

Brunel Walk Redevelopment and Turner Avenue Estate Improvements

Energy and Overheating Assessment

05 October 2022

Brunel Walk, Haringey, N15 5HQ and Turner Avenue Estate, Haringey, N15 5DG

BRUNEL WALK REDEVELOPMENT AND TURNER AVENUE ESTATE IMPROVEMENTS

ENERGY AND OVERHEATING ASSESSMENT

Quality Assurance Page

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Figure 1: CGI of the proposed development from Kirkton Road

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1 EXECUTIVE SUMMARY

This Energy and Overheating Assessment has been prepared by Meinhardt on behalf of London Borough of Haringey ('the Applicant') in support of an application for full planning permission for the Brunel Walk redevelopment and Turner Avenue Estate improvements. The proposals involve the redevelopment of Brunel Walk to provide 45 new Council rent homes in four buildings ranging from 3 to 4-storeys high including 39 apartments and 6 maisonettes, provision of associated amenity and play space, cycle and refuse/recycling stores and 4 wheelchair parking spaces, and reconfiguration and enhancement of existing parking areas and outdoor communal areas and play spaces on the Turner Avenue Estate.

The proposal has set a target of achieving net zero regulated carbon emissions. Taking a fabric first approach the design proposals are being developed in order to optimise the orientation, glazing proportion and distribution and the form factor of each of the buildings to minimise heat loss and maximise passive heat gain. At the same time the need for good levels of natural daylight and to mitigate against overheating have been taken into account. In addition, the U values and air tightness specified for the building envelope have been maximised within the constraints of the development. All these factors have been carefully balanced and optimised within the particular constraints relevant to this site.

Green energy strategies have been reviewed to provide options for low carbon technologies. Efficient Mechanical Ventilation with Heat Recovery is proposed to compliment the fabric first proposals and duct lengths to external walls have been minimised. Options such as ground source heat pumps were assessed against the energy demands of the scheme and viability. Air-to-water and water-to-water heat pumps are proposed in an ambient loop system to meet the schemes hot water and space heating demands. These will be supplemented with Photo Voltaic panels as a more effective use of roof space than solar hot water. Overall these green technologies will help contribute to an overall on-site reduction of 101% in regulated carbon dioxide emissions over Part L 2013.



Figure 2: CGI of the proposed development from Kirkton Road (Block D)

Overheating will be mitigated via a number of methods including providing shading with balconies and brise soliel, optimising window sizes in sensitive locations, specifying glass with a lower heat emissivity (G value) and enabling natural ventilation to bedrooms at night in a secure way at ground floor. The development is shown to

be full compliant with CIBSE TM59, with all apartments passing the DSY1 and 2 weather scenarios, and a significant proportion passing the DSY3 weather scenario – see section 9.

Energy and sustainability are an integral part of the proposed development design, and this report demonstrates how the scheme satisfies national, regional and local planning guidance in relation to climate change mitigation/adaption.

1.1 Carbon Reduction Targets

1.1.1 National Policy

In June 2019 the UK Government made a commitment to bring all greenhouse gas emissions to net zero by 2050. This has been followed by further commitments in December 2020 and April 2021, to reducing economy-wide greenhouse gas emissions by at least 68% by 2030 and by 78% by 2035, compared to 1990 levels.

An updated Building Regulations Part L was published in December 2021 that will deliver a 30% reduction in carbon emissions for domestic buildings and a 27% reduction for non-domestic, when introduced in June 2022.

Further consultation is expected on the new Future Homes Standard and Future Buildings Standard which are intended to be introduced in 2025.

1.1.2 London Plan (2021)

Major development should be net zero-carbon, with a minimum on-site reduction of at least 35 per cent beyond Building Regulations Part L 2013 requirements.

Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent reduction through energy efficiency measures.

Where the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, either through a cash in lieu contribution to the borough's carbon offset fund, or off-site provided that an alternative proposal is identified and delivery is certain.

Carbon emissions from any other part of the development i.e. unregulated emissions, should be calculated and minimised.

1.1.3 Energy Assessment Guidance (2020)

Planning guidance was published by the GLA, in April 2020 on the preparation of energy assessments, to clarify the requirements for compliance with some of the new policies of the new London Plan, subsequently published in 2021.

1.1.4 Energy Assessment Guidance (2022)

Updated planning guidance has recently been published by the GLA (in June 2022) which explains how London Plan policies apply now that Part L 2021 has taken effect.

1.1.5 London Borough of Haringey Local Plan

The London Borough of Haringey Local Plan requires all developments to be zero carbon, with a minimum 45% reduction in regulated carbon dioxide emissions on-site and the remaining regulated carbon dioxide emissions (to 100%) to be offset through a cash in lieu contribution.

Developments should seek to provide up to 20% reduction of carbon dioxide emissions through on-site renewable energy generation.

This proposal has set a target of achieving net zero regulated carbon emissions.

1.2 Carbon Reduction Strategy

The energy strategy for the detailed application follows the London Plan's updated energy hierarchy approach of 'Be Lean', 'Be Clean', 'Be Green', and 'Be Seen' as detailed in policy SI2.

In accordance with the GLA's latest Energy Assessment Guidance the carbon performance for the development is reported using the SAP 10 emission factors, which ensure that the assessment better reflects the actual carbon emissions associated with the expected operation.

The proposed development has been assessed using the current version (2022) of the Standard Assessment Procedure (SAP).

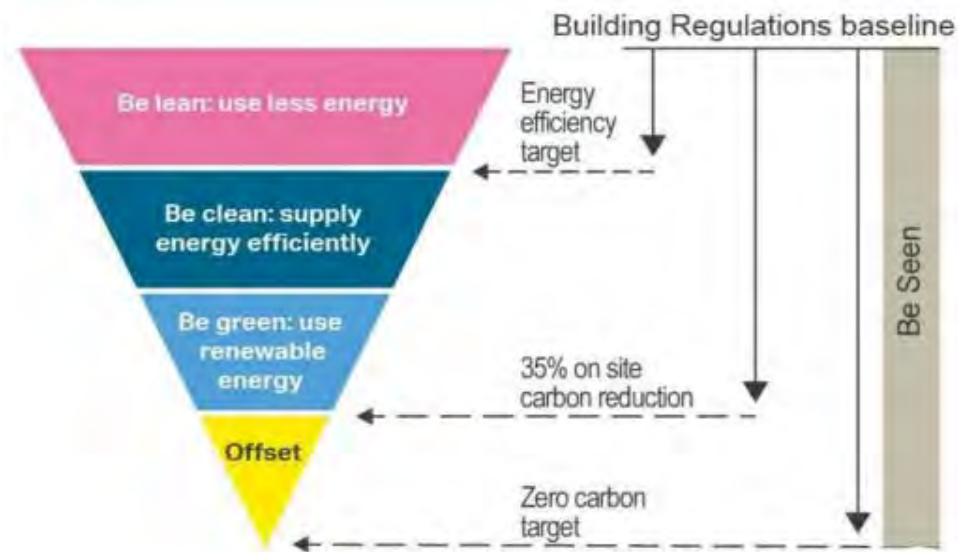


Figure 3: The energy hierarchy and associated targets

The new SAP 10.2 methodology software from our certification company (Stroma) for the revised 2021 version of Approved Document L has not yet been fully completed and approved by the BRE, so the Detailed application has been assessed using the current Building Regulations Part L 2013 version of the Standard Assessment Procedure (SAP) for the residential dwellings, as recommended under the energy planning guidance on the GLA website.

In accordance with the GLA's Energy Assessment Guidance the carbon performance for the development is reported using the SAP 10 emission factors, which ensure that the assessment better reflects the actual carbon emissions associated with the expected operation.

The outputs have been manually converted for the SAP 10 emission factors using the GLA's Carbon Emissions Reporting spreadsheet and in-house calculation sheets.

1.3 Carbon Reductions

1.3.1 Domestic Carbon Emissions and Savings

The expected carbon dioxide emissions at each stage of the hierarchy are shown in the graph below, which demonstrates that the development significantly exceeds the GLA benchmark of 50% and achieves the developments target of net-zero regulate carbon emissions with overall on-site reduction of 101% in regulated carbon dioxide emissions over Part L 2013.

Energy demand will be significantly reduced, exceeding the GLA expectation of 10%, achieving a reduction of 22.5% in regulated carbon emissions over Part L 2013 at the 'Be Lean' stage of the hierarchy through passive design and energy efficiency measures alone.

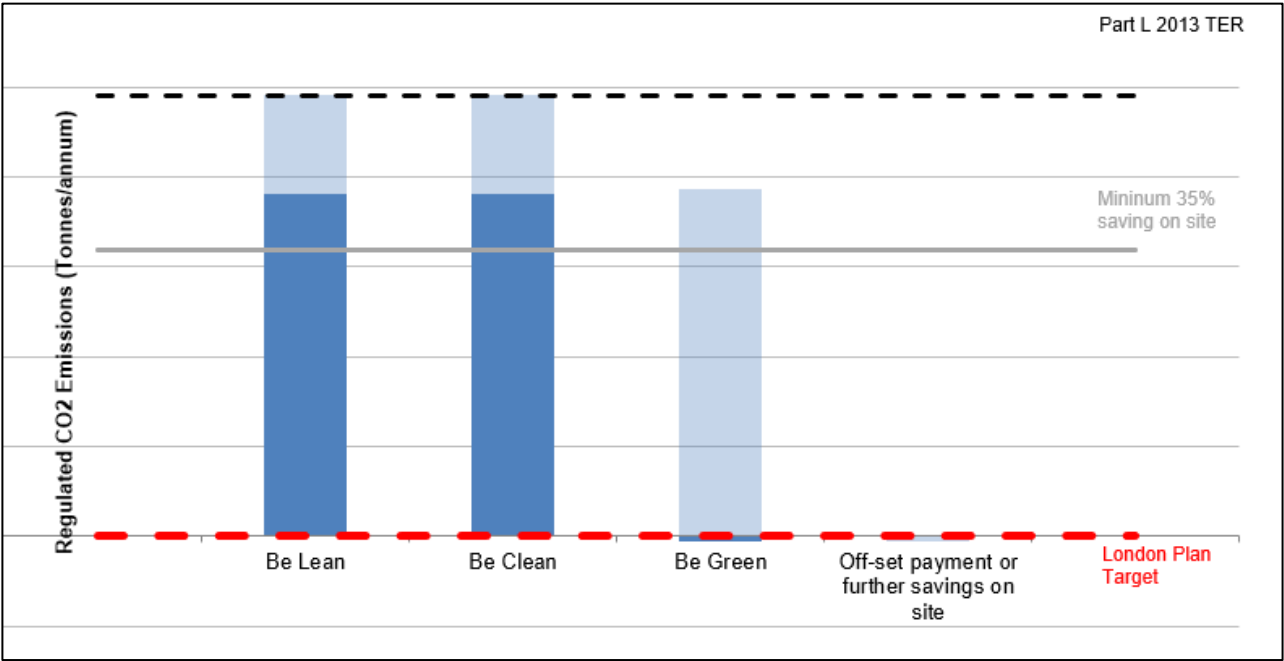


Figure 4: Domestic Energy Hierarchy and Targets (SAP 10 Emission Factors)

The tables below detail the carbon dioxide emissions and savings expected at each stage of the energy hierarchy for the residential elements; -

	Carbon dioxide emissions for domestic buildings (Tonnes CO ₂ per annum)		
	Regulated (Building Regulations 2013)	Regulated (SAP 10 Emission Factors)	Unregulated (SAP 10 Emission Factors)
Baseline: Part L 2013 Compliant	55.9	49.1	7.2
Be Lean: After energy demand reduction	45.9	38.1	6.4
Be Clean: After heat network	45.9	38.1	6.4
Be Green: After renewable energy	-1.3	-0.6	6.4

Table 1: Carbon dioxide emissions after each stage of the Energy Hierarchy for domestic elements

	Regulated domestic carbon dioxide savings	
	Tonnes CO ₂ per annum	%
Be lean: Savings from energy demand reduction	11.0	22.5%
Be clean: Savings from heat network	0.0	0.0%
Be green: Savings from renewable energy	38.7	78.7%
Cumulative on site savings	49.7	101.2%
Carbon shortfall	0	

Table 2: Regulated carbon dioxide savings from each stage of the Energy Hierarchy for domestic elements (SAP 10 Emission Factors)

1.4 Demand Reduction (Be Lean)

Energy demand will be significantly reduced beyond Part L requirements, achieving an overall 22.5% reduction in carbon emissions over Part L 2013 for the whole development, through passive design and energy efficiency measures alone.

The reduction will be achieved by a combination of measures, which shall include the following;

- Significantly improved fabric ‘U’ values.
- Improved air tightness.
- Minimised cold bridging.
- Optimisation of size and g-value of the glazing to provide a balance between minimising heat gain and maximising natural daylight (to reduce lighting energy).
- Communal heating system to the building.
- High efficiency ventilation systems including Mechanical Ventilation with Heat Recovery (MVHR) to residential apartments.
- Minimised heat loss from heating and hot water systems.
- Low energy lighting.
- Controls systems to monitor and operate the plant and equipment as efficiently as possible.
- Smart meters.
- Waste Water Heat Recovery systems in the showers

The table below details the breakdown of total energy demand by each building use at the ‘Be Lean’ stage of the hierarchy.

Space Type	Regulated Energy Demand (MWh/year)					Unregulated Energy Demand (MWh/year)	
	Heating	Hot Water	Lighting	Auxiliary	Cooling	Electricity	Gas
Residential	63.5	73.9	15.6	8.7	0.0	27.4	0.0

Table 3: Breakdown of total regulated energy demand at the Be Lean stage

The table below details the total Part L Fabric Energy Efficiency Standard (FEES) for the residential elements of the development.

	Part L Fabric Energy Efficiency Standard (FEES)		
	Target Fabric Energy Efficiency (MWh/year)	Design Fabric Energy Efficiency (MWh/year)	Improvement (%)
Development total	140.8	140.1	0.5%

Table 4: Total Part L Fabric Energy Efficiency Standard (FEES)

1.5 Heating Infrastructure (Be Clean)

Investigations confirmed that the proposed development is within the vicinity of a proposed district heat network (DHN), as shown in the below extract from London Heat Map. The option of providing a single plant room operating at a higher temperature than the proposed system, which would allow for a future connection to the DHN, was explored in detail. However, this proposed a number of challenges such as the ASHPs being much noisier, and the additional infrastructure required would also significantly increase the capital cost of the scheme.

It was also explored whether the plant room required could be placed inside one of the blocks however this would result in a reduction in the number of council homes the scheme could provide. Further information on the connection to the DHN can be found within section 6.1.



Figure 5: Extract from the London Heat Map

Therefore, it is proposed an ambient loop system will serve all parts of the development. The system uses an ambient communal water loop, fed by communal air to water heat pumps, designed at 25°C. Each apartment will have a water-to-water heat pump which 'uplift' the central loop to heat the water to 55°C to provide space heating and hot water to the dwellings. For more information refer to section 6.2

1.6 Renewable Energy (Be Green)

Heat pumps are proposed as the main heat source and the carbon savings generated will be reported under the Be Green stage of the hierarchy.

An assessment of the feasibility of including any further on-site renewable energy has been carried out and the results are shown in Section 7.

The assessment shows that Photovoltaics are appropriate for the development. With PV provision being maximised on the available roof space, providing an installation of 82.5kWp, requiring a total active panel area of 383m².

The heat pumps and PVs are expected to provide a further 78.7% improvement over Part L 2013 following the passive design/energy efficiency measures.

1.7 Energy Monitoring (Be Seen)

The applicant confirms a commitment to monitor and report its energy performance post-construction in accordance with the 'Be Seen' guidance.

The applicant will provide accurate and verified estimates of each of the planning stage performance indicators through the 'Be Seen' webform, during the planning application determination period as detailed on the GLA 'Be Seen' reporting spreadsheet.

1.8 Carbon Offset

As this development achieves net-zero regulated carbon emissions no cash in lieu offset payment is required.

1.9 Unregulated Energy

The energy demand and associated carbon dioxide emissions from unregulated uses, i.e. those not covered by the Building Regulations assessments (e.g. cooking and appliances), have been estimated using the BRE Domestic Energy Model (BREDEM).

An assessment has been carried out to determine how unregulated energy and carbon dioxide emissions can be reduced through the use of energy efficient appliances and equipment, controls, good management practice, etc.

It is expected that the proposed development will provide a 12.9% reduction in unregulated carbon dioxide emissions over the baseline.

1.10 Overheating and Cooling

As requested in the Energy Assessment Guidance, the Good Homes Alliance (GHA) Early Stage Overheating Risk Tool has been completed and is provided in Appendix A.6.

The proposed development has been assessed in accordance with the cooling hierarchy detailed in SI4 of the London Plan and the latest Energy Assessment Guidance, in order to reduce overheating and minimise the use of air conditioning.

Natural ventilation has been used to reduce overheating risk in all residential apartments, however window openings are limited, due to surrounding noise levels, as referred to in the detailed noise assessment completed by the acoustic consultant.

The external noise study by Max Fordham summarises the impact of the external noise on the façade and confirms which opening limitations of 28 degrees for all side hung windows, and 10 degrees for bottom hung windows within the development.

Full details of the overheating assessment are found within section 9 of this report and the results are within appendix A.7.

1.10.1 Residential Overheating Assessment: CIBSE TM59

The residential assessment includes dynamic thermal modelling on a representative sample of apartments to assess the risk of overheating, using IES modelling software, in accordance with the guidance and data sets in CIBSE TM49 and TM59 guidance, using the current 2020s summer year (DSY 1) and the more extreme DSY 2 and DSY 3 weather data.

The GLA energy assessment guidance expects that the CIBSE compliance criteria is met for the DSY1 weather scenario, however *"It is acknowledged that meeting the CIBSE compliance criteria is challenging for the DSY 2 & 3 weather files, although it is expected that in the majority of cases a significant proportion of spaces will be able to achieve compliance."*

The results of the dynamic modelling overheating assessment are summarised below:-

- The CIBSE compliance criteria are met in all rooms modelled (for the 2020s DSY1 and DSY2 weather scenarios) through the use of natural ventilation via openable windows/doors and increased mechanical ventilation, horizontal external shading on the south elevations and vertical external shading on the west elevations .
- The CIBSE compliance criteria are met in a 86% of rooms modelled for criteria (a) and 48% for criteria (b) (for the 2020s DSY3 weather scenario) through the use of natural ventilation via openable windows/doors and increased mechanical ventilation, horizontal external shading on the south elevations, vertical external shading on the west elevations and a low g-value of 0.4 to limit solar gains.
- For further information, additional testing has been undertaken for the residential apartments using the 2050 and 2080 versions of the Design Summer Years DSY1, DSY2 and DSY3 and can be found in appendix A.7, the results are summarised in the table below.

Weather file	DSY1		DSY2		DSY3	
	Criteria 1	Criteria 2	Criteria 1	Criteria 2	Criteria 1	Criteria 2
Rooms pass % (2050)	92.3%	47.1%	76.9%	2.3%	63.9%	0%
Rooms pass % (2080)	58.7%	0%	46.9%	0%	26.6%	0%

Table 5: Summary of Overheating Results for 2050 and 2080 weather files.

For the full set of results refer to appendix A.7.

2 SCHEME OVERVIEW

2.1 Site and Surroundings

The site is located within the Tottenham Green area to the south east of the Borough. It stretches east to west, immediately south of the Turner Avenue Estate and is accessed via Kirkton Road at its eastern end.

It is very close to West Green Road to the north with its local shops and easy access to buses. Seven Sisters Underground and overground are the nearest train stations, under half a mile away (8-minute walk) with further option slightly further such as Tottenham Hale overground and tube station to the east and Turnpike Lane tube station to the west.

The nearest primary school is Seven Sisters Primary School. The college at Haringey is located 0.6 miles to the east whilst Park View Secondary School is less than a mile away to the west of the site.

Downhills Park is approximately a 12-minute walk away as well as Chestnuts Park a similar distance, both located to the west of the site. Brunswick Road Open Space is closer by and is a short 6 minute walk from the site being under 500m away



Figure 6: Aerial View of Existing Site

The site is close to but not within the Clyde Circus Conservation Area to the north. It is seen as a backland location with available frontage onto Kirkton Road and Elmar Road but can be seen from Turner Avenue. Although some are poorly maintained or have received incongruous external treatments, the attractive terracing to Kirkton Road, Elmar Road and West Green Road (including the Clyde Circus Conservation area) provide attractive reference to character and detailing. These include stone sills and headers, brick or stone banding to help proportion and detail the facade, recessed entrance, the use of brick, stucco/stone mouldings and vertical fenestration creating a rhythm to the facade.

2.2 The Proposed Development

The Proposed Development comprises 45 new Council rent homes in four buildings ranging from 3 to 4-storeys high including 39 apartments and 6 maisonettes. It also includes the provision of associated amenity and play space, cycle and refuse/recycling stores and 4 wheelchair parking spaces and the reconfiguration and enhancement of existing parking areas and outdoor communal areas and play spaces on the Turner Avenue Estate.

The proposal seeks to re-organise the existing parking provision for the Turner Avenue Estate and to provide improvements to the public realm and connectivity throughout the area. Within Turner Avenue Estate the layout of existing parking areas that provided 29 spaces have been rationalised and the parking integrated into a pedestrian priority areas. However, in total 29 parking spaces including the 3 wheelchair spaces have been re-provided in order to meet existing demand on the estate. No car parking associated with the Turner Avenue Estate would be lost following the proposals.



Figure 7: Location Site Plan

Extensive public realm and landscape improvements to the wider Turner Avenue Estate are proposed as part of the scheme. These include rationalising existing parking areas to create a more pedestrian focused environment and additional green space, new and improved children's play areas, buffer planting to ground floor homes, additional tree planting, and new shared private gardens..

The proposal has adopted a fabric first approach with efficiently designed building envelopes and improved u-values and a high air tightness. It is proposed to utilise a green roof and use renewable technologies including PVs and air source heat pumps.

3 PLANNING POLICY

3.1 National

3.1.1 National Planning Policy Framework (2021)



The National Planning Policy Framework (NPPF) set out the Government's planning policies for England and how these are expected to be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. Identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. National planning Practice Guidance provides comprehensive coverage of all required policies.

3.2 Regional

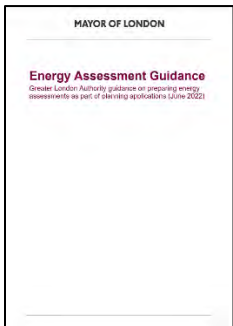
3.2.1 The London Plan (2021)



The London Plan 2021 is the Spatial Development Strategy for Greater London. It sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth.

The Plan is part of the statutory development plan for London, meaning that the policies in the Plan should inform decisions on planning applications across the capital. Borough's Local Plans must be in 'general conformity' with the London Plan, ensuring that the planning system for London operates in a joined-up way and reflects the overall strategy for how London can develop sustainably.

3.2.2 Energy Assessment Guidance (2022)



This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor.

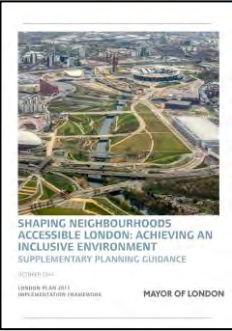
The purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy hierarchy. It also ensures energy remains an integral part of the development's design and evolution.

3.2.3 Building Regulations: Part O (2021)



This Approved Document covers the overheating mitigation requirements of the building regulations as set out in Part O of Schedule 1 to the Building Regulations and in a number of specific building regulations. Technical guidance is contained in Approved Document O. Approved Document O applies to new residential buildings.

3.2.4 Shaping Neighbourhoods: Accessible London SPG (2014)



The Accessible London SPG provides advice to boroughs, developers, designers and planning applicants on implementing inclusive design principles effectively and on creating an accessible environment in London, with particular emphasis on the access requirements of disabled and older people.

3.2.5 Housing SPG (2016)



This supplementary Planning Guidance (SPG) provides guidance on the implementation of housing policies in the 2015 London Plan and the 2016 Minor Alterations to the Plan (MALP).

The guidance covers housing supply, housing quality, housing choice, viability appraisals, investment and existing housing stock, social infrastructure, and mixed use/large developments.

3.2.6 Shaping Neighbourhoods: Play and Informal Recreation SPG (2012)



The Play and Informal Recreation SPG provides more detailed guidance relating to the implementation of London Plan Policy 3.6 and a range of policies on shaping neighbourhoods.

3.2.7 Social Infrastructure SPG (2015)



The Social Infrastructure SPG provides guidance to support London Plan Policy 3.16 on the Protection and Enhancement of Social Infrastructure, as well as policies 3.17 Health and Social Care Facilities, 3.18 Education Facilities and 3.19 Sports Facilities.

It particularly focuses on those elements of social infrastructure that face the biggest strategic challenges— specifically health, education, sport, faith and burials.

3.2.8 'Be Seen' Energy Monitoring Guidance



This guidance explains the process that needs to be followed to comply with the 'Be Seen' post-construction monitoring requirement of Policy SI2 of the new London Plan.

The collected data will help the GLA and local authorities better understand how London Plan policies are being applied to new developments, it will provide useful insights to the performance gap and will drive improved building performance.

3.2.9 The Control of Dust and Emissions During Construction and Demolition SPG (2014)



This document provides more detailed guidance on the implementation of all relevant policies in the London Plan and the Mayor's Air Quality Strategy.

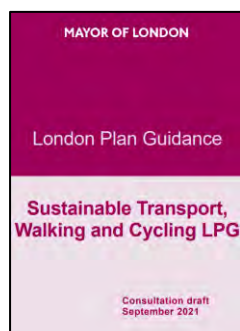
It sets out the methodology for assessing the air quality impacts of construction and demolition in London and identifies good practice for mitigating and managing air quality impacts, with the overarching aim of protecting public health and the environment.

3.2.10 Affordable Housing and Viability SPG (2017)



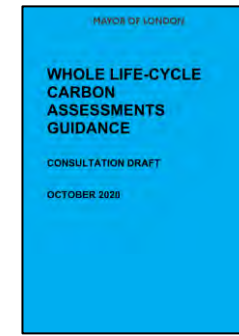
This supplementary planning guidance (SPG) focuses on affordable housing and viability. It includes four distinct parts: background and approach; the threshold approach to viability assessments; detailed guidance on viability assessments; and a specific approach to Build to Rent schemes.

3.2.11 Sustainable Transport Walk and Cycling LPG (Draft for Consultation)



This guidance uses the terms safeguarding and protection to refer to the general approach of preventing development that would conflict with the operation and necessary expansion of London's transport networks.

3.2.12 Whole Life-Cycle Carbon Assessments Guidance (Draft for Consultation)



This guidance explains how to calculate WLC emissions and the information that needs to be submitted to comply with the policy. It also includes information on design principles and WLC benchmarks to aid planning applicants in designing buildings that have low operational carbon and low embodied carbon.

3.2.13 Circular Economy Statement Guidance (Draft for Consultation)



Circular Economy Statements is intended to demonstrate how a development, including any public realm and supporting infrastructure, will incorporate Circular Economy measures into all aspects of the design, construction and operation process.

3.2.14 Air Quality Positive (Draft for Consultation)



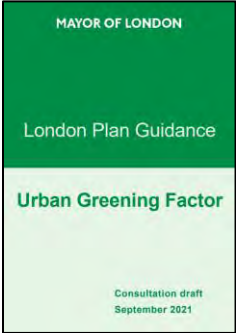
The Air Quality Positive guide is intended maximises the benefits to local air quality in and around a development site or masterplan area and minimises exposure to existing sources of poor air quality. It requires planners, designers, architects and air quality experts to show what measures have been taken during the design stages to achieve the best possible outcomes for air quality.

3.2.15 Air Quality Neutral (Draft for Consultation)



'Air Quality Neutral' is a term for developments that do not contribute to air pollution beyond allowable benchmarks. The benchmarks, set out in this guidance, are based on research and evidence carried out by building and transport consultants.

3.2.16 Urban Greening Factor Guidance (Draft for Consulation)



The Urban Greening Factor is a tool to evaluate the quality and quantity of urban greening. It enables major developments to demonstrate how they have included urban greening as a fundamental element of site and building design in order to meet London Plan Policy G5 Urban greening.

3.3 Local

3.3.1 Haringey Local Plan: Strategic Policies 2013-2026



Haringey's Local Plan: Strategic Policies was adopted by the council in 2013, to replace the Unitary Development Plan (UDP) - with subsequent alterations adopted on the 24 July 2017. The purpose of the document is to set out the long term vision of how Haringey should develop by 2026 and sets out the council's strategy for achieving that vision including high-level strategic policies used in determining planning applications.

3.3.2 Development Management DPD (2017)



The council has prepared a Development Management Development Plan Document (DPD) which sets out planning policies to help determine which developments are granted planning permission in Haringey. It was adopted by the council on the 24 July 2017.

3.3.3 Sustainable Design & Construction SPD (2013)



The Sustainable Design and Construction Supplementary Planning Document (SPD), was adopted in February 2013. The document supports the Local Plan: Strategic Policies (adopted March 2013).

The SPD can be found in the attached files section below. The SPD is considered in determining planning applications. It does not create new policy but complements the Local Plan and brings together policy requirements and guidance from national, regional and local planning framework that promote sustainable buildings.

3.3.4 North London Waste Plan (2022)

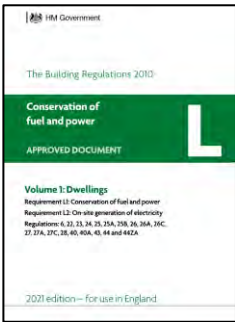


The 7 North London boroughs of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest have prepared a joint Waste Plan. It was adopted by Haringey Council on 18 July 2022.

The Waste Plan identifies a range of suitable sites for the management of all North London's waste up to 2031, and includes policies and guidelines for determining planning applications for waste developments.

3.4 Other Relevant Documentation

3.4.1 Building Regulations: Part L (2021)

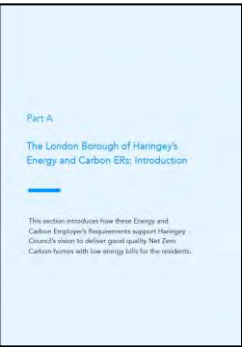


The Building Regulations set out the statutory standards that developments are to meet. Part L covers energy efficiency requirements.

An updated Building Regulations Part L was published in December 2021 that will deliver a 30% reduction in carbon emissions for domestic buildings and a 27% reduction for non-domestic, when introduced in June 2022.

Further consultation is expected on the new Future Homes Standard and Future Buildings Standard which are intended to be introduced in 2025.

3.4.2 The London Borough of Haringey's Energy and Carbon ERs



This section introduces how these Energy and Carbon Employer's Requirements support Haringey Council's vision to deliver good quality Net Zero Carbon homes with low energy bills for the residents.

3.4.3 Haringey Individual Heating System Technical Specification



This document includes the specification for various permutations of common individual heating systems:

- Gas Boilers – Combi & System Boilers (inclusive of any cylinder requirements);
- Air Source Heat Pumps – Individual Units;
- Solar Thermal Systems;

4 ENERGY STRATEGY

4.1 Carbon Reduction Targets

4.1.1 National Policy

In June 2019 the UK Government made a commitment to bring all greenhouse gas emissions to net zero by 2050. This has been followed by further commitments in December 2020 and April 2021, to reducing economy-wide greenhouse gas emissions by at least 68% by 2030 and by 78% by 2035, compared to 1990 levels.

An updated Building Regulations Part L was published in December 2021 that will deliver a 30% reduction in carbon emissions for domestic buildings and a 27% reduction for non-domestic, when introduced in June 2022.

Further consultation is expected on the new Future Homes Standard and Future Buildings Standard which are intended to be introduced in 2025.

4.1.2 London Plan (2021)

Major development should be net zero-carbon, with a minimum on-site reduction of at least 35 per cent beyond Building Regulations Part L 2021 requirements.

Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent reduction through energy efficiency measures.

Where the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, either through a cash in lieu contribution to the borough's carbon offset fund, or off-site provided that an alternative proposal is identified and delivery is certain.

Carbon emissions from any other part of the development i.e. unregulated emissions, should be calculated and minimised.

4.1.3 Energy Assessment Guidance (2020)

Planning guidance was published by the GLA, in April 2020 on the preparation of energy assessments, to clarify the requirements for compliance with some of the new policies of the new London Plan, subsequently published in 2021.

4.1.4 Energy Assessment Guidance (2022)

Updated planning guidance has recently been published by the GLA (in June 2022) which explains how London Plan policies apply now that Part L 2021 has taken effect.

4.1.5 London Borough of Haringey Local Plan

The London Borough of Tower Hamlets Local Plan requires all developments to be zero carbon, with a minimum 45% reduction in regulated carbon dioxide emissions on-site and the remaining regulated carbon dioxide emissions (to 100%) to be offset through a cash in lieu contribution.

Developments should seek to provide up to 20% reduction of carbon dioxide emissions through on-site renewable energy generation.

This proposal has set a target of achieving net zero regulated carbon emissions.

4.2 Carbon Reduction Strategy

The energy strategy for the detailed application follows the London Plan's updated energy hierarchy approach of 'Be Lean', 'Be Clean', 'Be Green', and 'Be Seen' as detailed in policy SI2.

4.3 Modelling

4.3.1 Residential

Building Regulations Part L1A SAP calculations have been undertaken, using Elmhurst SAP 10 software, for all 45 No. apartments across the four buildings.

Samples of the results of the residential SAP calculations (Compliance output sheets and DER worksheets) are provided in Appendix A.1 for the 'Be Lean' stage of the hierarchy, and in Appendix A.2 and for the 'Be Green' stage.

4.3.2 Carbon Factors

In accordance with the GLA's latest Energy Assessment Guidance the carbon performance for the development is reported using the SAP 10 emission factors, which ensure that the assessment better reflects the actual carbon emissions associated with the expected operation.

The GLA "Carbon Emission Reporting Spreadsheet" is provided in Appendix A.3 to confirm the correct conversion.

5 PASSIVE DESIGN AND ENERGY EFFICIENCY (BE LEAN)

Energy demand will be significantly reduced beyond Part L requirements and will exceed the GLA's target for a minimum 10% reduction in residential carbon emissions over Part L 2013 through passive design and energy efficiency measures alone.

The development is expected to achieve an overall 22.5% reduction in carbon emissions over Part L 2013 at the 'Be Lean' stage of the energy hierarchy.

The table below details the breakdown of regulated energy demand by energy use, for each space type, at the 'Be Lean' stage of the hierarchy.

Space Type	Regulated Energy Demand (kWh/year)				
	Heating	Hot Water	Lighting	Auxiliary	Cooling
Residential	63.5	73.9	15.6	8.7	0.0

Table 6: Breakdown of regulated energy demand at the Be Lean stage

The chart below details the breakdown of regulated energy demand by energy use, at the 'Be Lean' stage of the hierarchy.

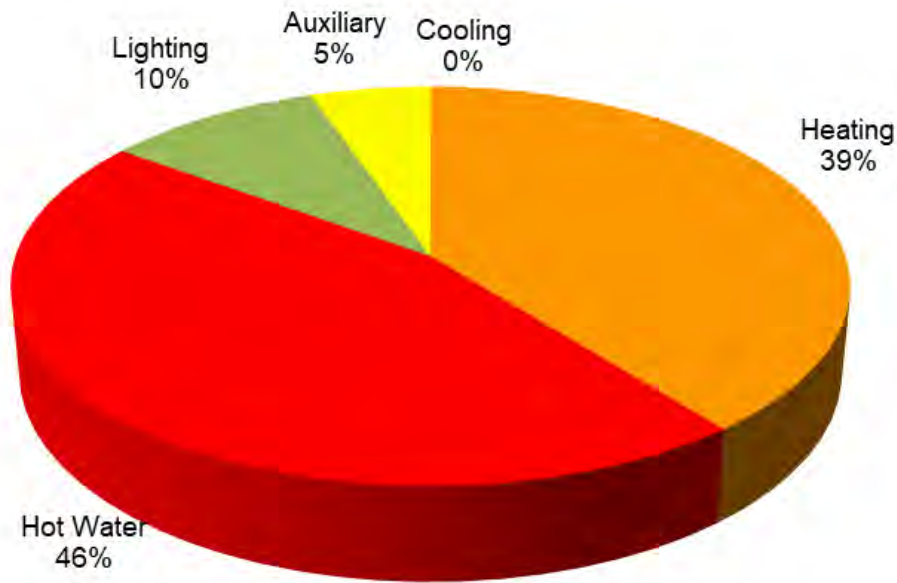


Figure 7: Breakdown of regulated energy demand at the Be Lean stage for the development

The table below details the breakdown of regulated CO₂ emissions by energy use, for each space type, at the 'Be Lean' stage of the hierarchy.

Space Type	Regulated CO ₂ Emissions (kg CO ₂ /year)				
	Heating	Hot Water	Lighting	Auxiliary	Cooling
Residential	15.0	17.4	3.6	2.0	0.0

Table 5: Breakdown of regulated CO₂ emissions at the Be Lean stage (SAP 10 Emission Factors)

The chart below details the breakdown of CO₂ emissions by energy use, at the 'Be Lean' stage.

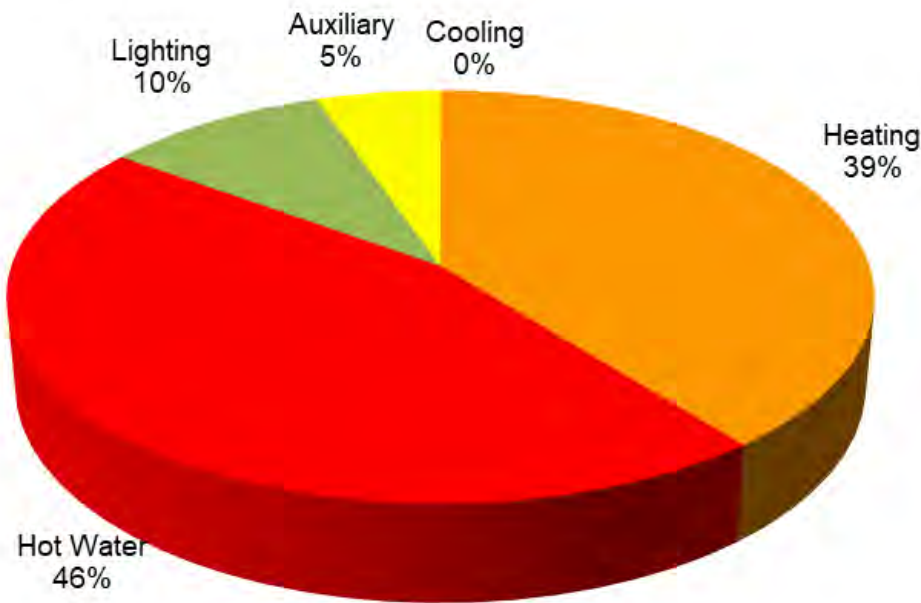


Figure 8: Breakdown of regulated CO₂ emissions at the Be Lean stage (SAP 10 Emission Factors) for the development

The demand reduction will be achieved by a combination of the measures including those detailed below;-

5.1 Building Fabric Insulation

Residential

The thermal performance of the building fabric will be improved over Part L 2021 minimum requirements as below;-

Residential Fabric Element	Limiting 'U' Value (W/m ² K)	Proposed 'U' Value (W/m ² K)
External Walls	0.26	0.15
Floor	0.18	0.1
Roof	0.16	0.1
Glazing	1.60	1.3

Table 8: Proposed residential fabric 'U' values

The party walls are proposed to have a 'U' value of 0.0 W/m² K based on a fully filled cavity with effective sealing at all exposed edges and in alignment with insulation layers in abutting elements.

5.2 Cold Bridging

Cold bridging will be minimised to prevent the loss of heat and to prevent the development of cold spots which can lead to mould. Suitable construction details will be developed to ensure insulation continuity and to meet the air tightness targets detailed below.

5.3 Air Tightness

The target air permeability for the development has been set at $2 \text{ m}^3/(\text{h m}^2)$ at 50 Pa as compared to the Part L 2021 minimum requirement of $8 \text{ m}^3/(\text{h m}^2)$ to reduce heat loss in winter.

5.4 Natural Daylight

Natural daylight has been maximised wherever possible in the residential accommodation by providing at least dual aspect in all dwellings and by ensuring ceiling voids are as small as possible (particularly at the perimeter) to maintain the maximum floor to ceiling heights possible.

5.5 Solar Gain

For the residential apartments the size and g-value of the glazing has been optimised using the SAP calculations and the dynamic thermal modelling for the overheating assessment, to provide a balance between minimising summer heat gain to prevent overheating, maximising winter heat gain to reduce heating loads, and maximising natural daylight to reduce lighting energy. This has resulted in the g-value of the residential glazing being set at 0.4.

5.6 Shading

External shading including brise soleil and balconies have been built into the design to help mitigate overheating in the summer months.

5.7 Heating and Hot Water System Insulation

Heat losses from heating and hot water pipework will be reduced by minimising the length of pipe runs, and by providing a high level of insulation to all parts of the systems, in accordance with the recommendations of CIBSE CP1.

5.8 Heating

As required by energy assessment guidance, at the Be Lean stage of the hierarchy we have assumed gas boilers with the standard efficiency of 93.5%.

5.9 Cooling

Active mechanical cooling is not proposed within the development, with the use of natural ventilation via openable windows and increased mechanical ventilation proposed to prevent overheating in summer.

5.10 Ventilation Systems

Ventilation to the residential apartments to provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F will be via individual Mechanical Ventilation with Heat Recovery (MHVR) units. Each unit will achieve a Specific Fan Power of up to $0.5 \text{ W}/(\text{l/s})$ and a heat recovery efficiency of up to 90% in the one and two bed apartments, and Specific Fan Power of up to $0.56 \text{ W}/(\text{l/s})$ and a heat recovery efficiency of up to 94% in the 3 bed / duplex dwellings, depending on the number of wet rooms

5.11 Lighting

Energy efficient LED lighting will be used throughout the proposed development. Occupancy and daylight sensors will be used where appropriate.

5.12 Smart Controls / Metering

It is expected that residential apartments will be provided with an individual, programmable, zoned, control system, together with smart energy meters.

This will allow the display of energy use within individual units, assisting occupants to understand the way in which they consume energy and how much it costs, and encouraging them to turn off non-essential equipment or run some equipment at a lower capacity during times of peak demand.

A central Building Management System (BMS) will be provided to operate the 'Landlord' plant and systems in the most energy efficient manner.

5.13 Appliances

Where appliances are provided by the developer, they will be of an energy efficient type, which generally generate less heat and can help minimise the build-up of heat within the buildings. Where appliances are not provided by the developer, owners/tenants will be encouraged to supply energy efficient equipment.

6 HEAT INFRASTRUCTURE (BE CLEAN)

6.1 Area Wide Network

Investigations confirmed that the proposed development is within the vicinity of an existing heat network, as shown in the below extract from London Heat Map. The option of providing a single plant room operating at a higher temperature than the proposed system, which would allow for a future connection to the DHN, was explored in detail.

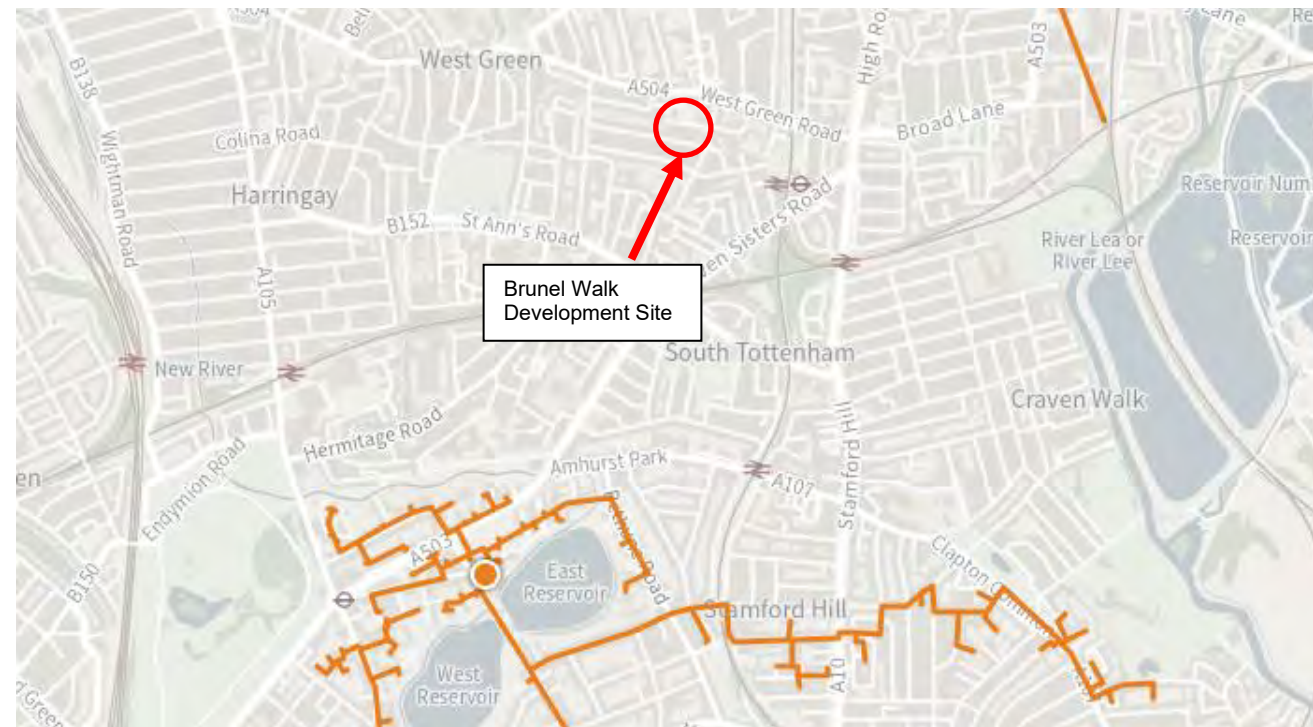


Figure 9: Extract from the London Heat Map

However, this proposed a number of challenges:

6.1.1 Roof Mounted ASHP Enclosure

The air source heat pumps required for the whole system to operate at a higher temperature, fed from a single plant, are much noisier than what was initially proposed. This meant in order to be placed on the roof of one of the blocks they would need a larger acoustic enclosure than what is proposed – and would have made the development taller than the permitted height resulting in implications for a neighbouring amenity. Even with acoustic attenuation adjacent dwellings may also experience elevated levels of background noise. Due to the negative visual impact this option would create this option was rejected.

6.1.2 ASHP Located at Ground Floor

The option of creating an external plant room at ground level was explored. However this option was rejected because they would result in a loss of outdoor amenity space and would place the enclosure too close to existing and proposed dwellings. In spite of rearranging the internal layouts and windows positions in the apartments adjacent to the enclosure at ground floor and above there remains a concern that occupants may be effected by background noise and exhaust air flows. Occupants may not wish to open their windows for night time cross ventilation and so suffer from overheating. Comfort cooling could mitigate this but is less sustainable than natural ventilation.

Secondly there is an existing Thames Water surface water sewer running across the site which needs to be diverted and the proposed route is along the rear of the site. Alternative routes are not available and it is not permitted to pass under a building and so this rules out the option.

6.1.3 ASHPs Located within the proposed building envelope

This left the only option being to place the plant room inside one of the blocks. This option raised concerns regarding the acoustic and airflow impact on the two neighbouring flats at second floor. It would also add massing to the rear of the building. This option would also reduce the number of council homes the scheme could provide and was therefore rejected.

6.1.4 Capital Cost and Overall Viability

Lastly, the system would significantly increase the capital cost of the scheme, making it financially unfeasible. Therefore, after detailed options appraisal, it has been deemed that it is not feasible to allow for a future connection to the DHN. Instead, the heating strategy detailed below is proposed.

6.2 Site Heat and Hot Water

The Site heat network will be an ambient loop system. The system uses an ambient communal water loop, fed by communal air to water heat pumps, designed at 25°C. Each apartment will have a water-to-water heat pump which 'uplift' the central loop to heat the water to 55°C to provide space heating and hot water to the dwellings. Ambient loop energy systems were designed to overcome the challenges of modern residential developments, delivering a solution that increasing efficiency and reducing losses compared to higher temperature systems, and therefore reducing the carbon footprint of buildings.

The site heat network within the development will be designed in accordance with CIBSE CP1 Heat Networks: Code of Practice, and will include the following to reduce losses and increase efficiency;-

- A high level of insulation (in excess of British Standards) will be provided to all parts of the systems, in accordance with the recommendations of CIBSE CP1.
- The system will operate with a variable volume and an operating temperature as low as possible to satisfy the requirements of the tertiary system, which delivers the heat demand to the occupied spaces.

The centralised heat pumps are expected to have a seasonal efficiency of 362% whilst the water-to-water heat pumps will operate at efficiencies around 410-430%

The carbon reductions generated by the heat pumps are included at the Be Green stage of the hierarchy.

6.3 Fuel Poverty

Fuel poverty is a growing issue as energy prices significantly increase year-on-year. Residents therefore spend an increasing proportion of their budget on energy, with the most vulnerable often the most affected.

The proposed development will reduce the potential for fuel poverty by significantly reducing the demand for energy in the first instance, through its passive design and highly insulated building envelope, and by maximising the efficiency of equipment and systems.

Heat will be supplied to each dwelling by a highly efficient systems fed by electric heat pumps (not natural gas), with the distribution network designed to minimise heat losses, thereby keeping the costs of heat supply as low as possible.

7 RENEWABLE ENERGY (BE GREEN)

An appraisal of potential on-site renewable energy systems has been undertaken for the development, with the following technologies considered:

- Biomass boilers
- Photovoltaics (PVs)
- Solar thermal
- Ground source heat pumps
- Air source heat pumps
- Wind Turbines

Further details of these systems are presented in Appendix A.5, with the summary of the assessment below.

7.1 Biomass Boilers

Biomass boilers could provide a proportion of the space heating and hot water load, but would compete with the proposed heat pumps for the base heat load.

Biomass boilers are better operating as the lead heat source (and not as top up to the air source heat pumps) as they are not suited to operating with variable load.

Space and maintenance requirements are significant.

Biomass boilers are against LBH policy. Biomass boilers would also adversely impact on local air quality due to their emissions, and vehicular delivery of fuel would be required resulting in increased traffic movements.

Biomass boilers are therefore not proposed for the development.

7.2 Photovoltaics (PVs)

The proposed development will maximise the use of photovoltaic panels and have been assessed as a renewable energy technology to reduce the carbon emissions for the proposed development.

An installation of 82.5 kWp is proposed. An active area of 381m² of photovoltaic panels with an efficiency of 21.6% would generate around 66,581 kWh per year, providing a saving of around 15,513 kg CO₂ per year in regulated carbon dioxide emissions.

Photovoltaics are therefore proposed for the development.

7.3 Solar Thermal

A solar thermal system could provide a proportion of the heating load, and would work in conjunction with the heat pumps.

There is very limited roof space available so either PVs or solar thermal could be used, but PVs are preferred as they would achieve greater carbon savings.

Solar thermal is therefore not proposed for the development.

7.4 Ground Source Heat Pumps

A ground source heat pump system would provide low grade heat which is not best suited to the development's main heat demand – domestic hot water.

The overall cooling load is very low compared to the heating load, resulting in a poor balance between heating and cooling demand, which would adversely impact on the potential yield from any ground source system.

As the development is a tower, the site footprint is very small which would significantly reduce the capacity and effectiveness of both closed or open loop options.

Ground source heat pumps are therefore not proposed for the development.

7.5 Air to Water and Water to Water Heat Pumps

The use of heat pumps as the main heat source is appropriate for the proposed development, in accordance with planning policy to reduce the use of fossil fuels.

The proposed development will maximise the use a combination of air-to-water and water-to-water heat pumps and have been assessed as a possible renewable energy technology to reduce the carbon emissions for the proposed development. It is proposed to install an 'ambient loop' system to increase the system efficiency and reduce losses, as discussed in section 6.2.

The proposed heat pumps are expected to provide a saving of 33.1 Tonnes CO₂ per year (44.%) in regulated carbon dioxide emissions.

Air to water and water to water heat pumps are therefore proposed for the development.

The further information requested in the GLA Energy Assessment Guidance is provided below:-

Topic	Response
Details of the Seasonal Coefficient of Performance (SCOP), the Seasonal Performance Factor (SFP) and Seasonal Energy Efficiency ratio (SEER), which should be used in the energy modelling. This should be based on a dynamic calculation of the system boundaries over the course of a year i.e. incorporating variations in source temperatures and the design sink temperatures (for space heat and hot water). Details of the assumptions should be included in the energy assessment, including manufacturer datasheets showing performance under test conditions for the specific source and sink temperatures of the proposed development and assumptions for hours spent under changing source temperatures.	The detailed design has not yet been completed, so full dynamic calculations of the loads have not yet been carried out to allow selection of particular equipment. For the centralised heat pumps the potential supplier has confirmed the SCOP of 3.62 and ESEER of 3.98, the COP of 3.24 has been used in this assessment. The water-to-water heat pumps have a COP of 4.3 and 4.1 for the 4kW and 6kW models respectively.
Clarification as to how the ASHP will operate alongside any other heating/cooling technologies being specified for the development (i.e. how will the heat pump system operate alongside communal heating systems, and/or combined heat and power plant, solar thermal, etc. if they are also being proposed by the applicant).	Refer to section 6.2.
Whether any additional technology is required for top up, for instance during peak loads. This should be incorporated into the energy modelling assumptions and explanation of how this has been done should be provided.	No additional technology is required for top up.
The approach to generating domestic hot water. To optimise the system's operation it will be expected that thermal store will be integrated in the majority of applications; the operation of the system should be provided.	Refer to section 6.2.
A calculation of the CO ₂ savings that are expected to be realised through the use of this technology.	The proposed heat pumps are expected to provide a saving of 33.1 Tonnes CO ₂ per year (44.9%) in regulated carbon dioxide emissions.
An estimate of the expected heating costs to occupants, demonstrating that the costs have been minimised through energy efficient design.	-

Topic	Response
An estimate of the heating and/or cooling energy the heat pump would provide to the development and the electricity the heat pump would require for this purpose.	The heat pumps are expected to generate 63,500 kWh of space heating and 73,900 kWh of hot water per year, with an electrical input of 19,599 and 22,808 kWh per year respectively.
Applicants will need to provide a diagram of the proposed location of the heat pumps and the associated condenser units. Where condenser units are installed internally there should be adequate access to air flow. For developments in HNPA's, the diagram should include the pipework which will be installed for future connection to a heat network.	See Appendix A.8 for roof drawings.
Specifically for ASHPs, evidence that the heat pump complies with the minimum performance standards as set out in the Enhanced Capital Allowances (ECA) product criteria for the relevant ASHP technology as well as evidence that the heat pump complies with other relevant issues as outlined in the Microgeneration Certification Scheme Heat Pump Product Certification Requirements document.	The final heat pump selection has not yet been made, but it is expected that the minimum performance requirements of the ECA product criteria will be met
Confirmation that end-users will be supplied with regular information to control and operate the system e.g. at point of occupancy and maintenance visits.	Confirmed.
A commitment to monitor the performance of the heat pump system post construction to ensure it is achieving the expected performance approved during planning, in line with the be seen policy.	The applicant confirms a commitment to monitor and report its energy performance post-construction in accordance with the 'Be Seen' guidance.

Table 9: Air Source Heat Pump information

7.6 Wind Turbines

Wind turbines would be a complimentary technology to the proposed district heat network, however, they would have significant architectural and townscape implications, together with potential noise impact.

Wind turbines are therefore not proposed for the development.

8 UNREGULATED ENERGY

This section outlines how non-regulated energy and carbon dioxide emissions will be reduced through the use of energy efficient appliances and equipment, controls, good management practice, etc.

8.1 Baseline

The energy demand and associated carbon dioxide emissions from unregulated uses, i.e. those not covered by the Building Regulations assessments (e.g. cooking and appliances), have been estimated using the BRE Domestic Energy Model (BREDEM).

The table below details the breakdown of baseline unregulated energy demand and associated CO₂ emissions.

Energy Use	Residential	
	Total Energy Demand (kWh/year)	Total Carbon Dioxide Emissions (kg CO ₂ /year)
Cooking (electric)	10,433	2,431
Appliances/equipment	20,455	4,766
Total (Unregulated)	30,888	7,197

Table 10: Baseline unregulated energy demand and CO₂ emissions (SAP10 emission factors)

8.2 Demand Reduction (Be Lean)

An assessment has been carried out to determine how unregulated energy and carbon dioxide emissions can be reduced through the use of energy efficient appliances and equipment, controls, good management practice, etc.

The table below details the breakdown of unregulated energy demand and associated CO₂ emissions following demand reduction.

Energy Use	Residential	
	Total Energy Demand (kWh/year)	Total Carbon Dioxide Emissions (kg CO ₂ /year)
Cooking (electric)	9,223	2,149
Appliances/equipment	18,165	4,232
Total (Unregulated)	27,388	6,381

Table 11: Reduced unregulated energy demand and CO₂ emission (SAP10 emission factors)

It is expected that the proposed development will provide a 12.9% reduction in unregulated carbon dioxide emissions over the baseline.

It is expected that the energy demand reduction will be achieved by a combination of measures including those detailed below.

8.2.1 Residential Cooking

The baseline energy demand and associated carbon dioxide emissions from BREDEM are assumed to be based on the use of cooking appliances with a good standard of energy efficiency commonly available in the commercial market, such as 'A' rated electric ovens and 'D' rated cooker hood extract units.

More efficient appliances are easily available, and provision of 'A+' rated oven and a 'C' rated cooker hood extract units will be encouraged.

8.2.2 Residential Appliances/Equipment

The baseline energy demand and associated carbon dioxide emissions from BREDEM are assumed to be based on the use of appliances with a good standard of energy efficiency commonly available in the commercial market, such as 'A+' rated fridge/freezers, 'A++' rated washing machines, 'A+' rated dishwashers and 'A' rated televisions.

More efficient appliances are easily available, and purchasers/tenants will be encouraged to reduce energy demand by providing an 'A++' rated fridge/freezer, an 'A+++' rated washing machine, an 'A++' rated dishwasher and an 'A+' rated television.

Further reductions in unregulated energy can be achieved by owners/tenants of residential properties as detailed below. The potential savings are difficult to quantify as they are operational items. A reduction has not been included in this assessment, but owners/tenants will be encouraged to operate appliances as suggested.

Washing Machine and Dryer

Wash full loads rather than just a few items.

Use a temperature setting of 40°C or even 30°C where possible.

Reduce dryer use by using an outdoor line in summer and a drying rack in winter.

Use tumble dryer balls to reduce drying time.

Dishwasher

Fill the dishwasher before using.

Use the economy setting if available.

Kettle

Only boil the amount you need each time.

Oven

Limit the number of times the oven door is opened while cooking.

Hob

Use the smallest pot possible each time.

Use a lid.

Use stacked steamers.

General Appliances

Do not leave appliances on standby.

9 OVERHEATING AND COOLING

9.1 Overview

As requested in the Energy Assessment Guidance, the Good Homes Alliance (GHA) Early-Stage Overheating Risk Tool has been completed and is provided in Appendix A.6.

The proposed development has been assessed in accordance with the cooling hierarchy detailed in SI4 of the London Plan, Haringey Overheating Planning Application requirements and the latest Energy Assessment Guidance, in order to reduce overheating and minimise the use of air conditioning.

Max Fordham's external noise study summarises the impact of the external noise on the façade and confirms which windows can/cannot be opened for the longer periods necessary to provide natural ventilation to reduce overheating risk.

The overheating modelling assumes that window opening is limited in certain apartments.

The representative sample of apartments reflect the external noise study, with side hung windows being limited to 28 degree openings and bottom hung windows being limited to 10 degrees.

Through the reduction of solar gain through optimising the glazing's g-value and introducing external shading, as well as maximising the opportunity for natural and mechanical ventilation all apartments pass under DSY1 and 2 weather files. All has been done to increase the pass rate under DSY3 conditions, with only a small proportion of rooms not passing TM59 when this extreme weather file was used.

9.2 Overheating Risk Assessment Methodology

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments. TM59 Design Methodology for the Assessment of Overheating Risk in Homes should be used for residential developments.

For compliance with CIBSE TM59, the modelled apartments must pass both of the following two criteria:

- For living rooms, kitchens and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).
- For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both (a) and (b) above must be passed for all relevant rooms.

9.2.1 Weather Data

The weather file used for the assessment is as per TM59: DSY1 (Design Summer Year) for the site location, for the 2020s, high emissions, 50% percentile scenario.

The London Heathrow weather data set has been used which is the most representative for the site location.

Additional testing has been undertaken for the residential apartments using the 2020 versions of the following more extreme design weather years:-

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

The GLA energy assessment guidance expects that the CIBSE compliance criteria is met for the DSY1 weather scenario. It is acknowledged that meeting the CIBSE compliance criteria is challenging for the DSY 2 & 3 weather

files, although it is expected that in the majority of cases a significant proportion of spaces will be able to achieve compliance.

9.3 Summary of Overheating Modelling Results

The results of the dynamic modelling overheating assessment are provided in Appendix A.7, and summarised below:-

9.3.1 Domestic

The results of the dynamic modelling overheating assessment are summarised below:-

- The CIBSE compliance criteria are met in all rooms (for the 2020s DSY1 and DSY2 weather scenario) through the use of natural ventilation via fully openable windows/doors, increased mechanical ventilation and external shading.
- The CIBSE compliance criteria are met in a 86% of rooms modelled for criteria (a) and 48% for criteria (b) (for the 2020s DSY3 weather scenario) through the use of natural ventilation via openable windows/doors and increased mechanical ventilation, horizontal external shading on the south elevations and vertical external shading on the west elevations.
- For further information, additional testing has been undertaken for the residential apartments using the 2050 and 2080 versions of the Design Summer Years DSY1, DSY2 and DSY3 and can be found in appendix A.7, the results are summarised in the table below.

Weather file	DSY1		DSY2		DSY3	
Test criteria	Criteria 1	Criteria 2	Criteria 1	Criteria 2	Criteria 1	Criteria 2
Rooms pass % (2050)	92.3%	47.1%	76.9%	2.3%	63.9%	0%
Rooms pass % (2080)	58.7%	0%	46.9%	0%	26.6%	0%

Table 12: Summary of Overheating Results for 2050 and 2080 weather files.

The assessment demonstrates that the risk of overheating has been reduced as far as practical, with all available passive measures explored.

The proposed overheating mitigation measures are summarised below:-

- The use of natural ventilation via fully openable windows/doors
- Increased mechanical ventilation
- Solar gain into the apartments will be significantly reduced through using a low g-value of 0.4 and through the provision of external shading on the west side of the buildings.
- During extreme summer weather, residents will be encouraged to use additional measures to reduce the risk of overheating, including the following:-
 - Using portable fans to increase airflow
 - Minimising internal heat gains
 - Keeping windows open as long as possible
- Guidance will be provided to residents on reducing the overheating risk in their home in line with the cooling hierarchy.

9.4 Cooling Hierarchy

The assessment of the proposed development against the cooling hierarchy is as detailed below:-

9.4.1 Minimise internal heat generation through energy efficient design

Internal heat generation will be minimised by a combination of measures including the following:-

- Minimising cold bridging
- Minimising heat loss from heating and hot water systems
- No boilers in apartments
- Low energy lighting
- Energy efficient appliances; and
- Low temperature heat network.

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

The heat entering the building will be reduced by a combination of measures including the following:-

- Improved fabric 'U' values
- Improved air tightness
- Optimisation of glazing g-value
- Optimisation of glazing area
- External shading via briese soleis and balconies

9.4.3 Manage the heat within the building through exposed thermal mass and high ceilings

Floor to floor heights have been maximised in the proposed development.

9.4.4 Mechanical ventilation

Ventilation to the residential apartments to provide fresh air and extract moisture/pollutants in accordance with Building Regulations Part F will be via individual Mechanical Ventilation with Heat Recovery (MVHR) units.

As demonstrated by the dynamic modelling assessment, overheating can be prevented in the residential apartments through the use of the natural ventilation via fully openable windows/doors and increased mechanical ventilation.

9.4.5 Active Cooling Systems

Active cooling is not proposed for the development.

9.5 Conclusion

CIBSE TM59 compliance criteria are met for the DSY1 and 2 weather scenarios in all rooms, as well as in 86% of rooms modelled for criteria (a) and 48% for criteria (b) for the DSY3 weather scenario. Additional testing has also been conducted using 2050 and 2080 weather files with results summarised in table 12.

Through a variety of passive measures including optimising natural ventilation and mechanical ventilation and with a low g-value of 0.4 to reduce solar gains as well as including external shading in the form of balconies as well as additional briese soleil, which has been added to the side of the buildings have ensured compliance is met in all of the apartments.

10 CONCLUSION

The proposal has set out the target of achieving net zero regulated carbon emissions. A fabric first approach has optimised the orientation, glazing proportion, form factor whilst air tightness and u-values have been significantly reduced beyond Part L 2021 also help to optimise the energy efficiency of the development.

Green energy strategies have been reviewed to provide options for low carbon technologies. Efficient Mechanical Ventilation with Heat Recovery is proposed to compliment the fabric first proposals and duct lengths to external walls have been minimised. Options such as ground source heat pumps were assessed against the energy demands of the scheme and viability. Air-to-water and water-to-water heat pumps are proposed in an ambient loop system to meet the schemes hot water and space heating demands. These will be supplemented with Photo Voltaic panels as a more effective use of roof space than solar hot water.

Overall, through a combination of fabric efficiency and green technologies an overall on-site reduction of 101% in regulated carbon dioxide emissions over Part L 2013 has been achieved.

Overheating will be mitigated via a number of methods including providing shading with balconies and brise soliel, optimising window sizes in sensitive locations, specifying glass with a lower g-value, mechanical and enabling natural ventilation to bedrooms at night in a secure way at ground floor. The development is shown to be fully compliant with CIBSE TM59, with all apartments passing the 2020 DSY1 and 2 weather scenarios, and a significant proportion passing the DSY3 weather scenario. For further information additional testing has also been conducted using future weather files

Energy and sustainability are an integral part of the proposed development design, and this report demonstrates how the scheme satisfies national, regional and local planning guidance in relation to sustainability and climate change mitigation/adaption.

Appendix A.1 – SAP Calculations (Be Lean)

Appendix A.2 – SAP Calculations (Be Green)

Appendix A.3 – GLA Carbon Emission Reporting Spreadsheet

SAP 2012 Performance

SAP 10.0 Performance

Domestic

Table 1 Carbon Dioxide Emissions after each stage of the Energy Intensity for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnne CO ₂ per annum)	
	Regulated	Unregulated
Baseline Part L 2012 of the Building Regulations Compliance	45.5	14
After energy demand reduction (see text)	45.5	14
After heat network connection (see text)	45.5	14
After renewable energy (see text)	4.3	14

Table 2 Regulated Carbon Dioxide savings from each stage of the Energy Intensity for domestic buildings

Regulated domestic carbon dioxide savings (Tonnne CO ₂ per annum)		
	TN	(%)
See text: savings from energy demand reduction	0.0	0%
See text: savings from heat networks	0.0	0%
See green: savings from renewable energy	41.2	94%
Cumulative on-site savings	41.2	100%
Actual savings from off-site payment	4.3	-
(Tonnne CO ₂)		
Cumulative savings for off-site payment	49	-
Zero in-line contribution (Z)	-4875	

Notes: zero in-line contribution (Z) is based on the recommended price of £100 per annum of carbon dioxide credits (Z=0). Positive values indicate a benefit to the client and negative values indicate a cost to the client.

Non-domestic

Table 3 Carbon Dioxide Emissions after each stage of the Energy Intensity for non-domestic buildings

	Carbon Dioxide Emissions for non-domestic buildings (Tonnne CO ₂ per annum)	
	Regulated	Unregulated
Baseline Part L 2012 of the Building Regulations Compliance	0.0	-
After energy demand reduction (see text)	0.0	-
After heat network connection (see text)	0.0	-
After renewable energy (see text)	0.0	-

Table 4 Regulated Carbon Dioxide savings from each stage of the Energy Intensity for non-domestic buildings

Regulated non-domestic carbon dioxide savings (Tonnne CO ₂ per annum)		
	TN	(%)
See text: savings from energy demand reduction	0.0	0%
See text: savings from heat networks	0.0	0%
See green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	0%
Actual savings from off-site payment	0.0	-
(Tonnne CO ₂)		
Cumulative savings for off-site payment	0	-
Zero in-line contribution (Z)	0	

Notes: zero in-line contribution (Z) is based on the recommended price of £100 per annum of carbon dioxide credits (Z=0). Positive values indicate a benefit to the client and negative values indicate a cost to the client.

SITE-WIDE

	Total regulated emissions (Tonnne CO ₂ per annum)	CO ₂ savings (Tonnne CO ₂ per annum)	Percentage savings (%)
Part L 2012 baseline	45.5	-	-
See text	45.5	0.0	0%
See clean	45.5	0.0	0%
See green	4.3	41.2	94%
Total savings	-	41.2	100%
		CO ₂ savings off-site (Tonnne CO ₂)	-
Off-site	-	-49	-

Table 1 Carbon Dioxide Emissions after each stage of the Energy Intensity for domestic buildings

	Carbon Dioxide Emissions for domestic buildings (Tonnne CO ₂ per annum)	
	Regulated	Unregulated
Baseline Part L 2012 of the Building Regulations Compliance	45.5	7
After energy demand reduction (see text)	39.5	4
After heat network connection (see text)	39.5	4
After renewable energy (see text)	4.0	4

Table 2 Regulated Carbon Dioxide savings from each stage of the Energy Intensity for domestic buildings

Regulated domestic carbon dioxide savings (Tonnne CO ₂ per annum)		
	TN	(%)
See text: savings from energy demand reduction	0.0	0%
See text: savings from heat networks	0.0	0%
See green: savings from renewable energy	38.7	79%
Cumulative on-site savings	48.7	100%
Actual savings from off-site payment	4.0	-
(Tonnne CO ₂)		
Cumulative savings for off-site payment	47	-
Zero in-line contribution (Z)	-4880	

Notes: zero in-line contribution (Z) is based on the recommended price of £100 per annum of carbon dioxide credits (Z=0). Positive values indicate a benefit to the client and negative values indicate a cost to the client.

	Carbon Dioxide Emissions for non-domestic buildings (Tonnne CO ₂ per annum)	
	Regulated	Unregulated
Baseline Part L 2012 of the Building Regulations Compliance	0.0	-
After energy demand reduction (see text)	0.0	-
After heat network connection (see text)	0.0	-
After renewable energy (see text)	0.0	-

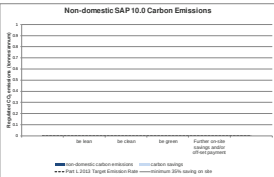
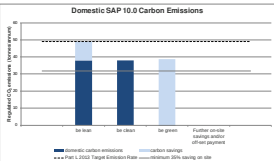
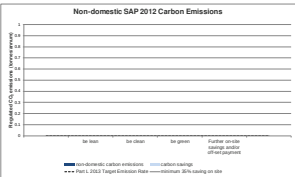
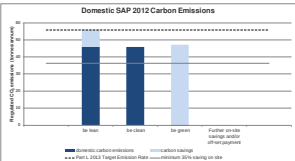
Table 4 Regulated Carbon Dioxide savings from each stage of the Energy Intensity for non-domestic buildings

Regulated non-domestic carbon dioxide savings (Tonnne CO ₂ per annum)		
	TN	(%)
See text: savings from energy demand reduction	0.0	0%
See text: savings from heat networks	0.0	0%
See green: savings from renewable energy	0.0	0%
Total Cumulative Savings	0.0	0%
Actual savings from off-site payment	0.0	-
(Tonnne CO ₂)		
Cumulative savings for off-site payment	0	-
Zero in-line contribution (Z)	0	

Notes: zero in-line contribution (Z) is based on the recommended price of £100 per annum of carbon dioxide credits (Z=0). Positive values indicate a benefit to the client and negative values indicate a cost to the client.

	Target Plastic Energy Efficiency (2010-11)	Domestic Plastic Energy Efficiency (2010-11)	Improvement (%)
Domestic SAP 10.0	30.3%	30.3%	0%

	Area weighted non-domestic energy demand (2010-11)	Total area weighted non-domestic energy demand (2010-11)
Actual	-	-
Baseline	-	-



Appendix A.4 – Heat Network Correspondence

Will Newall

From: Starley-Grainger Tim <Tim.Starley-Grainger@haringey.gov.uk>
Sent: 22 April 2022 11:50
To: Will Newall
Cc: Richard Denteh; Haringey Planning Policy
Subject: RE: N15 heat network query

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Will

The area wide network won't be operational until c.2024/25 and I don't think we would be connecting Brunel Walk from day 1 anyway but I think you should still provision to connect (and you would be required to do this through planning if referable to the GLA, which it doesn't look like you are, or by our policy DM22 anyway)

Provisioning to connect means

- 1) Site wide heat network with single energy centre
- 2) Space provision in EC for future substation
- 3) Route for primary network from EC to edge of site

I assume you mean communal ASHP rather than individual ASHPs and so you already have a site wide HN? Is the intent for the communal ASHP to supply 100% of heat or would it be in combination with a gas boiler/other heat source? What thermal storage are you allowing for? You will see our standard spec calls for gas boilers with the ASHP plus storage to supply the majority of the heat (but that is looking at a scale 100x bigger than Brunel Walk)

Best wishes

Tim

Tim Starley-Grainger

T: 020 8489 1180
M: 07905 733531
E: tim.starley-grainger@haringey.gov.uk
Working Pattern: Full Time

From: Will Newall <Will.Newall@meinhardt.co.uk>
Sent: 22 April 2022 10:00
To: Starley-Grainger Tim <Tim.Starley-Grainger@haringey.gov.uk>
Cc: Richard Denteh <richard.denteh@meinhardt.co.uk>; Haringey Planning Policy <Planning.Policy@haringey.gov.uk>
Subject: RE: N15 heat network query

Hi Tim,

Thanks for your quick reply.

The development comprises of 4 blocks, containing a total of 45 Units (see images below). The total site area is TBC at the moment.

The development has a target of achieving net-zero operational carbon. Air source heat pumps are currently proposed for the developments heating requirements.

This development is for the council.

Is the heat network available to connect to now, if not is this something we will need to include provisions for in the future?

Summary of proposals

Accommodation:
8 x 1B2P Flats
16 x 2B4P Flats
15 x 3B5P Flats
6 x 3B5P Maisonettes

Total 45 new homes

TOTAL - BLOCKS A, B, C, D & HOUSES															
	Units	Total GIA *		1B1P	1B2P	2B3P	2B4P	3B4P	3B5P	3B6P	4B6P		Habitable Rooms	GIA (floor plate)	
		m ²	ft ²											m ²	ft ²
TOTAL	45	3,583	38,554	0	8	0	16	0	21	0	0		148	4,736.4	50,963.7

Thank you for your assistance.

Regards

Will Newall
Graduate Energy & Sustainability Engineer



Meinhardt (UK) Ltd, 10 Aldersgate Street, London, EC1A 4HJ
TEL: 020 7831 7969

Infrastructure & Environment | Structures | MEP | Project Management | Planning & Urban Development | Façade Engineering | Environmentally Sustainable Design | Specialist and Architectural Lighting | Fire Performance Engineering | Integrated Design Management | Mission Critical Facility Design

E: will.newall@meinhardt.co.uk | W: www.meinhardt.co.uk



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From: Starley-Grainger Tim <Tim.Starley-Grainger@haringey.gov.uk>
Sent: 21 April 2022 15:11
To: Will Newall <Will.Newall@meinhardt.co.uk>
Cc: Richard Denteh <richard.denteh@meinhardt.co.uk>; Haringey Planning Policy <Planning.Policy@haringey.gov.uk>
Subject: RE: N15 heat network query

Hi Will

We are in the process of updating the London Heat Map

Attached is a rough plan for our network

It is currently routing around 500m west of Brunel Walk which would potentially see it caught by the Council's DM22 policy

If it is referable to the Mayor, you are in a HN priority area and so would be expected to comply with GLA policy

How big is the development? What is your headline energy strategy? Is this a development for the Council? There has been some previous correspondence with my (former) colleague Chris – see attached email

If it is a Council scheme, it should be built to the attached specification which should have been provided to you by the Council's project manager

Best wishes

Tim

Tim Starley-Grainger

T: 020 8489 1180

M: 07905 733531

E: tim.starley-grainger@haringey.gov.uk

Working Pattern: Full Time

From: Will Newall <Will.Newall@meinhardt.co.uk>

Sent: 21 April 2022 11:43

To: Starley-Grainger Tim <Tim.Starley-Grainger@haringey.gov.uk>

Cc: Richard Denteh <richard.denteh@meinhardt.co.uk>; Starley-Grainger Tim <Tim.Starley-Grainger@haringey.gov.uk>; Haringey Planning Policy <Planning.Policy@haringey.gov.uk>

Subject: RE: N15 heat network query

Good Morning Tim,

Are you able to advise on the below?

I reiterate that this needs to be submitted for planning soon so I would greatly appreciate hearing from you promptly.

Thanks in advance.

Regards

Will Newall
Graduate Energy & Sustainability Engineer



Meinhardt (UK) Ltd, 10 Aldersgate Street, London, EC1A 4HJ

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From: Haringey Planning Policy <Planning.Policy@haringey.gov.uk>

Sent: 19 April 2022 11:50

To: Will Newall <Will.Newall@meinhardt.co.uk>

Cc: Richard Denteh <richard.denteh@meinhardt.co.uk>; Starley-Grainger Tim <Tim.Starley-Grainger@haringey.gov.uk>

Subject: RE: N15 heat network query

Dear Will,

Apologies for the delayed reply to your query.

I have cc'd my colleague Tim Starley-Grainger who is the Council's Energy Infrastructure Manager and who is best placed to advise you about existing and planned heat networks.

Tim – Thanks in advance for assisting

Best wishes,
Bryce

Bryce Tudball MRTPI
Interim Head of Planning Policy, Transport & Infrastructure
Haringey Council
6th Floor, River Park House, Wood Green, London, N22 8HQ
T. 07870 831 737
E. bryce.tudball@haringey.gov.uk

From: Will Newall <Will.Newall@meinhardt.co.uk>

Sent: 14 April 2022 11:08

To: LDF <LDF.LDF@haringey.gov.uk>

Cc: Richard Denteh <richard.denteh@meinhardt.co.uk>

Subject: RE: N15 heat network query

Good Morning,

Any update on the below? We are submitting for planning soon so it would be great to hear from you promptly.

Thanks you.

Regards

Will Newall

From: Richard Denteh
Sent: 12 August 2022 14:47
To: Will Newall
Subject: FW: Brunel Walk, Documents for Planning

Kind Regards

Richard Denteh
Senior Consultant
BEng (Hons) OCDEA DipNDEA



Meinhardt (UK) Ltd, 10 Aldersgate Street, London, EC1A 4HJ
TEL: 020 7831 7969 **MOB:** 07890 025702

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From: Emma Currens <E.Currens@madlins.co.uk>
Sent: 17 June 2022 13:10
To: N.McBride@maxfordham.com
Cc: Stephen Finn <Stephen.Finn@meinhardt.co.uk>; Kiran Curtis <kiran@kcaarchitects.co.uk>; Nathaniel Gregory <nathaniel.gregory@meinhardt.co.uk>; Richard Denteh <richard.denteh@meinhardt.co.uk>; Richard Wilkes <richard.wilkes@meinhardt.co.uk>; Maria Boyer <maria@kcaarchitects.co.uk>
Subject: RE: Brunel Walk, Documents for Planning

Thanks Neil, it has since been confirmed that LBH will be proceeding with the existing energy strategy with no future connection to the DEN.

Maria, in Kiran's absence can you please respond. Similarly Stephen on behalf of Meinhardt.

Kind Regards

Emma Currens | Associate



T: 01483 751 600

M: 07710 097 034

London: 5 St Johns Lane, London EC1M 4BH
Woking: Nova Scotia House 70 Goldsworth Road, GU21 6LQ

www.madlins.co.uk

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From: N.McBride@maxfordham.com <N.McBride@maxfordham.com>
Sent: 17 June 2022 11:39
To: Emma Currens <E.Currens@madlins.co.uk>
Cc: Stephen Finn <Stephen.Finn@meinhardt.co.uk>; Kiran Curtis <kiran@kcaarchitects.co.uk>
Subject: Re: Brunel Walk, Documents for Planning

(Email sent again with Kiren included)

Emma,

Have cc'ed Stephen and Kiren as it's relevant.

The current Noise Impact Assessment report you have (rev P02 04/0422) describes the previous ASHP scheme with units on each roof...

We understand from the M&E Engineers that each Block will have 2no. ASHPs located on the roof of 1 Blocks. One of the units is for redundancy – we can assume that one will run at up to 100% duty during and night, as a worst case.

We have assessed that to meet the plant noise limits in Table 6, the sound power emitted from each Block's ASHPs would need to be no more than 58 dBA. The sort of units being considered (at the time writing) have a higher sound power, and so noise mitigation that provides about 21 dB of attenuation required. This will be provided by bespoke louvred enclosures (i.e. sides and over the top of the unit). Loss values of between 20-25 dB are feasible for this type of enclosure. Alternatively, a combination of enclosure/attenuator mitigation, and a noise screen around the units, could also be employed to deliver required mitigation.

So when a final site plan is available, and the final ASHP scheme (single plant room etc?), I can update my document.

Is this info is available now (Colin, Stephen)?

Regards

Neil

Dr Neil McBride
Principal Acoustic Engineer, Partner

MAX FORDHAM
42-43 Gloucester Crescent
London



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M: 07710 097 034

London: 5 St Johns Lane, London EC1M 4BH
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From: Will Newall
Sent: 11 April 2022 16:13
To: ldf@haringey.gov.uk
Cc: Richard Denteh <richard.denteh@meinhardt.co.uk>
Subject: N15 heat network query

Hello,

I work for a building services and energy consultants working on a new development closely located on Brunel Walk, N15.

On the London heat map it shows there are currently no heat networks in the vicinity of the development. However, I am emailing to enquire to see if there are any proposed heat networks planned for the area that we should be aware of before we submit our energy strategy for planning.

If I have emailed the wrong department would you be able to direct me to the appropriate department within the council to ask?

Thanks in advance for your help.

Regards

Will Newall
Graduate Energy & Sustainability Engineer



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Appendix A.5 – Renewables Assessment

A.5 Renewables Assessment

A.5.1 Biomass Boilers

Description

As with all biomass heat provision, wood chips or wood pellets are responsible for CO₂ emissions at the point of combustion. When burnt, levels of emissions are almost double that of natural gas. However, as wood has captured CO₂ during its growth process, the overall CO₂ balance of wood chips or wood pellets is equivalent to that of a very low carbon fuel.

Types

Wood chips are a medium-sized solid material made by cutting, or chipping, larger pieces of wood. Pellets are made from clean wood waste or clean forest-sources such as saw mills, joinery factories and well-managed woodland thinning. They are designed specifically to compete with fossil fuels on convenience and performance.

Pellets offer a number of advantages for small scale installations, including:

- Quality: they are drier and homogeneous in size and shape;
- Storage: they are denser and require less storage;
- Operation and Maintenance: they are easier to ignite, more compatible with automated feed mechanisms and lower in ash content.

Key Features

Unlike natural gas, wood fuel is delivered and has to be stored. Recent advances in boiler designs and controls mean that most modern boilers are highly automated. The key human interventions can be limited to loading the store periodically, de-ashing every six months and cleaning the flue.

Storage needs to be considered and provided carefully as it is a critical component of automated biomass boiler systems, which tend to be based on either vacuum suction- or screw-auger-based systems. Wood pellets can be delivered in reduced quantities (e.g. 10 kg bags) but are generally supplied in much larger volumes (e.g. 1 ton). Low intervention systems require large fuel stores.

It is recommended to select high quality equipment present on the exempted heating appliance list (mandatory in some 'smoke control' zones) and potentially to fit a catalytic converter to reduce local emissions and improve efficiency.

Efficiency

The efficiency of the boiler is an important consideration but the carbon content of the fuel is equally important.

Although wood pellets can generally be distributed economically within a radius of 80 to 250 miles, it is important to ensure that an efficient supply is accessible and that the carbon content of the fuel is verified beforehand.

Cost Benchmarks

Prices of an automatically fed pellet boiler vary depending on the size. The price of a 200 kW boiler (including feeding mechanism) is estimated to be approximately £120,000.

Financial Incentives

The Non-Domestic Renewable Heat Incentive Scheme closed to new applicants on 31st March 2021. The Domestic Renewable Heat Incentive Scheme closes to new applicants on 31st March 2022.

There may be additional tax allowances available if a product is selected from the Energy Technology List.

Maintenance

Medium / High

The boiler fuel feed mechanism will require attention on a regular basis.

Typical Lifetime

15-20 years

Embodied Carbon

Low to medium

Key Advantages

Very low carbon fuel

Assessment

Biomass boilers could provide a proportion of the heat load, but would compete with the proposed heat pumps for the base heat load.

Biomass boilers are better operating as the lead heat source (and not as top up to the air source heat pumps) as they are not suited to operating with variable load.

Space and maintenance requirements are significant.

The discharge of combustion gases would be problematic in a tower development such as this.

Biomass boilers are not supported by LBH. Biomass boilers would also adversely impact on local air quality due to their emissions, and vehicular delivery of fuel would be required resulting in increased traffic movements.

Biomass boilers are therefore not proposed for the development.

A.5.2 Photovoltaics

Description

Photovoltaic cells, also known as solar PVs, generate electricity from sunlight. An inverter turns the Direct Current (DC) generated into Alternative Current (AC) which can be used in the building, with any surplus sent to the grid.

PV modules are made of a number of photovoltaic cells, a semiconductor device usually made of silicon wafers.

They can generate some electricity even when they are not in direct sunlight as the light is diffused by the cloud cover.

PV modules are wired together to create arrays of several kWp.

Types

Monocrystalline - Slices of a single grown crystal of pure silicon

Polycrystalline - Slices of multiple crystals of pure silicon

Thin film - Amorphous silicon, CdTe or CIS/CIGS

Hybrid - Crystalline and amorphous silicon

Key Features

PVs are generally mounted on the roof in an unshaded location, oriented towards the best possible view of the sun's path.

They can be fixed with bolts or clips on prefabricated rails or mounting brackets (both of which are fixed through the roof and roofing material) or on angled metal frames weighed down with concrete ballasts.

Efficiency

The amount of electricity generated by a PV module depends typically on the type of PV cells, on the orientation/incline of the module, on the location and on the inverter's efficiency. Therefore PV modules are generally described by quoting their peak output in kilowatts peak (kWp).

Generally, in terms of efficiency, the following can be assumed:

Monocrystalline	18 to 24%
Polycrystalline	15 to 20%
Thin film	12 to 20%
Hybrid	16 to 22%

Cost Benchmarks

Prices of PVs are coming down fast, but are typically between £200 and £400 / sqm depending on the product.

Financial Incentives

The Feed-in-Tariff (FIT) scheme closed to new applicants from 1st April 2019.

Maintenance

Very low – occasional cleaning

Typical Lifetime

25 years for the panels - 10 years for the inverter

Embodied Carbon

Medium

Key Advantages

Requires no fuel to operate

Has no moving parts

Good payback periods.

Assessment

PVs would be a complimentary technology to the proposed heat pumps.

As there is very limited roof space available, PVs are preferred to solar thermal as they would achieve greater carbon savings.

Photovoltaics are therefore proposed for the development.

A.5.3 Solar Thermal

Description

Heating water with solar energy is the most common use of solar thermal technology. The main elements of a solar water heating system are a solar collector, a pump, a hot water tank and a controller. In the UK, a solar water heating system can generally cover up to 50% of the annual hot water needs.

Types

Flat-plate collectors consist of a black absorber (usually copper or metal) with a glazed layer in front and insulation around the edges and at the back.

Evacuated tubes are collectors that have had the air evacuated out of them to prevent heat-loss through convection. The tubes generally contain sealed copper pipes.

The thermal fluid used in both cases is the same: a non-toxic glycol alcohol-based antifreeze. It circulates in the absorber in the case of flat plate collectors and in the copper pipes in evacuated tubes.

Key Features

A temperature sensor placed near the outlet pipe of the collector relays temperature information to the controller unit, which activates/de-activates a pump depending on the difference between the measured temperature leaving the collector and the temperature in the hot water tank.

The hot water tank should have a volume of approximately 60-80 litres per sqm of solar collector.

Efficiency

The amount of hot water generated by a solar thermal collector depends typically on the type of collector, on the orientation/incline of the module, on the location and on the size of the hot water tank.

Evacuated tubes are generally the most efficient, particularly on cold sunny days.

Generally, in terms of efficiency, the following can be assumed:

Flat plate	40%
Evacuated tubes	40 to 50%

Cost Benchmarks

Prices of a typical solar thermal installation are approximately £500 to £700/sqm excl. VAT. Evacuated tubes are more expensive but more efficient than flat-plate collectors.

Financial Incentives

The Non-Domestic Renewable Heat Incentive Scheme closed to new applicants on 31st March 2021. The Domestic Renewable Heat Incentive Scheme closes to new applicants on 31st March 2022.

There may be additional tax allowances available if a product is selected from the Energy Technology List.

Maintenance

Very low – annual inspection

Typical Lifetime

20-25 years (except pumps)

Embodied Carbon

Low

Key Advantages

Can be used to complement other technologies efficiently (e.g. heat pumps)

Can be building-integrated

Essentially 'free' heat

Assessment

A solar thermal system could provide a proportion of the heating load, and would work in conjunction with the heat pumps.

There is very limited roof space available so either PVs or solar thermal could be used, but PVs are preferred as they would achieve greater carbon savings.

Solar thermal is therefore not proposed for the development.

A.5.4 Heat Pumps

Description

The purpose of heat pumps is to absorb dispersed low-grade heat, upgrade it to a higher quality and deliver it to the spaces that need heating. Low-grade heat is considered by many as both renewable and essentially free. It is present in the ground, the air or a body of water (e.g. aquifer). Electricity is required to run the system.

Types

Ground source (horizontal)

Ground source (vertical)

Ground source (aquifer)

Air source

Key Features

The three key components of a heat pump system are:

- the heat sink (e.g. ground loop, aquifer, outside air, exhaust air);
- the heat pump system and associated hot water storage;
- the distribution system.

The heat sink can be based on a horizontal or vertical, open-loop or closed-loop design and its installation (e.g. depth) will vary depending on the heat exchange and the ground conditions. In the case of air source heat pumps, it is the outside air which serves as the heat sink.

The heat pump contains a refrigerant which boils and condenses at different temperatures and pressures, absorbing and releasing heat in the process.

Underfloor heating and low surface temperature radiators are ideally suited to heat pump systems: they provide the most efficient delivery of the kind of consistent lower temperature heat produced by the heat pump.

Efficiency

Heat pump efficiencies are often described in terms of the coefficient of performance (COP), which describes how many units of energy are delivered for every unit used. Typical seasonal efficiencies are given below and compared to a standard direct electric heater.

Ground source heat pump	250 to 600%
Air source heat pump	200 to 350%
Standard electric heater	100%

Cost Benchmarks

Prices of heat pumps depend significantly on the type but generally a vertical ground source heat pump system would cost approximately £1,400 / kW.

Financial Incentives

The Non-Domestic Renewable Heat Incentive Scheme closed to new applicants on 31st March 2021. The Domestic Renewable Heat Incentive Scheme closes to new applicants on 31st March 2022.

There may be additional tax allowances available if a product is selected from the Energy Technology List.

Maintenance

Medium/High – Pumps and refrigerant circuit critical

Typical Lifetime

15 years

Embodied Carbon

Medium

Key Advantages

Heat pumps can be reversible and can provide cooling.

Carbon emissions will lower over time with the de-carbonisation of the electricity grid.

Assessment

A ground source heat pump system would provide low grade heat which is not best suited to the development's main heat demand – domestic hot water.

The overall cooling load is very low compared to the heating load, resulting in a poor balance between heating and cooling demand, which would adversely impact on the potential yield from any ground source system.

As the development is a tower, the site footprint is very small which would significantly reduce the capacity and effectiveness of both closed or open loop options.

Ground source heat pumps are therefore not proposed for the development.

The Site heat network will be an ambient loop system. The system uses an ambient communal water loop, fed by communal air to water heat pumps, designed at 25°C. Each apartment will have a water-to-water heat pump which 'uplift' the central loop to heat the water to 55°C to provide space heating and hot water to the dwellings. Ambient loop energy systems were designed to overcome the challenges of modern residential developments, delivering a solution that increasing efficiency and reducing losses compared to higher temperature systems, and therefore reducing the carbon footprint of buildings.

The site heat network within the development will be designed in accordance with CIBSE CP1 Heat Networks: Code of Practice, and will include the following to reduce losses and increase efficiency:-

- Risers are arranged on each side of the core to minimise lateral pipe runs and hence heat losses.
- A high level of insulation (in excess of British Standards) will be provided to all parts of the systems, in accordance with the recommendations of CIBSE CP1.
- The system will operate with a variable volume and an operating temperature as low as possible to satisfy the requirements of the tertiary system, which delivers the heat demand to the occupied spaces.

The centralised heat pumps are expected to have a seasonal efficiency of 362% whilst the water-to-water heat pumps will operate at efficiencies around 410-430%

The carbon reductions generated by the heat pumps are included at the Be Green stage of the hierarchy.

Air to water and water to water heat pumps are therefore proposed for the development.

A.5.5 Wind Turbines

Description

Wind power can be used to generate electricity, either in parallel with mains supplies, gear or for stand-alone applications with battery back-up.

Types

Horizontal axis

Vertical axis

Key Features

In order to generate worthwhile quantities of electricity, average wind speeds of more than 5–6 m/s are typically required.

The best locations for wind turbines are away from obstructions which affect air flow, including any features of buildings which may have an effect on airflow. Wind speed increases with height, and so turbines often require masts or towers to take advantage of higher wind speeds and to avoid turbulence caused by the building structure. Ideal geographical locations include near hill tops and the coast.

Wind characteristics are specific to each location, and initial evaluations of the feasibility of wind power at any particular site will require details of historic meteorological data. A more detailed local assessment will normally be required to establish the effects of local topology, obstructions, etc.

Efficiency

The theoretical maximum power efficiency of any design of wind turbine is 0.59 (i.e. no more than 59% of the energy carried by the wind can be extracted by a wind turbine).

Once the inefficiencies of a complete wind turbine system (e.g. generator, bearings, power transmission etc.) are included, around 10-30% of the power of the wind is actually converted into usable electricity.

The power output of wind turbines depends on two key factors: the swept area of the rotor and the wind speed.

Horizontal axis wind turbines generally have higher power efficiencies than vertical axis, however wind direction is not as important for a vertical axis type.

Cost Benchmarks

Prices of wind turbines depend significantly on the type but generally a 6kW pole mounted system would cost approximately £30,000.

Financial Incentives

Wind turbines are eligible for Feed-in-Tariffs (FiTs). The tariff from 1 July 2018 to 20 September 2018 ranges from 0.59 p/kWh for an installation over 1.5MW to 8.39 p/kWh for an installation up to 50kW.

Maintenance

Low

Typical Lifetime

20 years (except inverter)

Embodied Carbon

Medium

Key Advantages

Low maintenance

Assessment

Wind turbines would be a complimentary technology to the proposed district heat network, however, they would have significant architectural and townscape implications, together with potential noise impact.

Wind turbines are therefore not proposed for the development.

Appendix A.6 – Early-Stage Overheating Risk Tool

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING

KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING

Geographical and local context

#1 Where is the scheme in the UK?
See guidance for map

South east	4
Northern England, Scotland & NI	0
Rest of England and Wales	2

4

#2 Is the site likely to see an Urban Heat Island effect?
See guidance for details

Central London (see guidance)	3
Grtr London, Manchester, B'ham	2
Other cities, towns & dense sub-urban areas	1

2

#8 Do the site surroundings feature significant blue/green infrastructure?
Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context

1	0
---	---

Site characteristics

#3 Does the site have barriers to windows opening?
- Noise/Acoustic risks
- Poor air quality/smells e.g. near factory or car park or very busy road
- Security risks/crime
- Adjacent to heat rejection plant

Day - reasons to keep all windows closed	8
Day - barriers some of the time, or for some windows e.g. on quiet side	4
Night - reasons to keep all windows closed	8
Night - bedroom windows OK to open, but other windows are likely to stay closed	4

4

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green?
Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme

1	0
---	---

#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas?
Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels

1	0
---	---

Scheme characteristics and dwelling design

#4 Are the dwellings flats?
Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples

3	3
---	---

#5 Does the scheme have community heating?
i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures

3	3
---	---

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation?
Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance

1	1
---	---

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future?
Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans

>2.8m and fan installed	2
> 2.8m	1

0

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings?
(as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space

>65%	12
>50%	7
>35%	4

7

#7 Are the dwellings single aspect?
Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation

Single-aspect	3
Dual aspect	0

0

#13 Is there useful external shading?
Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per #6

	Full	Part
>65%	6	3
>50%	4	2
>35%	2	1

2

#14 Do windows & openings support effective ventilation?
Larger, effective and secure openings will help dissipate heat - see guidance

	Openings compared to Part F purge rates		
	= Part F	+50%	+100%
Single-aspect	minimum	3	4
Dual aspect	required	2	3

2

TOTAL SCORE

22

=

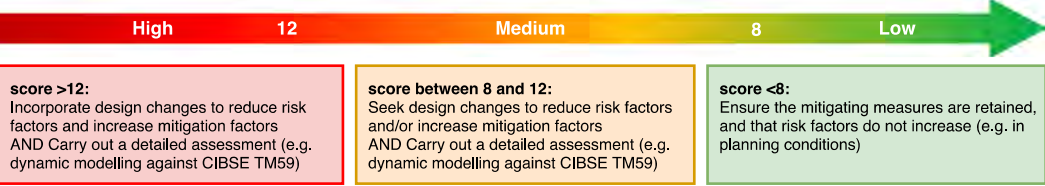
Sum of contributing factors:

27

minus

Sum of mitigating factors:

5



Appendix A.7 – Overheating Assessment

A.7 Overheating Assessment

As requested in the Energy Assessment Guidance, the Good Homes Alliance (GHA) Early Stage Overheating Risk Tool has been completed and is provided in Appendix A.6.

The proposed development has been assessed in accordance with the cooling hierarchy detailed in SI4 of the London Plan and the latest Energy Assessment Guidance, in order to reduce overheating and minimise the use of air conditioning.

Natural ventilation cannot be used to reduce overheating risk in all residential apartments, as the proposed development is impacted by high external noise levels from the Kirkton Road that passes the site on the east. Refer to the detailed noise assessment completed by the acoustic consultant.

The study provided in Appendix A.10 summarises the impact of the external noise on the façade and confirms which windows can/cannot be opened for the longer periods necessary to provide natural ventilation to reduce overheating risk.

A.7.1 Overheating Risk Assessment Methodology

Domestic (Apartments)

The Chartered Institution of Building Services Engineers (CIBSE) has produced guidance on assessing and mitigating overheating risk in new developments. TM59 Design Methodology for the Assessment of Overheating Risk in Homes should be used for residential developments.

For compliance with CIBSE TM59, the modelled apartments must pass both of the following two criteria:

- For living rooms, kitchens and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).
- For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

Criteria 2 and 3 of CIBSE TM52 may fail to be met, but both (a) and (b) above must be passed for all relevant rooms.

Weather Data

The weather file used for the assessment is as per TM59: DSY1 (Design Summer Year) for the site location, for the 2020s, high emissions, 50% percentile scenario.

The London Heathrow weather data set has been used which is the most representative for the site location.

Additional testing has been undertaken for the residential apartments using the 2020 versions of the following more extreme design weather years:-

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

The GLA energy assessment guidance expects that the CIBSE compliance criteria is met for the DSY1 weather scenario. It is acknowledged that meeting the CIBSE compliance criteria is challenging for the DSY 2 & 3 weather files, although it is expected that in the majority of cases a significant proportion of spaces will be able to achieve compliance.

For further information, additional testing has been undertaken for the residential apartments using the 2050 and

2080 versions of the Design Summer Years DSY1, DSY2 and DSY3.

A.7.2 Domestic Model Input Data

This section summarises the input assumptions that have been used in the dynamic thermal modelling. The modelling has been carried out in accordance with CIBSE TM59: Design methodology for the assessment of overheating risk in home.

Fabric Performance

Refer to Section 6.

Solar Gain

For the residential apartments the size and g-value of the glazing has been optimised using the dynamic thermal modelling, to provide a balance between minimising summer heat gain to prevent overheating, maximising winter heat gain to reduce heating loads, and maximising natural daylight to reduce lighting energy. This has resulted in the g-value of the residential glazing being set at 0.4.

Blinds and Shading Devices

Internal blinds have not been included in the apartments.

The horizontal brise soleil have been modelled to provide external shading for the apartments on the south faces of the blocks; and the vertical brise soleil has been modelled to provide adequate shading on the West side of the buildings.

Mechanical Ventilation

MVHR Units are proposed to provide fresh air and extract ventilation for the apartments. These units will be equipped with a summer bypass mode and a boost mode that will enable the unit to provide the following increased purge ventilation rates in the summer condition during the hours of 20:30-07:00 where the internal temperature exceeds 26°C and windows are required to close in line with the 2022 Part O approved document guidance.

- Bedroom 19 l/s
- Living Kitchens Rooms up to 19 l/s

Natural Ventilation

On the south/west/east sides of the building, a typical apartment has sliding, or side hung balcony doors which can be fully opened to encourage natural ventilation of the space in conjunction with limited inward opening windows elsewhere to allow natural ventilation when required.

On all sides of the building, the inward opening windows are assumed to be restricted to 28 degrees and 10 degrees for side hung and top hung windows correspondingly.

Infiltration

The target air permeability for the development is 2m³/hr.m²@50Pa. An average infiltration air change of 0.15ACH has been assumed in the dynamic thermal modelling in accordance with Table 4.24 in CIBSE Guide A.

Air Speed Assumptions

Operative air speed in the apartments has been set at 0.1m/s and assumed elevated air speed of 0.8m/s used in the thermal modelling calculation in accordance with CIBSE TM59.

Thermal Comfort Category

This is a new build development; therefore Cat II building was selected as Normal Expectations.

Internal Gains

A thermal template has been created for each of the spaces within the houses and apartments taking into account the internal gains. The internal heat gains consist of occupancy gains, equipment gains and lighting gains. CIBSE TM59 has been used in developing the internal gains profile.

Occupancy Gains

Occupancy heat gains and profiles were assumed in accordance with Table 2 in CIBSE TM59.

Occupancy gain has been set at 75 W/person sensible, 55 W/person latent.

Room Type	Profile/ Gain
Single Bedroom	1 person at 70% gains from 11pm -8am 1 person at full gains from 8am to 11pm
Double Bedroom	2 person at 70% gains from 11pm -8am 2 person at full gains from 8am to 9am and from 10pm to 11pm 1 person at full gains in the bedroom from 9am to 10pm
1 Bedroom (Living room/ kitchen)	1 person from 9am -10am, room is unoccupied for the rest the day
2 Bedroom (Living room/ kitchen)	2 person from 9am -10am, room is unoccupied for the rest the day
3 Bedroom (Living room/ kitchen)	3 person from 9am -10am, room is unoccupied for the rest the day

Table A.7-1: Occupancy Gains

Equipment Gains

Equipment heat gains and profiles were assumed in accordance with Table 2 in CISBE TM59.

Room Type	Profile/ Gain
Living Room/ Kitchen	Peak load of 450W from 6pm-8pm 200W from 8pm- 10pm 110W from 9am to 6pm and from 10pm to 12pm Base load of 85W for the rest of the day
Single Bedroom	Peak load of 80W from 8am to 11pm Base load of 10W during the sleeping hours
Double Bedroom	Peak load of 80W from 8am to 11pm Base load of 10W during the sleeping hours

Table A.7-2: Equipment Gains

Lighting Gains

Lighting gains of 2 W/m² have been assumed for each flat for the period of 6pm –11pm in accordance with CIBSE TM59.

A.7.3 Overheating Modelling Results

Domestic Dwellings

The results of the assessment of criteria (a) and (b) for each of the individual blocks, modelled with openable windows in accordance with the acoustic report limitations

A.7.3.1 2020 Weather Scenario

Block A Overheating Results

2020	DSY1		DSY2		DSY3	
Block A	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
A00.01 Twin Room	0	8	0	20	0	27
A00.01 Doublebed	0	6	0	18	0	23
A01.01 Living/Kitchen	0.9	NA	2.6	NA	3.4	NA
A01.01 Doublebed	0.6	11	1.3	20	1.9	31
A01.02 Living/Kitchen	0.6	NA	1.9	NA	2.5	NA
A01.03 Singlebed	0.5	11	1.1	20	1.3	33
A00.01 2B4P LKD	0	NA	0.2	NA	0	NA
A01.03 Doublebed	0.4	10	1	20	1.4	29
A01.03 Twin Room	0.2	11	0.8	22	0.9	31
A01.02 Doublebed	0.1	12	0.7	23	0.7	34
A01.03 Kitchen/Dining	1	NA	2.6	NA	3.3	NA
A01.03 Livingroom	0.8	NA	2.3	NA	2.8	NA
A02.01 Living/Kitchen	1	NA	2.7	NA	3.6	NA
A02.01 Doublebed	0.6	12	1.3	21	1.9	33
A02.02 Living/Kitchen	0.6	NA	2	NA	2.5	NA
A02.03 Singlebed	0.5	11	1.1	20	1.4	33
A02.03 Doublebed	0.4	10	1.1	20	1.7	30
A02.03 Twin Room	0.3	11	0.8	22	1.1	32
A02.02 Doublebed	0.1	12	0.7	24	0.7	35
A02.03 Kitchen/Dining	1	NA	2.6	NA	3.3	NA
A02.03 Livingroom	0.8	NA	2.4	NA	2.9	NA
A03.01 Living/Kitchen	1.1	NA	2.4	NA	4.2	NA
A03.02 Singlebed	0.5	12	1.3	20	1.7	34
A03.02 Doublebed	0.5	11	1.2	20	2	32
A03.02 Twin Room	0.4	12	1	22	1.4	34
A03.01 Doublebed	0.3	14	0.9	27	1.2	36
A03.02 Kitchen/Dining	1.1	NA	3	NA	3.7	NA
A03.02 Livingroom	1.1	NA	2.7	NA	3.8	NA

Block B/C Overheating Results

2020	DSY1		DSY2		DSY3	
Block B / C	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
B00.01 Living/Kitchen	0	NA	0	NA	0	NA
B00.01 Doublebed	0	5	0	16	0	20
B01.01 Doublebed	0.2	16	0.6	27	0.8	43
B01.01 Living/Dining	0.6	NA	1.7	NA	1.6	NA
B01.01 Twin Room	0	14	0.4	21	0.5	32
B01.01 Singlebed	0	11	0.1	21	0.4	32
B01.01 Kitchen	1.4	NA	2.2	NA	3.1	NA
B01.03 Doublebed	0	10	0	22	0	34
B01.03 Twin Room	0	13	0.1	22	0.2	35
B01.03 Living/Kitchen	0.3	NA	1	NA	1	NA
B01.02 Kitchen	0	NA	0.3	NA	0.2	NA
B01.02 Twin Room	0	16	0.5	27	0.5	40
B00.02 Twin Room	0	11	0	19	0	28
B00.02 Doublebed	0	11	0.3	21	0.2	30
B00.02 LKD	0	NA	0	NA	0	NA
B01.02 Living/Dining	0	NA	0.3	NA	0	NA
B01.02 SingleBed	0	10	0	23	0	25
B01.02 Doublebed	0	13	0.5	21	0.6	32
B02.01 Doublebed	0.3	16	0.7	28	1	45
B02.01 Living/Dining	0.7	NA	1.7	NA	1.7	NA
B02.01 Twin Room	0	14	0.5	21	0.6	34
B02.01 Singlebed	0	11	0.1	21	0.4	32
B02.01 Kitchen	1.6	NA	2.3	NA	3.3	NA
B02.03 Doublebed	0	12	0	22	0	32
B02.03 Twin Room	0	13	0.2	23	0.4	36
B02.03 Living/Kitchen	0.4	NA	1	NA	1.2	NA
B02.02 Kitchen	0	NA	0.3	NA	0.3	NA
B02.02 Twin Room	0	16	0.5	28	0.6	40
B02.02 Living/Dining	0	NA	0.4	NA	0.1	NA
B02.02 SingleBed	0	10	0	24	0	29
B02.02 Doublebed	0	13	0.6	22	0.6	32
B03.01 Doublebed	0.3	20	0.9	32	1.3	50
B03.01 Living/Dining	1.3	NA	2.4	NA	3.2	NA
B03.01 Twin Room	0.2	15	0.6	23	0.7	37
B03.01 Singlebed	0	13	0.5	22	0.6	35
B03.01 Kitchen	2.2	NA	2.8	NA	4.1	NA
B03.03 Doublebed	0	13	0.4	26	0.5	38
B03.03 Twin Room	0.2	17	0.6	28	0.8	41
B03.03 Living/Kitchen	0.7	NA	1.9	NA	2.1	NA
B03.02 LKD	0.7	NA	2.2	NA	2.1	NA
B03.02 Doublebed	0.1	13	0.7	21	0.7	30
B03.02 Twin Room	0.2	14	0.7	23	0.7	32

Block D Overheating Results

2020	DSY1		DSY2		DSY3	
Block D	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
H01.06 GF Kitchen	0.6	NA	1.8	NA	1.9	NA
H01.06 GF Living / Dining	0.6	NA	1.8	NA	2	NA
H01.02 GF Kitchen	0	NA	1.5	NA	0.8	NA
H01.02 GF Living / Dining	0	NA	1.5	NA	0.9	NA
H01.06 1F Doublebed	0.3	9	1.1	20	1.4	32
H01.06 1F Twin room	0.3	9	1	20	1.2	31
H01.06 1F Singlebed	0.3	10	1	21	1.3	31
H01.02 1F Doublebed	0	9	0.8	22	0.6	28
H01.02 1F Singlebed	0	8	0.9	21	0.7	28
H01.02 1F Twin Room	0	8	0.9	20	0.6	27
2F 02.03 LKD	0.9	NA	2.4	NA	2.9	NA
2F 02.03 Doublebed	0.3	10	1	23	1.3	39
2F 02.03 Twin room	0.2	11	1	28	1.2	41
2F 02.02 Doublebed	0.1	11	0.9	26	1	41
2F 02.02 LKD	0.4	NA	1.7	NA	1.9	NA
2F 02.01 Twin Room	0.3	10	1	22	1.2	34
2F 02.01 Doublebed	0.2	11	1	26	1.2	37
2F 02.01 LKD	0.8	NA	2.1	NA	2.5	NA
D00.01 Twin Room	0.4	9	1.3	24	1.5	36
D00.01 Doublebed	0.4	9	1.3	24	1.5	36
D00.01 LKD	0.8	NA	2.4	NA	3.3	NA
D01.02 Singlebed	0.3	9	0.9	20	1.2	30
D01.02 Kitchen	0.5	NA	1.7	NA	2.5	NA
D01.02 Livingroom	0.5	NA	1.7	NA	2.4	NA
D01.02 Doublebed	0.3	9	1	20	1.2	30
D01.02 Twin Bed	0.1	11	0.9	25	1	36
D02.02 Singlebed	0.4	11	1.2	24	1.6	37
D02.02 Kitchen	0.9	NA	2.2	NA	3.2	NA
D02.02 Livingroom	0.9	NA	2.1	NA	3.2	NA
D02.02 Doublebed	0.5	12	1.2	26	1.7	39
D02.02 Twin Bed	0.4	13	1.1	31	1.5	45

A.7.3.1 2050 Weather Scenario

Block A Overheating Results

2050	DSY1		DSY2		DSY3	
Block A	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
A00.01 Twin Room	0	19	0.2	41	0	54
A00.01 Doublebed	0	19	0.2	37	0	56
A01.01 Living/Kitchen	3	NA	4.3	NA	6.7	NA
A01.01 Doublebed	1.4	31	2.2	44	3.5	67
A01.02 Living/Kitchen	2.1	NA	3.8	NA	5.6	NA
A01.03 Singlebed	1.1	32	1.9	43	3	61
A00.01 2B4P LKD	0	NA	0.7	NA	0.4	NA
A01.03 Doublebed	1.2	31	2	43	3	61
A01.03 Twin Room	0.8	33	1.6	45	2.5	63
A01.02 Doublebed	0.5	34	1.2	51	2	69
A01.03 Kitchen/Dining	2.6	NA	4	NA	6.1	NA
A01.03 Livingroom	2	NA	3.7	NA	5.5	NA
A02.01 Living/Kitchen	3.2	NA	4.5	NA	6.8	NA
A02.01 Doublebed	1.6	33	2.3	46	3.7	70
A02.02 Living/Kitchen	2.3	NA	3.9	NA	5.7	NA
A02.03 Singlebed	1.2	32	2	44	3.1	62
A02.03 Doublebed	1.2	31	2	43	3.1	62
A02.03 Twin Room	0.9	34	1.7	46	2.6	63
A02.02 Doublebed	0.5	35	1.3	51	2.2	69
A02.03 Kitchen/Dining	2.8	NA	4.1	NA	6.3	NA
A02.03 Livingroom	2.2	NA	3.9	NA	5.7	NA
A03.01 Living/Kitchen	3.2	NA	5	NA	6.6	NA
A03.02 Singlebed	1.4	34	2.1	46	3.4	68
A03.02 Doublebed	1.4	34	2.3	45	3.5	64
A03.02 Twin Room	1.1	36	1.9	50	2.8	69
A03.01 Doublebed	0.8	37	1.6	53	2.7	75
A03.02 Kitchen/Dining	3.5	NA	4.5	NA	6.8	NA
A03.02 Livingroom	2.9	NA	4.6	NA	6.6	NA

Block B/C Overheating Results

2050	DSY1		DSY2		DSY3	
Block B / C	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
B00.01 Living/Kitchen	0	NA	0.1	NA	0	NA
B00.01 Doublebed	0	14	0	32	0	49
B01.01 Doublebed	0.8	53	1.3	58	2.2	87
B01.01 Living/Dining	1.6	NA	2.9	NA	3.6	NA
B01.01 Twin Room	0.4	36	0.9	50	1.3	75
B01.01 Singlebed	0.3	30	0.7	45	0.8	67
B01.01 Kitchen	3.5	NA	3.7	NA	5.3	NA
B01.03 Doublebed	0	28	0.1	46	0.2	67
B01.03 Twin Room	0.2	33	0.6	52	0.7	76
B01.03 Living/Kitchen	0.9	NA	2.1	NA	2.6	NA
B01.02 Kitchen	0.1	NA	0.8	NA	0.7	NA
B01.02 Twin Room	0.5	48	1	58	1.4	80
B00.02 Twin Room	0	31	0.4	42	0.2	57
B00.02 Doublebed	0.4	38	0.9	45	0.9	67
B00.02 LKD	0	NA	0.4	NA	0.2	NA
B01.02 Living/Dining	0.1	NA	0.9	NA	0.8	NA
B01.02 SingleBed	0	25	0.1	44	0	55
B01.02 Doublebed	0.5	32	1	46	1.4	69
B02.01 Doublebed	0.9	54	1.4	58	2.2	88
B02.01 Living/Dining	1.8	NA	3	NA	3.7	NA
B02.01 Twin Room	0.5	36	0.9	51	1.4	76
B02.01 Singlebed	0.3	31	0.7	45	0.9	69
B02.01 Kitchen	3.8	NA	3.9	NA	5.5	NA
B02.03 Doublebed	0	33	0.3	49	0.5	71
B02.03 Twin Room	0.3	36	0.7	53	1	77
B02.03 Living/Kitchen	0.9	NA	2.2	NA	2.9	NA
B02.02 Kitchen	0.2	NA	0.8	NA	0.8	NA
B02.02 Twin Room	0.5	49	1.1	59	1.5	81
B02.02 Living/Dining	0.3	NA	1.1	NA	1.1	NA
B02.02 SingleBed	0	29	0.1	49	0.1	60
B02.02 Doublebed	0.5	32	1.1	48	1.6	70
B03.01 Doublebed	1.4	55	1.7	64	2.7	94
B03.01 Living/Dining	3.2	NA	4.1	NA	5.6	NA
B03.01 Twin Room	0.6	39	1.1	53	1.7	79
B03.01 Singlebed	0.5	35	0.9	50	1.3	76
B03.01 Kitchen	4.7	NA	4.8	NA	6.5	NA
B03.03 Doublebed	0.4	41	0.7	53	1.1	82
B03.03 Twin Room	0.6	48	1.3	58	1.7	84
B03.03 Living/Kitchen	1.8	NA	3.4	NA	4.5	NA
B03.02 LKD	2.1	NA	4	NA	5	NA
B03.02 Doublebed	0.5	34	1.2	48	1.4	63
B03.02 Twin Room	0.5	38	1.3	50	1.4	71

Block D Overheating Results

2080	DSY1		DSY2		DSY3	
Block D	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
H01.06 GF Kitchen	4.8	NA	6.3	NA	8.5	NA
H01.06 GF Living / Dining	5	NA	6.6	NA	8.8	NA
H01.02 GF Kitchen	3	NA	5.7	NA	7.1	NA
H01.02 GF Living / Dining	3.2	NA	6.1	NA	7.5	NA
H01.06 1F Doublebed	3.3	98	4	109	5.4	145
H01.06 1F Twin room	3.1	94	3.9	104	5.4	140
H01.06 1F Singlebed	3.2	101	3.9	108	5.4	150
H01.02 1F Doublebed	2.1	93	3.6	112	4.6	147
H01.02 1F Singlebed	2.3	86	3.7	108	4.8	141
H01.02 1F Twin Room	2	91	3.5	107	4.6	143
2F 02.03 LKD	7.2	NA	7.4	NA	10.2	NA
2F 02.03 Doublebed	2.9	111	3.6	116	5.3	158
2F 02.03 Twin room	2.8	121	3.6	130	5.1	171
2F 02.02 Doublebed	2.1	118	3.4	122	4.7	171
2F 02.02 LKD	4.4	NA	6.3	NA	8.5	NA
2F 02.01 Twin Room	2.6	96	3.6	103	5.2	146
2F 02.01 Doublebed	2.7	110	3.6	118	5.1	161
2F 02.01 LKD	6.2	NA	6.9	NA	9.7	NA
D00.01 Twin Room	4.3	110	4.4	119	6	160
D00.01 Doublebed	3.9	109	4.2	118	5.9	157
D00.01 LKD	7.4	NA	7.6	NA	10.7	NA
D01.02 Singlebed	2.6	93	3.6	105	5	139
D01.02 Kitchen	5.1	NA	6.7	NA	9.1	NA
D01.02 Livingroom	4.5	NA	6.6	NA	8.8	NA
D01.02 Doublebed	2.8	95	3.8	105	5	143
D01.02 Twin Bed	2.3	108	3.5	121	4.7	159
D02.02 Singlebed	3.5	113	4.1	124	5.8	161
D02.02 Kitchen	7.3	NA	7.5	NA	10.5	NA
D02.02 Livingroom	7	NA	7.6	NA	10.6	NA
D02.02 Doublebed	4.1	115	4.3	122	5.9	166
D02.02 Twin Bed	3.4	143	4	137	5.8	191

A.7.3.1 2080 Weather Scenario

Block A Overheating Results

2080	DSY1		DSY2		DSY3	
Block A	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
A00.01 Twin Room	0.8	88	1.3	103	1.2	131
A00.01 Doublebed	0.7	84	1.1	99	1	129
A01.01 Living/Kitchen	7.4	NA	7.6	NA	10.1	NA
A01.01 Doublebed	4.2	91	4.1	101	5.6	138
A01.02 Living/Kitchen	6.1	NA	6.8	NA	8.7	NA
A01.03 Singlebed	3.3	99	3.5	103	4.7	142
A00.01 2B4P LKD	1.6	NA	3	NA	3.6	NA
A01.03 Doublebed	3.1	90	3.5	100	4.8	132
A01.03 Twin Room	2.3	105	3	110	4.2	144
A01.02 Doublebed	2	100	2.8	115	3.9	147
A01.03 Kitchen/Dining	6.6	NA	7	NA	9.4	NA
A01.03 Livingroom	5.6	NA	6.3	NA	8.6	NA
A02.01 Living/Kitchen	7.6	NA	7.7	NA	10	NA
A02.01 Doublebed	4.4	96	4.1	103	5.7	138
A02.02 Living/Kitchen	6.3	NA	6.9	NA	8.8	NA
A02.03 Singlebed	3.4	100	3.5	103	4.8	142
A02.03 Doublebed	3.3	90	3.5	101	4.9	132
A02.03 Twin Room	2.5	107	3	110	4.3	144
A02.02 Doublebed	2.1	103	2.9	115	4.1	150
A02.03 Kitchen/Dining	6.9	NA	7.1	NA	9.5	NA
A02.03 Livingroom	6	NA	6.4	NA	8.8	NA
A03.01 Living/Kitchen	8	NA	7.8	NA	10	NA
A03.02 Singlebed	3.9	104	3.9	109	5.2	147
A03.02 Doublebed	3.8	94	3.9	105	5.3	137
A03.02 Twin Room	3.1	111	3.3	112	4.5	149
A03.01 Doublebed	2.6	110	3.3	119	4.4	151
A03.02 Kitchen/Dining	7.7	NA	7.6	NA	10.1	NA
A03.02 Livingroom	7.2	NA	7.3	NA	9.7	NA

Block B/C Overheating Results

2080	DSY1		DSY2		DSY3	
Block B / C	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
B00.01 Living/Kitchen	0.5	NA	1.7	NA	0.9	NA
B00.01 Doublebed	0	55	0.1	89	0	117
B01.01 Doublebed	2.5	140	3	134	3.8	179
B01.01 Living/Dining	4.8	NA	5.5	NA	6.8	NA
B01.01 Twin Room	1.3	115	2.1	119	3	153
B01.01 Singlebed	1	103	1.8	115	2.4	143
B01.01 Kitchen	7.5	NA	6.7	NA	9.4	NA
B01.03 Doublebed	0.5	106	0.8	119	1	150
B01.03 Twin Room	1	119	1.6	122	2.4	163
B01.03 Living/Kitchen	2.8	NA	4.4	NA	5.5	NA
B01.02 Kitchen	0.9	NA	2.2	NA	2.3	NA
B01.02 Twin Room	1.5	138	2.5	133	3.3	171
B00.02 Twin Room	0.8	100	1.4	108	1.8	131
B00.02 Doublebed	1.2	109	2.3	110	2.9	141
B00.02 LKD	1.1	NA	1.9	NA	2.2	NA
B01.02 Living/Dining	1.3	NA	2.8	NA	3	NA
B01.02 SingleBed	0.3	99	0.7	110	0.6	137
B01.02 Doublebed	1.3	100	2.6	111	3.1	142
B02.01 Doublebed	2.7	140	3.1	135	3.9	179
B02.01 Living/Dining	5	NA	5.6	NA	6.9	NA
B02.01 Twin Room	1.3	117	2.2	120	3.2	154
B02.01 Singlebed	1.1	103	1.9	115	2.4	146
B02.01 Kitchen	7.9	NA	6.8	NA	9.6	NA
B02.03 Doublebed	0.8	114	1.1	121	1.5	157
B02.03 Twin Room	1.1	124	1.9	122	2.6	163
B02.03 Living/Kitchen	3.1	NA	4.6	NA	5.7	NA
B02.02 Kitchen	1	NA	2.3	NA	2.3	NA
B02.02 Twin Room	1.5	139	2.6	133	3.4	172
B02.02 Living/Dining	1.5	NA	3	NA	3.4	NA
B02.02 SingleBed	0.4	112	0.7	113	0.7	143
B02.02 Doublebed	1.4	100	2.7	112	3.4	142
B03.01 Doublebed	3.5	147	3.6	142	4.5	189
B03.01 Living/Dining	7.5	NA	6.9	NA	8.9	NA
B03.01 Twin Room	1.9	126	2.6	123	3.5	159
B03.01 Singlebed	1.2	115	2.3	118	3.1	152
B03.01 Kitchen	9.4	NA	7.9	NA	10.8	NA
B03.03 Doublebed	1.1	133	1.9	129	2.6	169
B03.03 Twin Room	1.9	136	2.8	132	3.6	171
B03.03 Living/Kitchen	5.4	NA	6.5	NA	7.8	NA
B03.02 LKD	6.2	NA	7.1	NA	8.5	NA
B03.02 Doublebed	1.5	102	2.7	106	3.3	136
B03.02 Twin Room	1.7	112	2.8	116	3.5	146

Block D Overheating Results

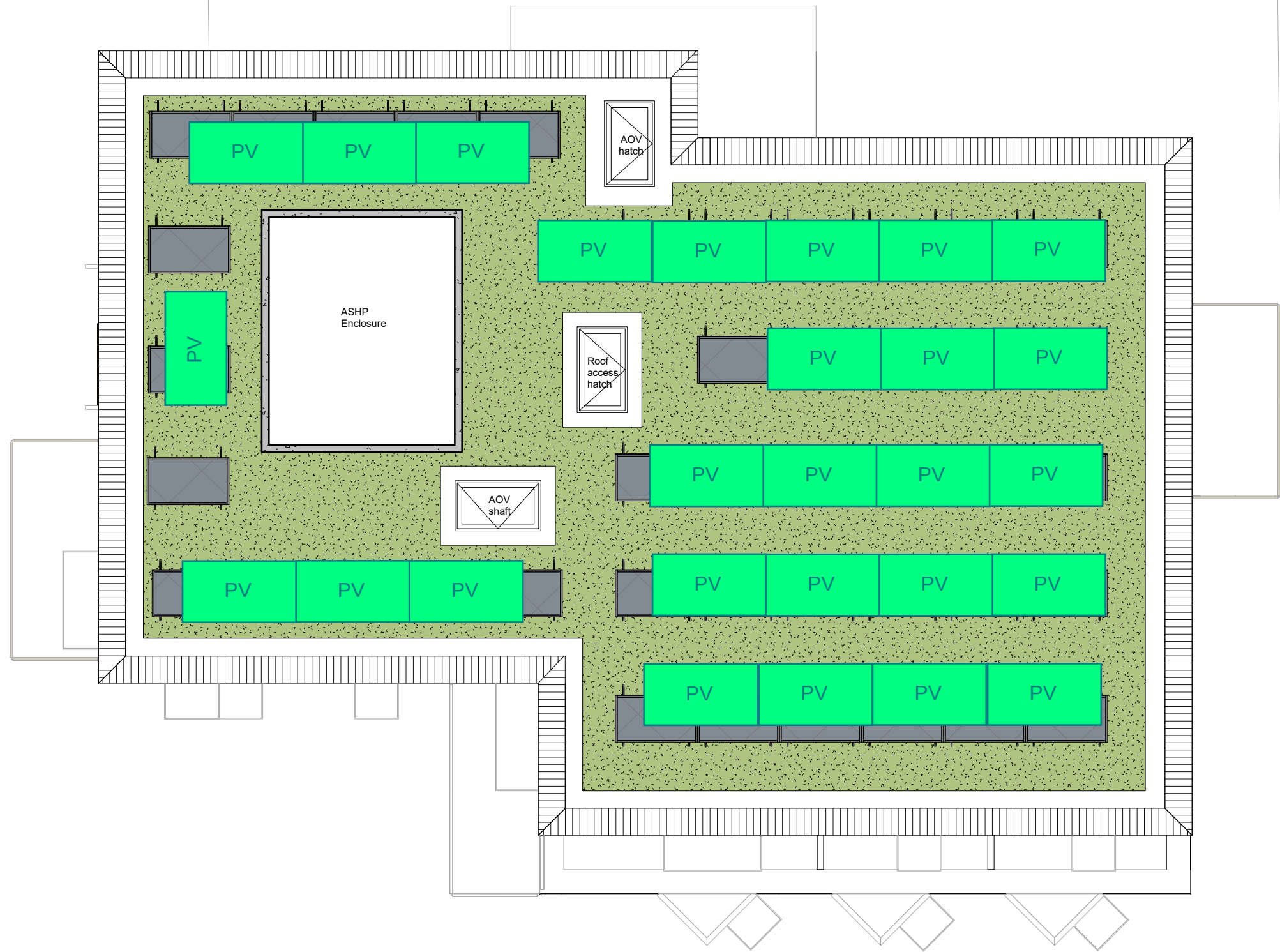
2080	DSY1		DSY2		DSY3	
Block D	Criteria a	Criteria b	Criteria a	Criteria b	Criteria a	Criteria b
Room Name	= < 3.0	< 33	= < 3.0	< 33	= < 3.0	< 33
H01.06 GF Kitchen	4.8	NA	6.3	NA	8.5	NA
H01.06 GF Living / Dining	5	NA	6.6	NA	8.8	NA
H01.02 GF Kitchen	3	NA	5.7	NA	7.1	NA
H01.02 GF Living / Dining	3.2	NA	6.1	NA	7.5	NA
H01.06 1F Doublebed	3.3	98	4	109	5.4	145
H01.06 1F Twin room	3.1	94	3.9	104	5.4	140
H01.06 1F Singlebed	3.2	101	3.9	108	5.4	150
H01.02 1F Doublebed	2.1	93	3.6	112	4.6	147
H01.02 1F Singlebed	2.3	86	3.7	108	4.8	141
H01.02 1F Twin Room	2	91	3.5	107	4.6	143
2F 02.03 LKD	7.2	NA	7.4	NA	10.2	NA
2F 02.03 Doublebed	2.9	111	3.6	116	5.3	158
2F 02.03 Twin room	2.8	121	3.6	130	5.1	171
2F 02.02 Doublebed	2.1	118	3.4	122	4.7	171
2F 02.02 LKD	4.4	NA	6.3	NA	8.5	NA
2F 02.01 Twin Room	2.6	96	3.6	103	5.2	146
2F 02.01 Doublebed	2.7	110	3.6	118	5.1	161
2F 02.01 LKD	6.2	NA	6.9	NA	9.7	NA
D00.01 Twin Room	4.3	110	4.4	119	6	160
D00.01 Doublebed	3.9	109	4.2	118	5.9	157
D00.01 LKD	7.4	NA	7.6	NA	10.7	NA
D01.02 Singlebed	2.6	93	3.6	105	5	139
D01.02 Kitchen	5.1	NA	6.7	NA	9.1	NA
D01.02 Livingroom	4.5	NA	6.6	NA	8.8	NA
D01.02 Doublebed	2.8	95	3.8	105	5	143
D01.02 Twin Bed	2.3	108	3.5	121	4.7	159
D02.02 Singlebed	3.5	113	4.1	124	5.8	161
D02.02 Kitchen	7.3	NA	7.5	NA	10.5	NA
D02.02 Livingroom	7	NA	7.6	NA	10.6	NA
D02.02 Doublebed	4.1	115	4.3	122	5.9	166
D02.02 Twin Bed	3.4	143	4	137	5.8	191

Appendix A.8 – Drawings

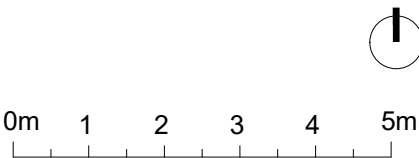


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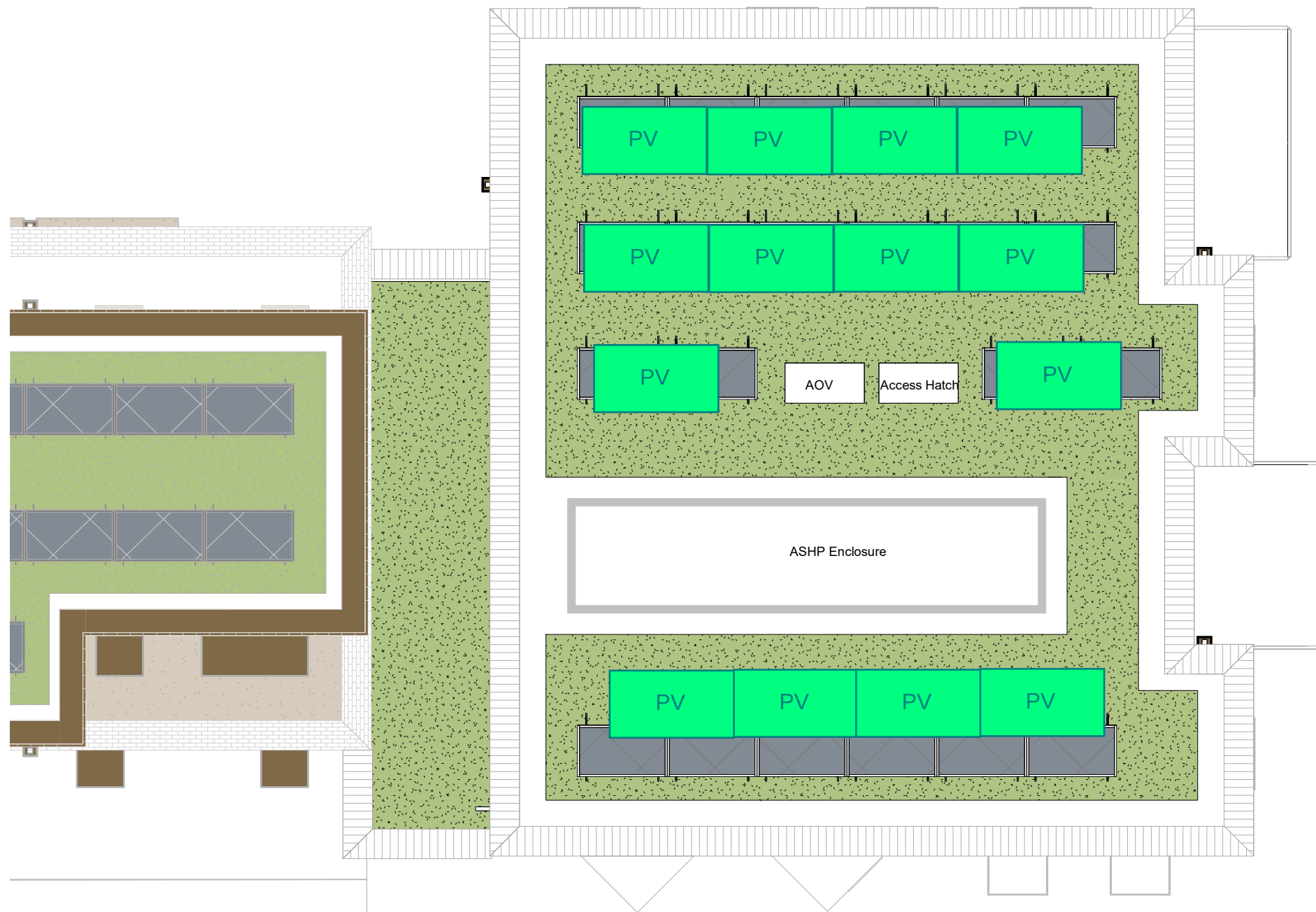
STATUS (INFO)			
 10 Aldersgate Street, London EC1A 4HJ. Telephone: +44 (0)20 7831 7969 www.meinhardt.co.uk			
PROJECT Brunel Walk			
CLIENT London Borough of Haringey			
TITLE Block A - PV LAYOUT			
DISCIPLINE ENERGY	DATE 12/08/22	SCALE @ A3 1:100	
DRAWN WN	DESIGNED WN	CHECKED RD	APPROVED RD
XXXX-00-00-00-001			ISSUE P01



1 Blocks B & C - Proposed Roof Plan



STATUS (INFO)		
 10 Aldersgate Street, London EC1A 4HJ. Telephone: +44 (0)20 7831 7969 www.meinhardt.co.uk		
PROJECT Brunel Walk		
CLIENT London Borough of Haringey		
TITLE Block B/C - PV LAYOUT		
DISCIPLINE ENERGY	DATE 17/08/22	SCALE @ A3 1:100
DRAWN WN	DESIGNED WN	CHECKED RD
APPROVED RD		ISSUE P01
XXXX-00-00-00-002		



- 1B 2P
- 2B 3/4P
- 3B 4/5P
- 4B 5/6/7P
- Circulation
- Service
- Ancillary



1 Block D1 - Proposed Roof Plan

STATUS (INFO)

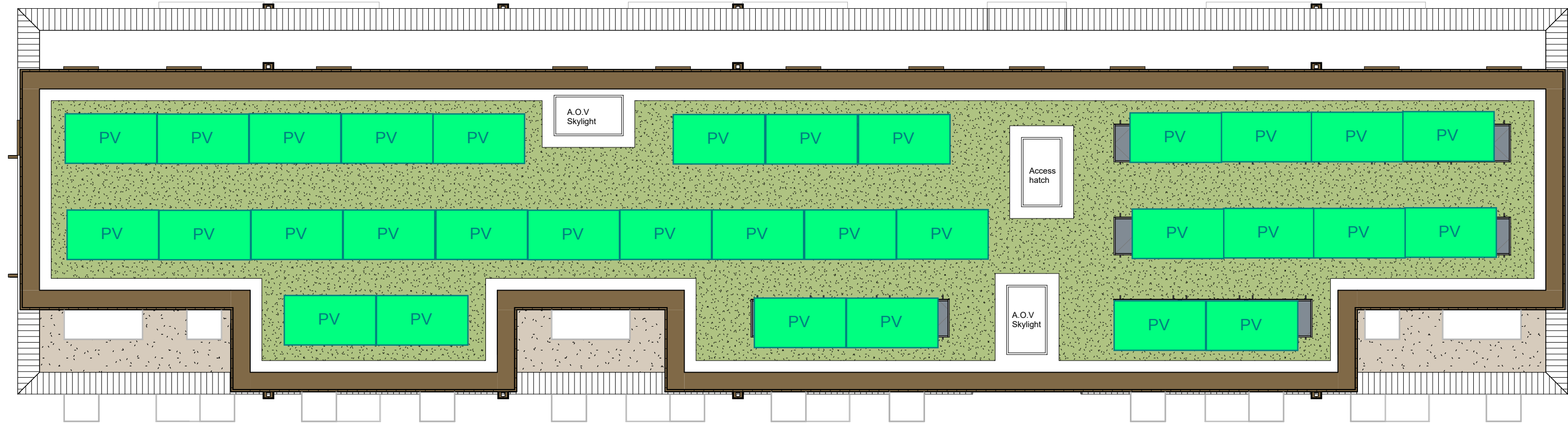


PROJECT
Brunel Walk

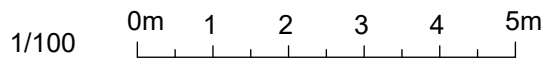
CLIENT
London Borough of Haringey

TITLE
Block D (Flats) - PV LAYOUT

DISCIPLINE ENERGY		DATE 17/08/22	SCALE @ A3 1:100
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1 **Block D_Roof Plan**
1 : 100



STATUS (INFO)



PROJECT
Brunel Walk

CLIENT
London Borough of Haringey

TITLE
Block D (Mews) - PV LAYOUT

DISCIPLINE
ENERGY

DATE
17/08/22

SCALE @ A3
1:100

DRAWN
WN

DESIGNED
WN

CHECKED
RD

APPROVED
RD

ISSUE
XXXX-00-00-00-003

ISSUE
P01



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