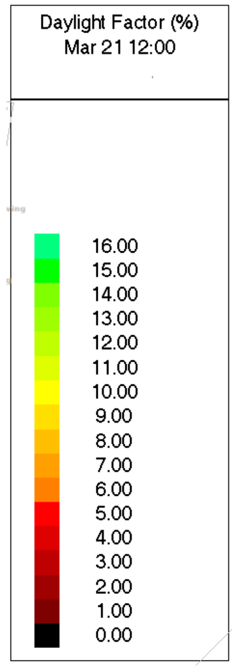


Figure 34 - ADF Contour Key

5 Conclusions

In response to the comments received from the Stage 2 planning submission to Wandsworth Council, particularly in regard to the lack of glazing variation across levels and orientation of the Battersea Park Road development, this design note has highlighted the areas where a glazing reduction would be beneficial to reduce solar gain while still achieving the BRE recommended average daylight factors.

5.1 Average Daylight Factor

A daylight factor of 1% should be targeted for bedrooms and a daylight factor of 2% should be targeted for the studios and kitchen/living areas. Any surplus average daylight factor significantly beyond this is an indication that solar gain should be reduced through either lower glazing percentages, extra shading or a lower g-value (which correlates to the visible light transmittance).

This report has also highlighted that certain sample areas of the current design achieve average daylight factors beyond the earlier BRE recommended targets. Where these high daylight factors also fall within the upper bandings of the solar exposure are the areas where glazing reduction will be most beneficial.

In Table 3.1, Table 4.1 and Table 4.2, areas with an ADF >3% have been highlighted and glazing reduction to these space types should be made the priority.

5.2 Solar Exposure

This report has highlighted certain areas of the façade which receive more solar exposure than others. The areas that fall within the >800kWh banding should be prioritised, with smaller variations to the current façade strategy as the solar exposure bandings decrease.

5.3 CIBSE TM59

However, this report has also highlighted that glazing reductions do not have a significant impact on the need for trim cooling to the sleeping areas. Some of the living/kitchen areas may omit the trim cooling on certain orientations, but this is dependent on the cooling of adjacent spaces to reduce the internal conduction gains they experience when the full building is modelled.

5.4 Recommendations

Based on the three metrics analysed (solar exposure, average daylight factor and thermal comfort), the areas where glazing reduction should take place can be deduced.

The first priority should be to reduce glazing areas where the daylight factors exceed 3%. While solar gain is beneficial in winter, the building is thermally tight with heating provided via ASHP, and so the cooling load associated with the summer solar gain exceeds the heating energy saved during winter.

The order of priority where glazing should be reduced is as follows (1 being the higher priority and 7 being the least priority):

1. Cluster Living
2. Plot A 2B Living/Kitchen
3. Plot A Bedrooms
4. Studios
5. Plot A 3B Living/Kitchen
6. Plot A 1B Living/Kitchen
7. Cluster Bedrooms

The following table gives a basis on the type of glazing reduction required based on the sample apartments in Section 4.

Table 5.1 Recommended Glazing Reduction

2-3% ADF	Reasonable daylight levels achieved; no change required
3-4% ADF	Reduce glazing by 25% (e.g., 40% glazed drops to 30% glazed)
4-5% ADF	Reduce glazing by 50% (e.g., 40% glazed drops to 20% glazed)
>5% ADF	Reduce glazing by at least 50% and prioritise more solar shading

Once the glazing has been reduced based on ADF, a further reduction may be necessary to compensate for the solar exposure. Using the bandings illustrated in Section 1 (Figure 5, Figure 6 and Figure 7), ensure that each orientation and level of façade falls within (or close to, if compensated for via extra shading devices) the following:

Table 5.2 Recommended Glazing Percentage

Solar Exposure Banding (kWh)	Recommended Glazing Percentage
200-400	30-40%
400-600	25-30%
600-800	20-25%
>800	15-20%

There is no one size fits all strategy, and as such the recommended next steps will be for the architect to produce elevations with reduced glazing percentages based on the results in this report. These will then be tested against another average daylight factor check, thermal comfort and update to the compliance modelling assessment, with the previously issued Energy Statement and Overheating Assessments being revised.

Appendix I - Model g-values

I.1 Plot 1

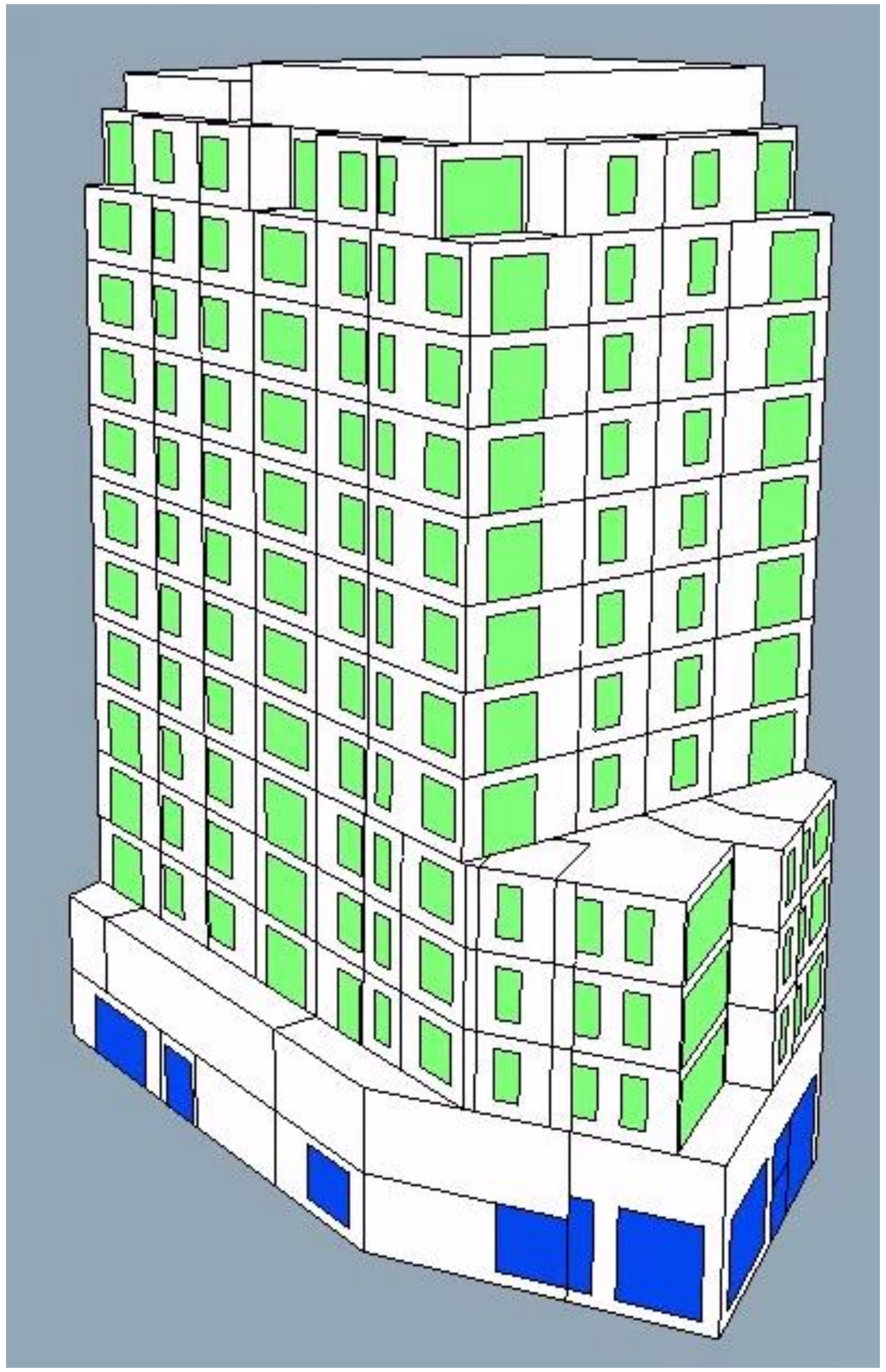


Figure I.1 View from south (red = 0.35, green = 0.28, blue = 0.21)

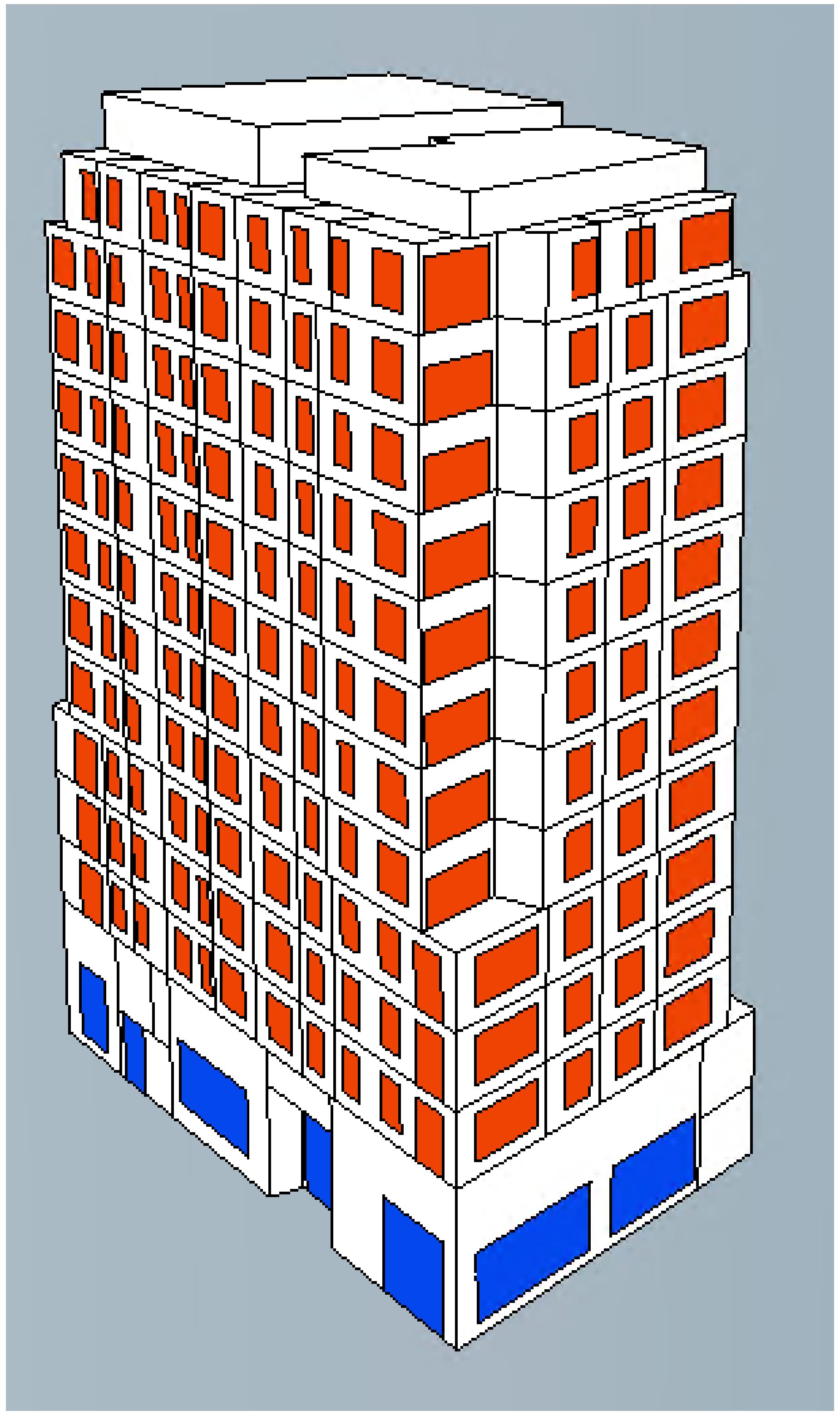


Figure I.2 View from north (red = 0.35, green = 0.28, blue = 0.21)

I.2 Plot 2

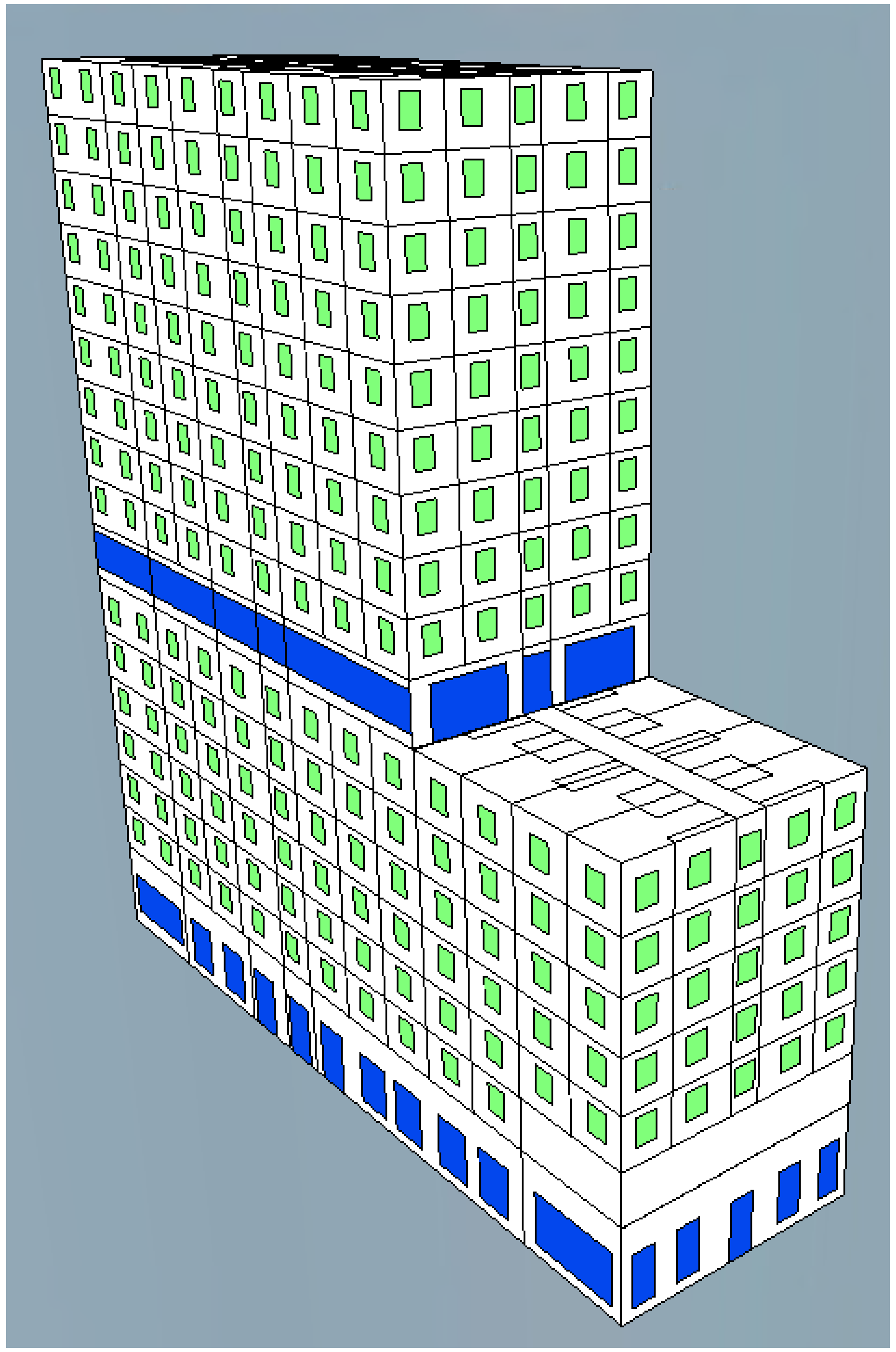


Figure I.3 View from south (red = 0.35, green = 0.28, blue = 0.21)

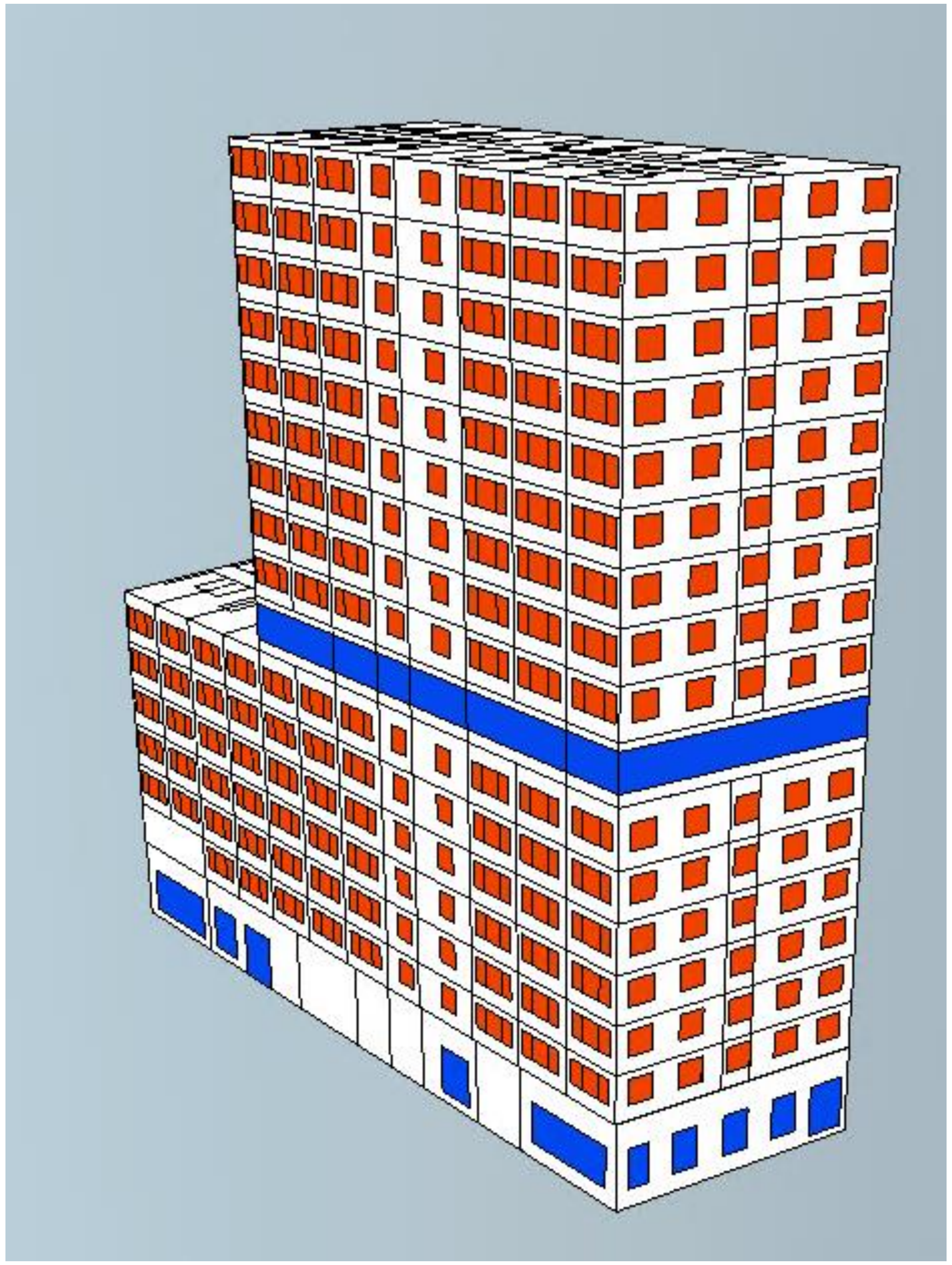


Figure I.4 View from north (red = 0.35, green = 0.28, blue = 0.21)

I.3 Plot 3

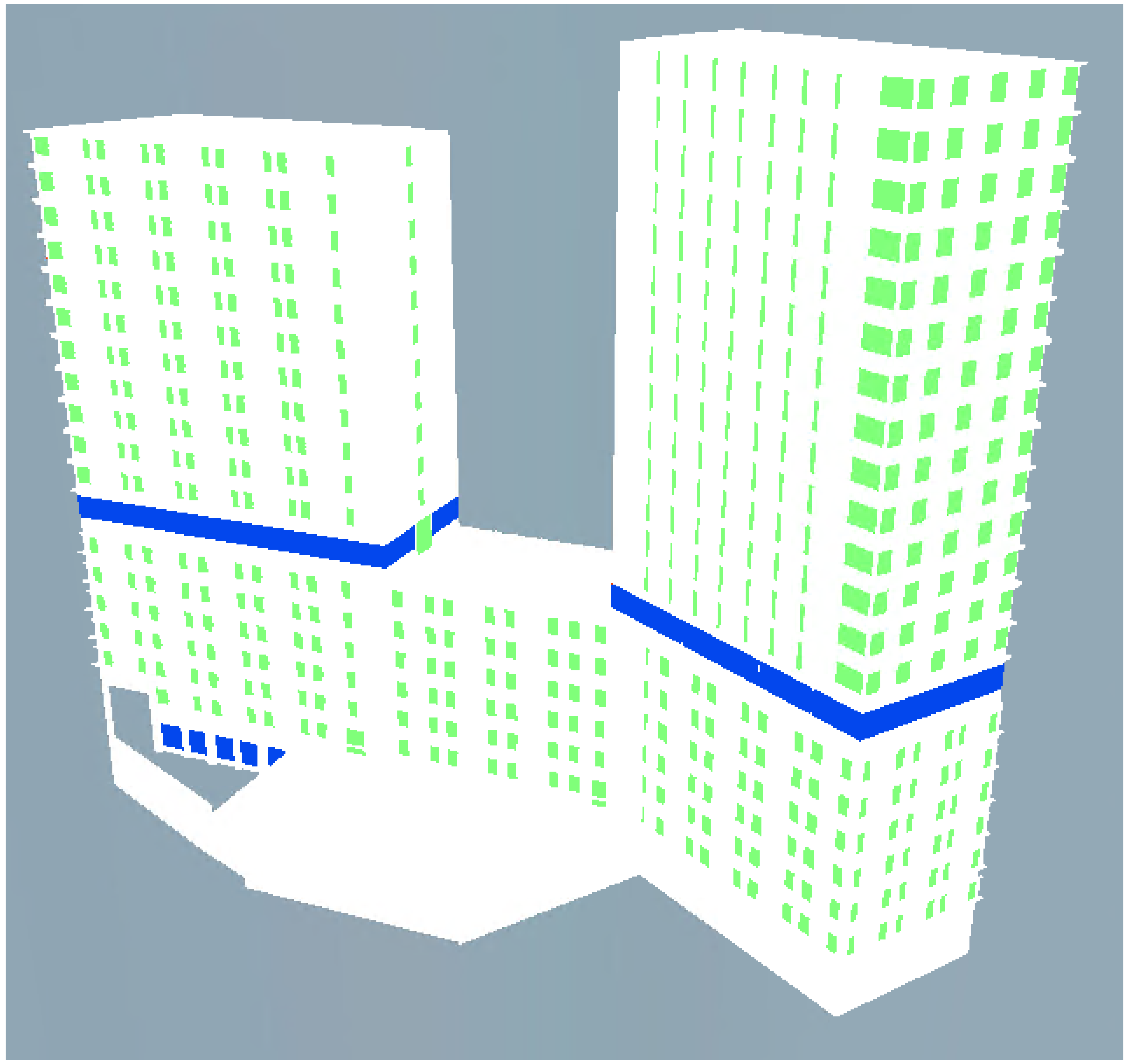


Figure I.5 View from south (red = 0.35, green = 0.28, blue = 0.21)

Figure I.6 View from north (red = 0.35, green = 0.28, blue = 0.21)