CCA
Energy & Environmental Consultants

One Vinyl Square

ARJ Construction Limited

Energy Statement

Revision 001 ISSUE

12/01/2023

CCA Environmental Limited
Environmental & Sustainability Building Consultants

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Revision	Description	Date	Prepared By
01	Issue	12.01.23	NB
00	Issue	06.12.22	NB

Contents

1. Executive Summary

CCA Environmental Limited has prepared this Energy Statement on behalf of ARJ Construction Limited to satisfy a planning condition associated with the proposed development at 1 Vinyl Square, The Old Vinyl Factory, Blyth Road, Hayes. The Applicant is seeking to discharge Condition 7 relating to planning application reference 59872/APP/2019/3852 as shown below.

7 - Prior to above ground works, an energy assessment shall be submitted to and approved in writing by the Local Planning Authority. The energy assessment shall provide full details and specifications of all the measures to be implemented on site to demonstrate the development will achieve the energy reduction targets of the London Plan Policy 5.2. The assessment shall demonstrate at least a 35% saving onsite with any shortfall being made up through an offsite contribution. The details within the assessment must include: 1. A full and clear baseline of the energy (kwhr) and carbon (tCO2) associated with the development assessment against building regulations 2013. 2. Full details of the energy efficiency measures to be incorporated within the development and their impact on the baseline energy and carbon performance. 3. Full details (including plans, elevations and roof plans) and specifications of the low and zero carbon technology to be incorporated within the development and the impact on the baseline energy and carbon performance. The development must proceed in accordance with the approved assessment, plans and specifications.

REASON. To ensure the development contributes to the reduction of carbon emissions in accordance with Policy 5.2 of the London Plan (2016) and Policy DMEI 2 of the Hillingdon Local Plan: Part 2 Development Management Policies (January 2020).

The proposal includes Redevelopment of the Site to provide a mixed-use development comprising 134 residential units (C3 Use Class) and ground floor commercial floorspace (flexible A1/A2/A3/A5/B1 Use Class), with associated car parking, cycle parking and landscaping, hereafter referred to as the 'Development'.

Figure 1.1 – Proposed development illustration

The primary target is to achieve 'zero carbon' for the new build residential aspects, corresponding to a 100% reduction in regulated CO_2 emissions beyond the requirements of the Building Regulations Part L (2013) and a 35% reduction for commercial areas, following the Greater London Authority guidance on preparing energy assessments as part of planning applications, Greater London Authority, March 2016.

Energy Reduction Targets

The regulated CO_2 emissions reduction targets are as follows.

Major domestic development → Zero carbon (minimum 35% achieved onsite)
Non-domestic development → 35% Beyond Part L 2013 of the Building Regulations

Energy Reduction Measures

The Applicant is committed to reducing the development's energy demand and CO_2 emissions. The following measures are proposed to that effect.

Be Lean – Reduce Energy Demand

Passive design measures to be implemented at the Proposed Development include:

- Good building fabric performance, improving upon Part L 2013 notional building u-values and air permeability
- Mechanical ventilation with high-efficiency heat recovery
- Openable windows and natural ventilation where possible to reduce cooling demand
- Low-energy lighting throughout
- No cooling proposed to the residential scheme

These measures are expected to lead to a 10.3% carbon emission reduction before the communal energy system connection or use of low and zero-carbon technologies.

Be Clean – Supply Energy Efficiency

- A sitewide communal energy system comprises combined heat and power units with a heat to power ratio of 1.25 and a high-efficiency boiler plant.
- The primary plant and equipment forming the energy centre will include:
    - CHP unit
    - Thermal storage vessels
    - Gas-fired boilers
    - Variable speed primary and secondary distribution pumps
    - Gas meters and controls

Connection to the side-wide communal energy system is expected to result in significant carbon emission reductions of approx. 24.5% compared to the Part L' baseline'.

Be Green – Use Renewable Energy

An appraisal of available renewable energy solutions has previously been carried out, which has identified the following technologies as the most appropriate for the development.

- 15,000 kWp Solar PV array of 59 panels

This is expected to result in a further sitewide carbon emission reduction of 3.9%.

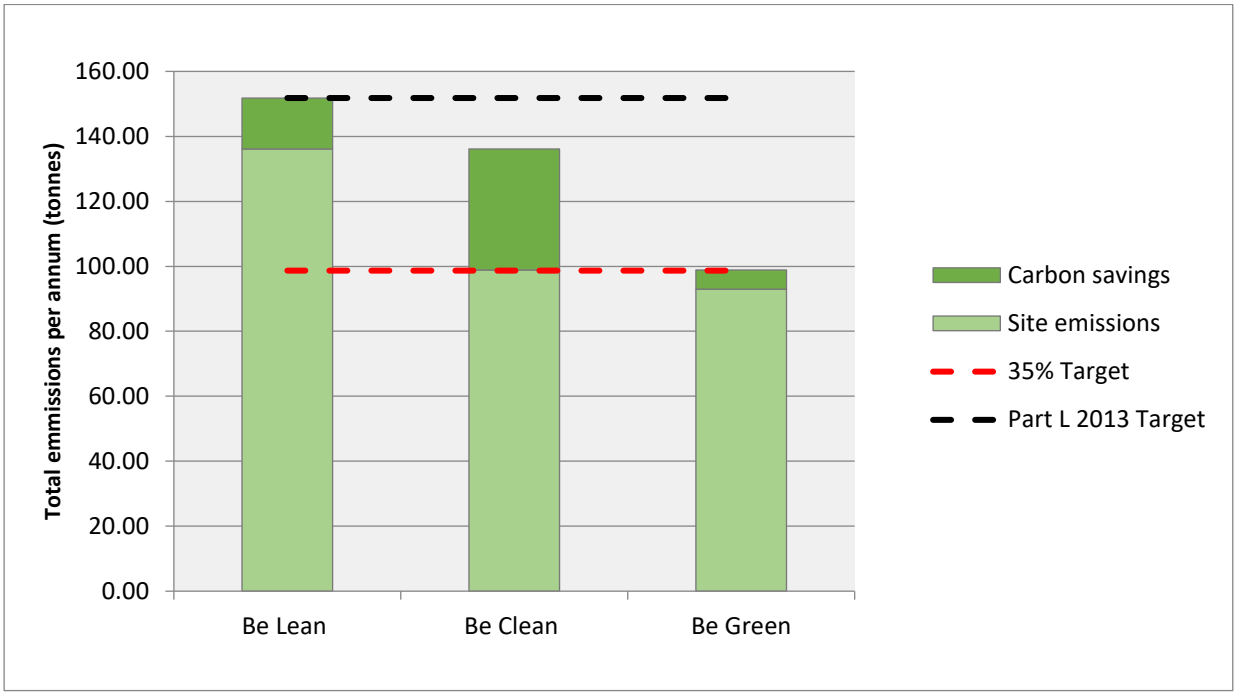
The tables below outline the onsite savings for domestic and non-domestic areas and the zero-carbon target shortfall used to calculate a total carbon offset payment of £155,376*

	Carbon dioxide emissions for domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Building Regulations 2013 Part L Compliant Development	140.2	165.1
After energy efficiency measures, savings	129.2	165.1
After CHP savings	91.9	165.1
After renewable energy savings	86.3	165.1
	Regulated domestic carbon dioxide savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	11.0	7.87
Savings from heat network / CHP	37.2	26.6
Savings from renewable energy	5.6	4.0
Cumulative onsite savings	**53.9**	**38.4**
Annual Savings from offset payment	86.3	-
Offset Payment	£155,376*	

Table 1.1 – Regulated domestic carbon dioxide savings from each stage of the energy hierarchy for the development

	Carbon dioxide emissions for non-domestic buildings (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Building Regulations 2013 Part L Compliant Development	11.6	13.3
After energy efficiency measures, savings	7.0	13.3
After CHP savings	7.0	13.3
After renewable energy savings	6.7	13.3
	Regulated non-domestic carbon dioxide savings	
	Tonnes CO_2 per annum	%
Savings from energy demand reduction	4.6	39.99
Savings from heat network / CHP	0.0	0.0
Savings from renewable energy	0.2	2.1
Cumulative onsite savings	**4.9**	**42.1**

Table 1.2 – Regulated non-domestic carbon dioxide savings from each stage of the energy hierarchy for the development



Graph 1.1 – Regulated sitewide carbon dioxide savings from each stage of the energy hierarchy

The development, as proposed, will deliver a sitewide CO_2 reduction of 38.7%, exceeding the requirements by the Building Regulations and the London Plan targets set for onsite carbon emission reductions.

**As noted in previous energy statements submitted for planning, the MTT energy centre S106 agreement report found in Appendix H confirms that the carbon saving from utilising the energy centre for the demands of this development exceeds the threshold of 394 tCO2 per annum outlined in Criterion 5, Section 13 of the S106 Agreement, requiring any shortfall being offset with a financial contribution. Subsequently, we believe that no carbon offset payment is required.*

2. Introduction

CCA Environmental Limited has prepared this Energy Statement on behalf of ARJ Construction Limited to satisfy a planning condition associated with the proposed development at 1 Vinyl Square, The Old Vinyl Factory, Blyth Road, Hayes. The Applicant is seeking to discharge Condition 7 relating to planning application reference 59872/APP/2019/3852.

Figure 2.1 – Proposed development illustration

The proposal includes Redevelopment of the Site to provide a mixed-use development comprising 134 residential units (C3 Use Class) and ground floor commercial floorspace (flexible A1/A2/A3/A5/B1 Use Class), with associated car parking, cycle parking and landscaping., hereafter referred to as the 'Development'.

Figure 2.2 – Proposed massing

3. Planning

London Borough of Hillingdon Local Plan Part 2

Policy DMEI 2 (Reducing Carbon Emissions) of the London Borough of Hillingdon's Local Plan Part 2 stipulates the following:

A) All developments are required to make the fullest contribution to minimising carbon dioxide emissions following London Plan targets.

B) All major development proposals must be accompanied by an energy assessment showing how these reductions will be achieved.

C) Proposals that fail to take reasonable steps to achieve the required savings will be resisted. However, where it is demonstrated that the targets for carbon emissions cannot be met onsite, the Council may approve the application and seek an off-site contribution to compensate for the shortfall.

Regional Planning Policy – Greater London Authority

The London Plan is the overall strategic plan for London, and it sets out a fully integrated economic, environmental, transport and social framework for the development of the capital to 2031. It forms part of the development plan for Greater London. The first London Plan was published in 2004, with the latest version published in March 2015. One of the main objectives of the London Plan is to improve the environment and reduce climate change by reducing CO_2 emissions.

Policy 5.2 Minimising carbon dioxide emissions sets a 'Zero Carbon' target reduction in CO_2 emissions for new build' Residential Buildings'. The energy assessment SPG defines 'Zero Carbon' homes as those where the residential element of the application achieves at least 35% CO_2 emissions reduction onsite, with the remainder achieved by a combination of off-site measures and cash in lieu payment (currently set at £1,800 per tonne of CO_2 of remaining emissions to achieve a total reduction of 100%).

Policy 5.2 Minimising carbon dioxide emissions

Developments should minimise CO_2 emissions in accordance with the following energy hierarchy:

1. **Be Lean:** Use less energy
2. **Be Clean:** Supply energy efficiently
3. **Be Green:** use renewable energy

The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations.

Residential Buildings	Non-Domestic Buildings
Target: 'zero carbon' development A definition of 'zero carbon homes is provided within the Energy Planning document as follows; *'Zero carbon homes are homes … where the residential element … achieves at least 35% reduction in regulated CO_2 emissions (beyond Part L 2013) on Site. The remaining regulated CO_2 emissions, to 100%, are to be offset through a cash in-lieu contribution.'*	Target: As per building regulations requirements Further guidance in the Energy Planning document stipulates that the *'GLA will continue to require that non-domestic development seek to achieve a 35% reduction against Part L 2013*'. It is explained that the building regulations at the time of setting this target were expected to improve. Still, since this has not been the case and to ensure a continued 'smooth trajectory towards a zero-carbon standard, the 35% target is expected to be met.

Major development proposals should include a detailed energy assessment to demonstrate how targets are met within the framework of the energy hierarchy.

Energy assessments should include the following:

a. Energy demand and CO_2 emissions of regulated consumption as well as any other plant or equipment.
b. Proposals to reduce CO_2 emissions through the energy-efficient design of the Site, buildings, and services.
c. Proposals to reduce CO_2 emissions using decentralised energy where feasible.
d. Proposal to reduce CO_2 emissions using onsite renewable energy technologies.

The reduction targets should be met onsite. Where it is clearly demonstrated that the specific targets cannot be fully achieved onsite, any shortfall may be provided off-site or through a cash-in-lieu contribution to the relevant borough and ring-fenced to secure delivery of CO_2 savings elsewhere.

Policy 5.3 - Sustainable design and construction

The highest standards of sustainable design and construction should be achieved in London to improve the environmental performance of new developments and adapt to the effects of climate change over their lifetime.

Development proposals should demonstrate that sustainable design standards are integral to the the proposal, including its construction and operation, and ensure that they are considered at the beginning of the design process.

Major development proposals should meet the minimum standards outlined in the Mayor's supplementary planning guidance, which should be demonstrated within a design and access statement. The criteria include measures to achieve other policies in this plan and the following sustainable design principles:

a. minimising carbon dioxide emissions across the Site, including the building and services (Such as heating and cooling systems)
b. avoiding internal overheating and contributing to the urban heat island effect
c. efficient use of natural resources (including water), including making the most of natural systems both within and around buildings
d. minimising pollution (including noise, air and urban runoff)
e. minimising the generation of waste and maximising reuse or recycling
f. avoiding impacts from natural hazards (including flooding)
g. ensuring developments are comfortable and secure for users, including avoiding the creation of adverse local climatic conditions
h. securing sustainable procurement of materials, using local supplies where feasible
i. promoting and protecting biodiversity and green infrastructure.

Policy 5.6 Decentralised Energy in Development Proposals

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

Energy systems should be selected following the following hierarchy:

1. Connection to existing heating or cooling networks.
2. Sitewide CHP network.
3. Communal heating and cooling.

Where future network opportunities are identified, proposals should be designed to connect to these networks.

Policy 5.7 – Renewable Energy

Within the framework of the energy hierarchy, major development proposals should provide a feasible reduction in expected CO_2 emissions through onsite renewable energy generation. All renewable energy systems should be located and designed to minimise any potential adverse impacts on biodiversity, the natural environment, and historic assets and to avoid any adverse impacts on air quality.

Policy 5.9 – Overheating and Cooling

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

1. Minimise internal heat generation through energy-efficient design.
2. Reduce summer heat entering a building through orientation, shading, albedo, fenestration, insulation, green roofs, and walls.
3. Manage the heat within the building through exposed internal thermal mass and high ceilings.
4. Passive ventilation.
5. Mechanical ventilation.
6. Active cooling systems.

Major development proposals should demonstrate how the development's design, materials, construction, and operation would minimise overheating and meet its cooling needs. New development in London should also be designed to avoid the need for energy-intensive air conditioning systems as much as possible.

Energy Reduction Targets

The regulated CO_2 emissions reduction targets are as follows.

Major domestic development	→	Zero carbon (minimum 35% achieved onsite)
Non-domestic development	→	35% Beyond Part L 2013 of the Building Regulations

The energy strategy for the development follows the energy hierarchy of 'Be Lean', 'Be Clean', and 'Be Green' as set out within the London Plan. The Development's CO_2 emissions are evaluated at each stage of the hierarchy, and the percentage reduction achieved for the measures applied is reported.

4. Assessment Methodology

Regulated energy use and the associated CO_2 emissions have been calculated using the Government's Standard Assessment Procedure (SAP) using SAP2012 Calculator (Design System) version 4.14r19 residential dwellings software and the Dynamic Simulation Model methodology using IES Virtual Environment version 7.0.17 software for the commercial space. The CO_2 emissions are evaluated at each stage of the energy hierarchy.

All total development CO_2 emissions reported are based on the outputs from the BRUKL report and SAP worksheets using the Building Emissions Rate (BER) and Dwelling Emissions Rate (DER), respectively. SAP assessments have been completed for all residential dwellings and block compliance worksheets have been included within this report for compactness.

Please note the SAP calculations and DSM model has been constructed in compliance with the 'National Calculation Methodology' and therefore include minor geometric simplifications resulting in a slight variance in floor area.

Carbon Dioxide Emission Factors

The SAP and BRUKL reports have been generated using software that uses the SAP Guidance 2012 carbon emission factors for gas and electricity.

Fuel	Emission Factor ($kgCO_2/kWh$)
	SAP 2012
Natural Gas	0.216
Grid Supplied (or Displaced) Electricity	0.519

Table 4.1 - CO_2 Emission Factors

Part L 2013 Baseline

Following the 2016 GLA Energy Planning Guidance on producing energy statements, Part L compliant calculations have been completed to provide the baseline, i.e., 'notional' emissions for the proposed building (Domestic and Non-Domestic elements).

The baseline inputs match those of the Notional building specification, and the associated carbon emission rates can be seen in the Tables below. The baseline full assessment details can be found in the appendices.

Baseline Sitewide Results			
	Total regulated emissions (Tonnes CO_2 per year)	CO_2 Savings (Tonnes CO_2 per year)	Percentage Savings (%)
Part L 2013 Baseline	151.8		

Table 4.2 – Baseline domestic

Baseline SAP 2012 Results	
Average domestic target emission rate (TER)	15.25 $kgCO_2/m^2$

Table 4.3 – Baseline domestic

Baseline BRUKL Results	
Non-domestic target emission rate (TER)	28.5 $kgCO_2/m^2$

Table 4.4 – Baseline domestic

Be Lean (passive measures)

At the 'Be Lean' stage of the Energy Hierarchy, a fabric-first approach has been applied to minimise energy consumption and resulting CO_2 emissions. Furthermore, best practices and appropriate measures have been included in the design to minimise the environmental impact on the development as set out in Policies 5.2 and 5.3 of The London Plan 2016.

The proposed development includes a wide range of energy efficiency measures intended to reduce energy demand. The following U-values are proposed to limit heat loss through the building fabric.

Fabric Element	U-Value ($W/m^2.K$)	G-Value
External Wall (domestic/non-domestic)	0.12	
Roof	0.11	
Ground Floor	0.13	
Glazing	1.20	0.40

Table 4.5 - Fabric U Values

Reduction of solar ingress

It is expected that the glazing U-value will be 1.2 W/m²K (including frame), with a g-value of 0.40 based on a combination of aesthetic properties and overall building performance. For lower g-values, the visible light transmittance of the glass is likely reduced due to the inclusion of reflective outer surfaces or tints to control solar energy transmittance.

Fabric Air Permeability

A high level of air tightness is proposed in accordance with applicable standards, with a target of $3m^3/h/m^2$, implying that air infiltration between the internal and external environment will be largely controlled, and space heating/cooling demand will be reduced even further.

Thermal Bridging

Thermal (or cold) bridging is another significant source of home heat loss. This construction detail has a higher thermal conductivity than the surrounding materials, allowing heat to flow through with the least resistance. Thermal bridges reduce the thermal resistance of the building elements overall and should be avoided where possible to prevent unwanted heat loss. Thermal bridging has been calculated using the default y value of 0.15 due to the nature of the construction type.

Be Lean Sitewide Results			
	Total regulated emissions (Tonnes CO_2 per year)	CO_2 Savings (Tonnes CO_2 per year)	Percentage Savings (%)
Part L 2013 Baseline	151.8		
Be Lean	136.1	15.7	10.3%

Table 4.6 – Be Lean Sitewide

Be Lean SAP Results	
Baseline - Domestic target emission rate (TER) SAP 10.0	15.25 $kgCO_2/m^2$
Be Lean - Domestic dwelling emission rate (DER) SAP 10.0	14.05 $kgCO_2/m^2$
% Improvement	7.87%

Table 4.7 – Be Lean domestic

Be Lean BRUKL Results	
Baseline – Non-domestic target emission rate SAP 10.0	28.5 $kgCO_2/m^2$
Be Lean - Domestic dwelling emission rate (DER) SAP 10.0	17.1 $kgCO_2/m^2$
% Improvement	40%

Table 4.8 – Be Lean non-domestic

Be Clean (heating infrastructure)

Following the 2016 GLA Energy Planning Guidance, all planning applications must demonstrate how their energy systems have been selected in accordance with the order of preference in Policy 5.6B once the energy demand has been minimised. A Section 106 legal agreement attached to 'The Old Vinyl Factory' planning permission for the master plan includes the agreement for this development to be connected to the sitewide CHP-led energy centre. This aligns with the GLA's requirement that sitewide heat networks' connections be prioritised.

The carbon dioxide emissions for the development under the 'Be Clean' tier of the Energy Hierarchy are shown below. Block compliance worksheets and the BRUKL report showing the 'Be Clean' performance of each of the dwellings modelled, and non-domestic areas are provided in the Appendix.

Be Clean Sitewide Results			
	Total regulated emissions (Tonnes CO_2 per year)	CO_2 Savings (Tonnes CO_2 per year)	Percentage Savings (%)
Part L 2013 Baseline	151.8		
Be Lean	136.1	15.7	10.3%
Be Clean	98.9	37.2	24.5%

Table 4.9 – Be Clean Sitewide

Be Clean SAP Results	
Baseline - Domestic target emission rate (TER) SAP 10.0	15.25 $kgCO_2/m^2$
Be Lean - Domestic dwelling emission rate (DER) SAP 10.0	14.05 $kgCO_2/m^2$
Be Clean - Domestic dwelling emission rate (DER) SAP 10.0	10.00 $kgCO_2/m^2$
% Improvement	34.43%

Table 4.10 – Be Clean domestic

Be Clean BRUKL Results	
Baseline – Non-domestic BRUKL 2013 (TER)	28.5 $kgCO_2/m^2$
Be Lean – Non-domestic BRUKL (BER)	17.1 $kgCO_2/m^2$
Be Clean – Non-domestic BRUKL (BER)	17.1 $kgCO_2/m^2$
% Improvement	40%

Table 4.11 – Be Lean non-domestic

Be Green (LZC technologies)

The GLA expects all major development proposals to include onsite renewable energy generation where feasible, regardless of whether a 35% target has already been reached through the early stages of the energy hierarchy. A full review of potentially applicable renewable technologies has previously been carried out during the planning process, considering both the effectiveness and viability of the different technologies.

It is proposed that an array of photovoltaic (PV) panels be employed to provide carbon-free electricity to the domestic areas of the development. The locations of the proposed arrays are highlighted on the roof plan displayed below. The areas proposed for the PV arrays have been maximised based on the available roof space when taking the requirements for lift overruns etc. The PV coverage extends to all reasonably available roof space that is unshaded.

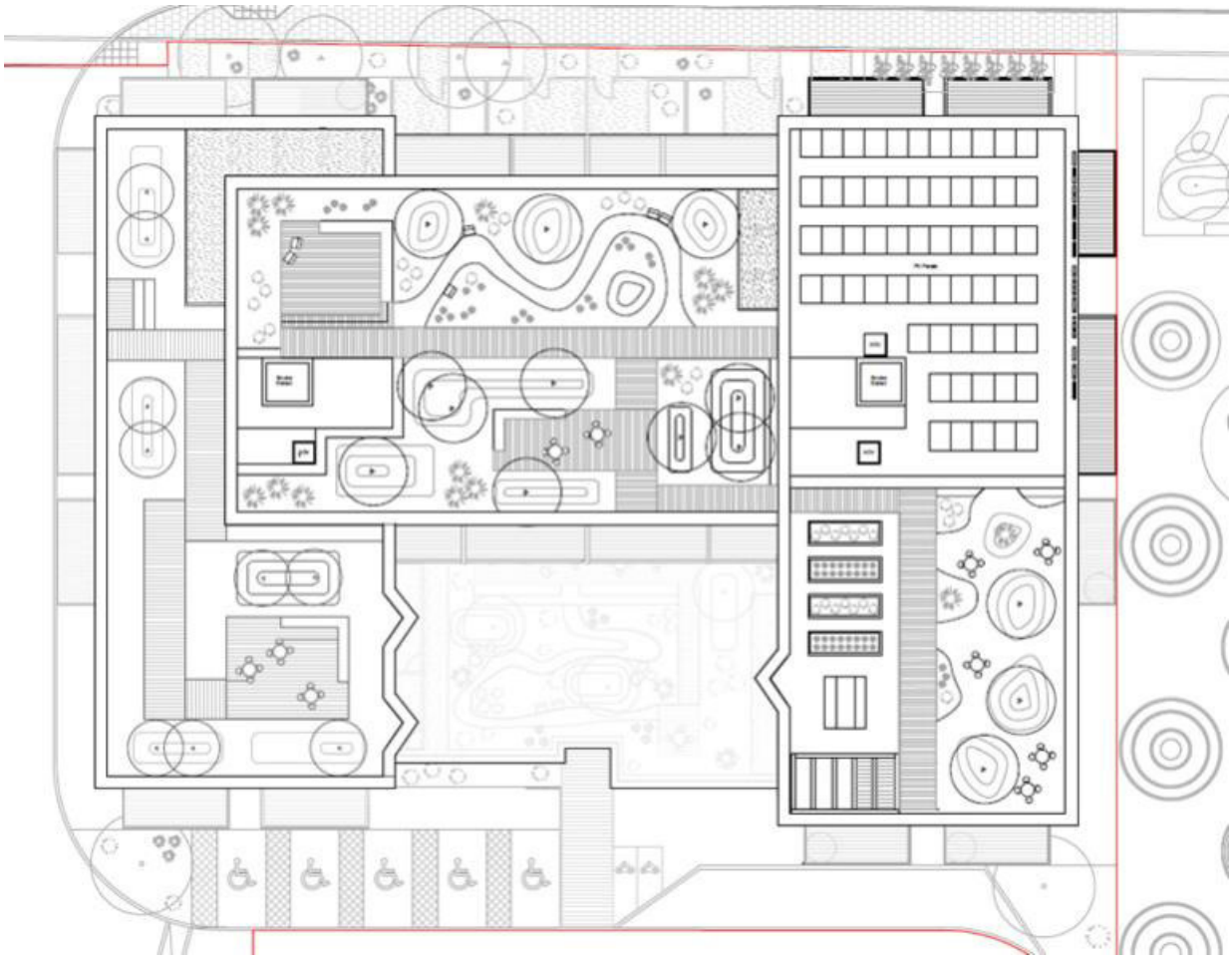


Figure 4.1 – Consented rooftop PV panel location

The PV will provide 15,000 kWp for the residential development and will be apportioned across the 134 residential units. The orientation is assumed to be SW at a 30-degree inclination angle.

The non-domestic space shall be developed as a shell only; however, the minimum MEP services for the future fit-out include VRF (heating and cooling), mechanical ventilation, and heat recovery (75% efficiency). The minimum heating and cooling SCOP/SEER shall be 3.0 and 3.5, respectively. Please refer to the Appendix for more details.

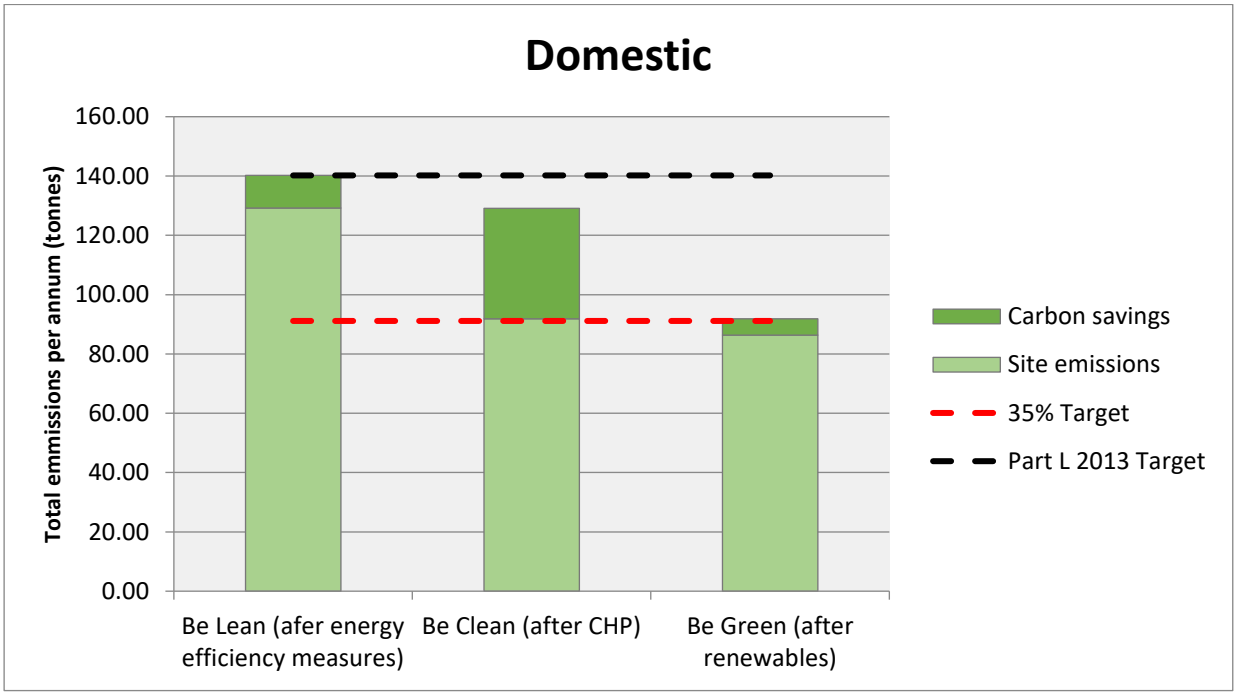
The carbon dioxide emissions for the development under the 'Be Green' tier of the Energy Hierarchy are shown below. Block compliance worksheets and the BRUKL report showing the 'Be Green' performance of each of the dwellings modelled and non-domestic areas are provided in the Appendix.

Be Green Site-wide Results			
Part L 2013 Baseline	Total regulated emissions (Tonnes CO_2 per year)	CO_2 Savings (Tonnes CO_2 per year)	Percentage Savings (%)
	151.8		
Be Lean	136.1	15.7	10.3%
Be Clean	98.9	37.2	24.5%
Be Green	93.0	5.9	3.9%

Table 4.12 – Be Clean Sitewide

Be Green SAP Results	
Baseline - Domestic target emission rate (TER) SAP 10.0	15.25 $kgCO_2/m^2$
Be Lean - Domestic dwelling emission rate (DER) SAP 10.0	14.2 $kgCO_2/m^2$
Be Clean - Domestic dwelling emission rate (DER) SAP 10.0	10.0 $kgCO_2/m^2$
Be Green - Domestic dwelling emission rate (DER) SAP 10.0	9.39 $kgCO_2/m^2$
% Improvement	38.4%

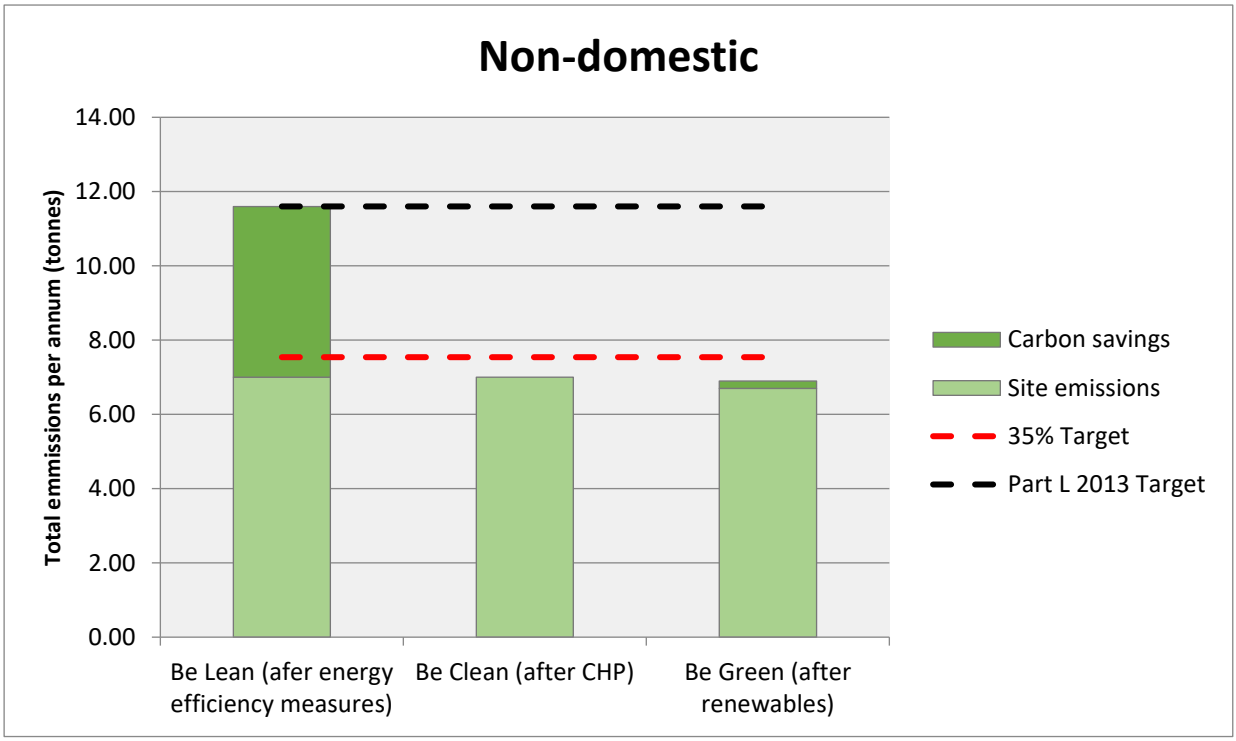
Table 4.13 – Be Green domestic



Graph 4.1 – Graph of Domestic Development Energy Hierarchy CO_2 Emissions Reduction

Be Green BRUKL Results	
Baseline – Non-domestic BRUKL 2013 (TER)	28.5 $kgCO_2/m^2$
Be Lean – Non-domestic BRUKL (BER)	17.1 $kgCO_2/m^2$
Be Clean – Non-domestic BRUKL (BER)	17.1 $kgCO_2/m^2$
Be Green - Non-domestic BRUKL (BER)	16.5 $kgCO_2/m^2$
% Improvement	42.1%

Table 4.14 – Be Green domestic



Graph 4.2 – Graph of Domestic Development Energy Hierarchy CO_2 Emissions Reduction

5. Overheating Risk Analysis

In tandem with the energy and CO_2 emissions appraisal, an assessment has been undertaken to determine the risk of summertime overheating and consider measures for minimising cooling demand (previously discharged under Condition 21 on 2nd September 2022).

This was undertaken using dynamic thermal modelling and guidance set out in CIBSE TM59 to model overheating in residential properties reliably. The most current CIBSE Design Summer Year (DSY) Weather File for London was chosen for the simulation (London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file), following CIBSE guide TM59:2017 "Design methodology for the assessment of overheating risk in homes" guidelines.

- DSY1. 1989: a moderately warm summer (current design year for London).

- DSY2. 1976: a year with a prolonged period of sustained warmth.

- DSY3. 2003: a year with a very intense single warm spell.

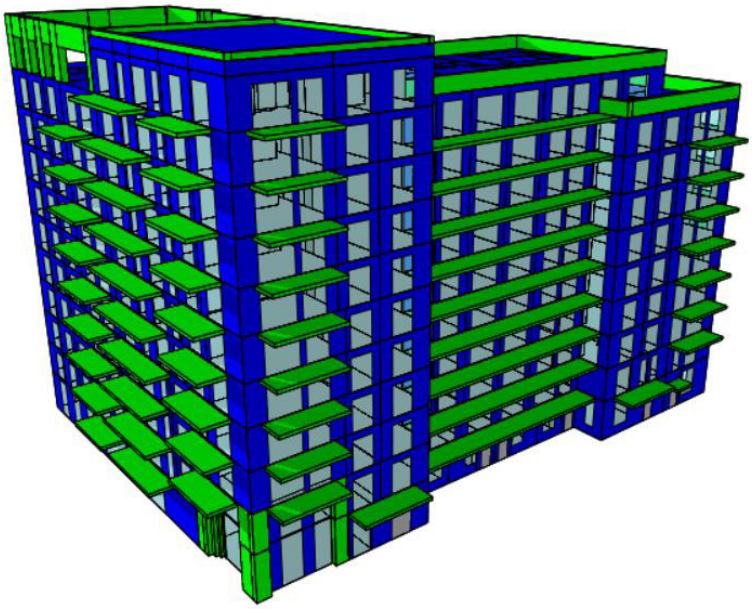


Figure 5.1 – Illustration of IES model

This analysis has been performed using IES software which provides full dynamic thermal analysis and is a CIBSE-certified Level 5 approved Dynamic Simulation Modelling Software. This analysis has been carried out following user instructions in IES manuals and CIBSE AM11 Building Energy and Environmental Modelling.

Based on the modelling conducted, the results show that all habitable rooms for all the apartments comply with the thermal comfort criteria set out by CIBSE guide TM59:2017, "Design methodology for the assessment of overheating risk in homes".

Mitigation Strategy

The proposed building design incorporates external solar shading via balconies, natural ventilation via openable windows/doors and solar control internal blinds as part of the overheating prevention strategy for summertime. Please note multiple design iterations were undertaken of the thermal model to arrive at the proposed design, which reduces the overheating risk as far as practicable

Please note that following the findings from the Environmental & Intrusive Noise Study (Document P2022-REP01-JPR P01 dated 11th April 2022), we have two scenarios for mitigating overheating:

1. In zones of development where external noise is expected to be lower, apartments can rely on natural ventilation via openable doors and windows.
2. In higher-noise zones of development, apartments can rely on mechanical ventilation.

Whilst not mandatory, the results show that all the communal corridors meet the CIBSE TM59 recommendations. Two further simulations have been performed to assess overheating risk under heatwave or future climate conditions using more extreme weather files DSY 2 and DSY 3. Please see the Appendix for results which have been included for information purposes only.

6. Cooling demand (non-domestic)

From a review of the BRUKL documents provided, the actual cooling demand is below that of the Notional for the no-domestic areas.

BRUKL 2013	Cooling Energy Consumption
Baseline (Notional)	223.5 MJ/m^2
Be Green (Actual)	174.8 MJ/m^2

Table 6.1 – Cooling demand

7. Appendices

- Appendix A: Be Lean SAP Block Compliance
- Appendix B: Be Clean SAP Block Compliance
- Appendix C: Be Green SAP Block Compliance
- Appendix D: Be Lean BRUKL (non-domestic)
- Appendix E: Be Green BRUKL (non-domestic)
- Appendix F: Shell fit-out to the commercial area
- Appendix G: Overheating Analysis Report
- Appendix H: MTT Report (Master planning)

Appendix A

Be Lean SAP Block Compliance

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Block Reference	Be Lean	**Issued on Date**	29/11/2022
Block Name			
Assessor Details	Mr. Adrian Fell, Compass Energy Solutions Limited, Tel: 01440785794, mail@compass-energy.co.uk	**Assessor ID**	N222-0001
Client			

Block Compliance Report - DER

Block Reference: Be Lean		Block Name:			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
A.02-03 - Lean-001	1	54.73	14.07	16.03	12.25 %
C.00-01 - Lean-001	1	99.32	15.02	15.59	3.64 %
C.00-02 - Lean-001	1	99.32	14.29	15.07	5.16 %
C.00-03 - Lean-001	1	99.32	14.29	15.07	5.16 %
C.00-04 - Lean-001	1	99.32	14.72	15.39	4.34 %
C.00-05 - Lean-001	1	105.24	17.32	17.48	0.91 %
C.00-06 - Lean-001	1	105.04	18.16	17.70	-2.62 %
C.00-07 - Lean-001	1	99.46	15.32	16.97	9.70 %
C.00-08 - Lean-001	1	104.28	14.11	15.62	9.68 %
C.00-09 - Lean-001	1	104.28	17.10	16.83	-1.60 %
A.01-01 - Lean-001	1	91.27	16.06	16.10	0.23 %
A.01-02 - Lean-001	1	88.26	14.65	14.78	0.88 %
A.01-03 - Lean-001	1	71.04	16.76	16.49	-1.65 %
A.01-04 - Lean-001	1	66.06	17.88	17.58	-1.72 %
A.02-01 - Lean-001	1	51.57	14.33	15.82	9.42 %
A.02-02 - Lean-001	1	96.57	11.14	12.46	10.57 %
A.02-04 - Lean-001	1	93.44	13.65	14.16	3.59 %
A.03-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.03-03 - Lean-001	1	74.53	13.09	14.94	12.38 %
A.04-04 - Lean-001	1	74.33	13.84	14.90	7.13 %
A.04-05 - Lean-001	1	62.28	12.73	13.87	8.23 %
A.04-06 - Lean-001	1	40.87	15.19	18.07	15.96 %
B.02-06 - Lean-001	1	52.56	15.92	16.65	4.38 %
B.02-07 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.09-01 - Lean-001	1	88.79	17.90	17.09	-4.73 %
B.09-02 - Lean-001	1	105.54	14.68	14.30	-2.63 %
A.10-01 - Lean-001	1	52.59	21.73	20.38	-6.61 %
A.10-02 - Lean-001	1	52.19	19.53	18.82	-3.75 %
A.10-03 - Lean-001	1	62.28	17.16	16.82	-2.03 %
B.02-03 - Lean-001	1	54.73	13.77	15.43	10.76 %
B.03-07 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.04-08 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.05-08 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.06-08 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.07-08 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.08-08 - Lean-001	1	58.18	14.46	15.35	5.82 %
B.03-06 - Lean-001	1	52.56	15.92	16.65	4.38 %

B.04-07 - Lean-001	1	52.56	15.92	16.65	4.38 %
B.05-07 - Lean-001	1	52.56	15.92	16.65	4.38 %
B.06-07 - Lean-001	1	52.56	15.92	16.65	4.38 %
B.07-07 - Lean-001	1	52.56	15.92	16.65	4.38 %
B.08-07 - Lean-001	1	52.56	15.92	16.65	4.38 %
A.02-05 - Lean-001	1	88.26	10.99	12.42	11.49 %
B.02-05 - Lean-001	1	88.26	11.27	13.02	13.47 %
A.02-06 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.03-06 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.04-07 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.05-07 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.06-07 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.07-07 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.08-07 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.09-07 - Lean-001	1	71.04	12.90	14.21	9.24 %
A.02-07 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.03-07 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.04-08 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.05-08 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.06-08 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.08-08 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.09-08 - Lean-001	1	66.06	13.71	14.95	8.29 %
B.02-04 - Lean-001	1	93.44	14.10	14.68	3.94 %
B.02-02 - Lean-001	1	96.57	11.14	12.46	10.57 %
A.03-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
A.04.01 - Lean-001	1	51.57	14.10	15.65	9.92 %
A.05-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
A.06-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
A.07-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
A.08-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
A.09-01 - Lean-001	1	51.57	17.55	17.88	1.85 %
B.02-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
B.03-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
B.04-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
B.05-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
B.06-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
B.07-01 - Lean-001	1	51.57	14.10	15.65	9.92 %
B.08-01 - Lean-001	1	51.57	15.17	16.41	7.54 %
A.05-06 - Lean-001	1	40.87	15.19	18.07	15.96 %
A.06-06 - Lean-001	1	40.87	15.19	18.07	15.96 %
A.07-06 - Lean-001	1	40.87	15.19	18.07	15.96 %
A.08-06 - Lean-001	1	40.87	15.19	18.07	15.96 %
A.09-06 - Lean-001	1	40.87	18.10	20.51	11.73 %
B.04-06 - Lean-001	1	40.87	15.69	19.58	19.88 %
B.05-06 - Lean-001	1	40.87	15.69	19.58	19.88 %
B.06-06 - Lean-001	1	40.87	15.69	19.58	19.88 %
B.07-06 - Lean-001	1	40.87	15.69	19.58	19.88 %

B.08-06 - Lean-001	1	40.87	15.69	22.33	29.73 %
A.05-05 - Lean-001	1	62.28	12.73	13.87	8.23 %
A.06-05 - Lean-001	1	62.28	12.73	13.87	8.23 %
A.07-05 - Lean-001	1	62.28	12.73	13.87	8.23 %
A.08-05 - Lean-001	1	62.28	12.73	13.87	8.23 %
A.09-05 - Lean-001	1	62.28	12.73	13.87	8.23 %
B.04-05 - Lean-001	1	62.28	13.47	15.34	12.16 %
B.05-05 - Lean-001	1	62.28	13.47	15.34	12.16 %
B.06-05 - Lean-001	1	62.28	13.47	15.34	12.16 %
B.07-05 - Lean-001	1	62.28	13.47	15.34	12.16 %
B.08-05 - Lean-001	1	62.28	17.24	17.67	2.45 %
A.05-04 - Lean-001	1	74.33	13.84	14.90	7.13 %
A.06-04 - Lean-001	1	74.33	13.84	14.90	7.13 %
A.07-04 - Lean-001	1	74.33	13.84	14.90	7.13 %
A.08-04 - Lean-001	1	74.33	13.84	14.90	7.13 %
A.09-04 - Lean-001	1	74.33	16.65	16.62	-0.18 %
B.04-04 - Lean-001	1	74.33	14.42	15.65	7.89 %
B.05-04 - Lean-001	1	74.33	14.42	15.65	7.89 %
B.06-04 - Lean-001	1	74.33	14.42	15.65	7.89 %
B.07-04 - Lean-001	1	74.33	14.42	15.65	7.89 %
B.08-04 - Lean-001	1	74.33	17.35	17.43	0.44 %
A.04-03 - Lean-001	1	74.53	13.09	14.94	12.38 %
A.05-03 - Lean-001	1	74.53	13.09	14.94	12.38 %
A.06-03 - Lean-001	1	74.53	13.09	14.94	12.38 %
A.07-03 - Lean-001	1	74.53	13.09	14.94	12.38 %
A.08-03 - Lean-001	1	74.53	13.09	14.94	12.38 %
A.09-03 - Lean-001	1	74.53	15.05	16.15	6.81 %
B.03-03 - Lean-001	1	74.53	12.79	14.44	11.44 %
B.04-03 - Lean-001	1	74.53	12.79	14.44	11.44 %
B.05-03 - Lean-001	1	74.53	12.79	14.44	11.44 %
B.06-03 - Lean-001	1	74.53	12.79	14.44	11.44 %
B.07-03 - Lean-001	1	74.53	12.79	14.44	11.44 %
B.08-03 - Lean-001	1	74.53	16.03	16.42	2.40 %
A.04-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.05-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.06-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.07-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.08-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.09-02 - Lean-001	1	77.23	11.86	15.41	23.06 %
B.03-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
B.04-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
B.05-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
B.06-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
B.07-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
B.08-02 - Lean-001	1	77.23	11.86	13.24	10.44 %
A.07-08 - Lean-001	1	66.06	13.71	14.95	8.29 %
A.03-05 - Lean-001	1	88.26	10.99	12.42	11.49 %

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

B.03-05 - Lean-001	1	88.26	11.48	13.46	14.71 %
A.03-04 - Lean-001	1	93.44	13.65	14.16	3.59 %
B.03-04 - Lean-001	1	93.44	14.39	15.01	4.15 %
Totals:	134	9193.689999999998	1,897.74	2,072.74	
Average DER = 14.05 $kgCO_2/m^2$		% DER/TER	PASS		
Average TER = 15.25 $kgCO_2/m^2$		7.87 %			

Block Compliance Report - DFEE

Block Reference: Be Lean		Block Name:			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
A.02-03 - Lean-001	1	54.73	27.46	31.83	13.74 %
C.00-01 - Lean-001	1	99.32	43.11	44.09	2.22 %
C.00-02 - Lean-001	1	99.32	40.28	41.40	2.70 %
C.00-03 - Lean-001	1	99.32	40.28	41.40	2.70 %
C.00-04 - Lean-001	1	99.32	41.91	42.92	2.35 %
C.00-05 - Lean-001	1	105.24	54.10	55.83	3.10 %
C.00-06 - Lean-001	1	105.04	58.07	58.04	-0.04 %
C.00-07 - Lean-001	1	99.46	44.87	52.22	14.08 %
C.00-08 - Lean-001	1	104.28	41.09	45.71	10.10 %
C.00-09 - Lean-001	1	104.28	53.13	53.82	1.28 %
A.01-01 - Lean-001	1	91.27	45.33	43.91	-3.24 %
A.01-02 - Lean-001	1	88.26	38.93	36.06	-7.98 %
A.01-03 - Lean-001	1	71.04	43.44	40.60	-7.00 %
A.01-04 - Lean-001	1	66.06	47.30	45.31	-4.39 %
A.02-01 - Lean-001	1	51.57	26.39	28.47	7.30 %
A.02-02 - Lean-001	1	96.57	26.27	29.23	10.12 %
A.02-04 - Lean-001	1	93.44	36.55	37.23	1.82 %
A.03-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
A.03-03 - Lean-001	1	74.53	30.34	35.21	13.84 %
A.04-04 - Lean-001	1	74.33	33.32	35.11	5.09 %
A.04-05 - Lean-001	1	62.28	22.56	22.63	0.32 %
A.04-06 - Lean-001	1	40.87	22.13	22.62	2.17 %
B.02-06 - Lean-001	1	52.56	34.67	34.51	-0.44 %
B.02-07 - Lean-001	1	58.18	29.94	30.75	2.61 %
B.09-01 - Lean-001	1	88.79	52.14	50.90	-2.44 %
B.09-02 - Lean-001	1	105.54	42.52	41.03	-3.63 %
A.10-01 - Lean-001	1	52.59	58.29	53.67	-8.62 %
A.10-02 - Lean-001	1	52.19	48.99	45.68	-7.24 %
A.10-03 - Lean-001	1	62.28	42.32	39.70	-6.62 %
B.02-03 - Lean-001	1	54.73	25.41	28.53	10.95 %
B.03-07 - Lean-001	1	58.18	29.94	30.75	2.61 %
B.04-08 - Lean-001	1	58.18	29.94	30.75	2.61 %
B.05-08 - Lean-001	1	58.18	29.94	30.75	2.61 %
B.06-08 - Lean-001	1	58.18	29.94	30.75	2.61 %
B.07-08 - Lean-001	1	58.18	29.94	30.75	2.61 %

B.08-08 - Lean-001	1	58.18	29.94	30.75	2.61 %
B.03-06 - Lean-001	1	52.56	34.67	34.51	-0.44 %
B.04-07 - Lean-001	1	52.56	34.67	34.51	-0.44 %
B.05-07 - Lean-001	1	52.56	34.67	34.51	-0.44 %
B.06-07 - Lean-001	1	52.56	34.67	34.51	-0.44 %
B.07-07 - Lean-001	1	52.56	34.67	34.51	-0.44 %
B.08-07 - Lean-001	1	52.56	34.67	34.51	-0.44 %
A.02-05 - Lean-001	1	88.26	22.09	23.87	7.46 %
B.02-05 - Lean-001	1	88.26	24.09	27.08	11.04 %
A.02-06 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.03-06 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.04-07 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.05-07 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.06-07 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.07-07 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.08-07 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.09-07 - Lean-001	1	71.04	27.05	28.86	6.29 %
A.02-07 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.03-07 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.04-08 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.05-08 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.06-08 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.08-08 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.09-08 - Lean-001	1	66.06	28.92	31.04	6.83 %
B.02-04 - Lean-001	1	93.44	38.54	39.81	3.19 %
B.02-02 - Lean-001	1	96.57	26.27	29.23	10.12 %
A.03-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
A.04.01 - Lean-001	1	51.57	25.12	27.57	8.90 %
A.05-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
A.06-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
A.07-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
A.08-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
A.09-01 - Lean-001	1	51.57	40.89	39.28	-4.10 %
B.02-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
B.03-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
B.04-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
B.05-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
B.06-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
B.07-01 - Lean-001	1	51.57	25.12	27.57	8.90 %
B.08-01 - Lean-001	1	51.57	30.57	31.58	3.22 %
A.05-06 - Lean-001	1	40.87	22.13	22.62	2.17 %
A.06-06 - Lean-001	1	40.87	22.13	22.62	2.17 %
A.07-06 - Lean-001	1	40.87	22.13	22.62	2.17 %
A.08-06 - Lean-001	1	40.87	22.13	22.62	2.17 %
A.09-06 - Lean-001	1	40.87	37.75	35.63	-5.95 %
B.04-06 - Lean-001	1	40.87	27.06	32.02	15.50 %
B.05-06 - Lean-001	1	40.87	27.06	32.02	15.50 %

B.06-06 - Lean-001	1	40.87	27.06	32.02	15.50 %
B.07-06 - Lean-001	1	40.87	27.06	32.02	15.50 %
B.08-06 - Lean-001	1	40.87	27.06	44.35	38.98 %
A.05-05 - Lean-001	1	62.28	22.56	22.63	0.32 %
A.06-05 - Lean-001	1	62.28	22.56	22.63	0.32 %
A.07-05 - Lean-001	1	62.28	22.56	22.63	0.32 %
A.08-05 - Lean-001	1	62.28	22.56	22.63	0.32 %
A.09-05 - Lean-001	1	62.28	22.56	22.63	0.32 %
B.04-05 - Lean-001	1	62.28	27.70	32.19	13.95 %
B.05-05 - Lean-001	1	62.28	27.70	32.19	13.95 %
B.06-05 - Lean-001	1	62.28	27.70	32.19	13.95 %
B.07-05 - Lean-001	1	62.28	27.70	32.19	13.95 %
B.08-05 - Lean-001	1	62.28	43.53	44.14	1.40 %
A.05-04 - Lean-001	1	74.33	33.32	35.11	5.09 %
A.06-04 - Lean-001	1	74.33	33.32	35.11	5.09 %
A.07-04 - Lean-001	1	74.33	33.32	35.11	5.09 %
A.08-04 - Lean-001	1	74.33	33.32	35.11	5.09 %
A.09-04 - Lean-001	1	74.33	44.80	43.79	-2.31 %
B.04-04 - Lean-001	1	74.33	36.08	38.92	7.29 %
B.05-04 - Lean-001	1	74.33	36.08	38.92	7.29 %
B.06-04 - Lean-001	1	74.33	36.08	38.92	7.29 %
B.07-04 - Lean-001	1	74.33	36.08	38.92	7.29 %
B.08-04 - Lean-001	1	74.33	47.72	47.83	0.23 %
A.04-03 - Lean-001	1	74.53	30.34	35.21	13.84 %
A.05-03 - Lean-001	1	74.53	30.34	35.21	13.84 %
A.06-03 - Lean-001	1	74.53	30.34	35.21	13.84 %
A.07-03 - Lean-001	1	74.53	30.34	35.21	13.84 %
A.08-03 - Lean-001	1	74.53	30.34	35.21	13.84 %
A.09-03 - Lean-001	1	74.53	38.51	41.35	6.87 %
B.03-03 - Lean-001	1	74.53	28.74	32.65	11.97 %
B.04-03 - Lean-001	1	74.53	28.74	32.65	11.97 %
B.05-03 - Lean-001	1	74.53	28.74	32.65	11.97 %
B.06-03 - Lean-001	1	74.53	28.74	32.65	11.97 %
B.07-03 - Lean-001	1	74.53	28.74	32.65	11.97 %
B.08-03 - Lean-001	1	74.53	42.28	42.74	1.10 %
A.04-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
A.05-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
A.06-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
A.07-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
A.08-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
A.09-02 - Lean-001	1	77.23	24.54	38.50	36.25 %
B.03-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
B.04-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
B.05-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
B.06-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
B.07-02 - Lean-001	1	77.23	24.54	27.38	10.37 %
B.08-02 - Lean-001	1	77.23	24.54	27.38	10.37 %

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

A.07-08 - Lean-001	1	66.06	28.92	31.04	6.83 %
A.03-05 - Lean-001	1	88.26	22.09	23.87	7.46 %
B.03-05 - Lean-001	1	88.26	25.44	29.34	13.28 %
A.03-04 - Lean-001	1	93.44	36.55	37.23	1.82 %
B.03-04 - Lean-001	1	93.44	39.80	41.47	4.04 %
Totals:	134	9193.689999999998	4,188.38	4,455.66	
Average DFEE = 32.07 kWh/m²/yr		**% DFEE/TFEE**	PASS		
Average TFEE = 34.07 kWh/m²/yr		5.87 %			

Appendix B

Be Clean SAP Block Compliance

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Block Reference	Be Clean	**Issued on Date**	29/11/2022
Block Name			
Assessor Details	Mr. Adrian Fell, Compass Energy Solutions Limited, Tel: 01440785794, mail@compass-energy.co.uk	**Assessor ID**	N222-0001
Client			

Block Compliance Report - DER

Block Reference: Be Clean		Block Name:			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
A.02-03 - Clean-001	1	54.73	10.05	16.03	37.32 %
C.00-01 - Clean-001	1	99.32	10.63	15.59	31.80 %
C.00-02 - Clean-001	1	99.32	10.18	15.07	32.44 %
C.00-03 - Clean-001	1	99.32	10.18	15.07	32.44 %
C.00-04 - Clean-001	1	99.32	10.45	15.39	32.09 %
C.00-05 - Clean-001	1	105.24	12.03	17.48	31.17 %
C.00-06 - Clean-001	1	105.04	12.49	17.70	29.42 %
C.00-07 - Clean-001	1	99.46	10.75	16.97	36.64 %
C.00-08 - Clean-001	1	104.28	10.05	15.62	35.67 %
C.00-09 - Clean-001	1	104.28	11.81	16.83	29.83 %
A.01-01 - Clean-001	1	91.27	11.35	16.10	29.49 %
A.01-02 - Clean-001	1	88.26	10.51	14.78	28.89 %
A.01-03 - Clean-001	1	71.04	11.69	16.49	29.10 %
A.01-04 - Clean-001	1	66.06	12.47	17.58	29.06 %
A.02-01 - Clean-001	1	51.57	10.23	15.82	35.34 %
A.02-02 - Clean-001	1	96.57	8.13	12.46	34.73 %
A.02-04 - Clean-001	1	93.44	9.67	14.16	31.70 %
A.03-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.03-03 - Clean-001	1	74.53	9.38	14.94	37.22 %
A.04-04 - Clean-001	1	74.33	9.84	14.90	33.97 %
A.04-05 - Clean-001	1	62.28	9.20	13.87	33.68 %
A.04-06 - Clean-001	1	40.87	10.76	18.07	40.47 %
B.02-06 - Clean-001	1	52.56	11.16	16.65	32.97 %
B.02-07 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.09-01 - Clean-001	1	88.79	12.29	17.09	28.09 %
B.09-02 - Clean-001	1	105.54	10.27	14.30	28.20 %
A.10-01 - Clean-001	1	52.59	14.73	20.38	27.74 %
A.10-02 - Clean-001	1	52.19	13.38	18.82	28.92 %
A.10-03 - Clean-001	1	62.28	11.92	16.82	29.13 %
B.02-03 - Clean-001	1	54.73	9.87	15.43	36.03 %
B.03-07 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.04-08 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.05-08 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.06-08 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.07-08 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.08-08 - Clean-001	1	58.18	10.25	15.35	33.24 %
B.03-06 - Clean-001	1	52.56	11.16	16.65	32.97 %

B.04-07 - Clean-001	1	52.56	11.16	16.65	32.97 %
B.05-07 - Clean-001	1	52.56	11.16	16.65	32.97 %
B.06-07 - Clean-001	1	52.56	11.16	16.65	32.97 %
B.07-07 - Clean-001	1	52.56	11.16	16.65	32.97 %
B.08-07 - Clean-001	1	52.56	11.16	16.65	32.97 %
A.02-05 - Clean-001	1	88.26	8.18	12.42	34.12 %
B.02-05 - Clean-001	1	88.26	8.35	13.02	35.89 %
A.02-06 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.03-06 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.04-07 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.05-07 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.06-07 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.07-07 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.08-07 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.09-07 - Clean-001	1	71.04	9.33	14.21	34.36 %
A.02-07 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.03-07 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.04-08 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.05-08 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.06-08 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.08-08 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.09-08 - Clean-001	1	66.06	9.82	14.95	34.31 %
B.02-04 - Clean-001	1	93.44	9.95	14.68	32.21 %
B.02-02 - Clean-001	1	96.57	8.13	12.46	34.73 %
A.03-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
A.04-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
A.05-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
A.06-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
A.07-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
A.08-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
A.09-01 - Clean-001	1	51.57	12.21	17.88	31.71 %
B.03-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
B.02-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
B.04-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
B.05-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
B.06-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
B.07-01 - Clean-001	1	51.57	10.09	15.65	35.54 %
B.08-01 - Clean-001	1	51.57	10.74	16.41	34.54 %
A.05-06 - Clean-001	1	40.87	10.76	18.07	40.47 %
A.06-06 - Clean-001	1	40.87	10.76	18.07	40.47 %
A.07-06 - Clean-001	1	40.87	10.76	18.07	40.47 %
A.08-06 - Clean-001	1	40.87	10.76	18.07	40.47 %
A.09-06 - Clean-001	1	40.87	12.55	20.51	38.80 %
B.04-06 - Clean-001	1	40.87	11.07	19.58	43.47 %
B.05-06 - Clean-001	1	40.87	11.07	19.58	43.47 %
B.06-06 - Clean-001	1	40.87	11.07	19.58	43.47 %
B.07-06 - Clean-001	1	40.87	11.07	19.58	43.47 %

B.08-06 - Clean-001	1	40.87	11.07	22.33	50.42 %
A.05-05 - Clean-001	1	62.28	9.20	13.87	33.68 %
A.06-05 - Clean-001	1	62.28	9.20	13.87	33.68 %
A.07-05 - Clean-001	1	62.28	9.20	13.87	33.68 %
A.08-05 - Clean-001	1	62.28	9.20	13.87	33.68 %
A.09-05 - Clean-001	1	62.28	9.20	13.87	33.68 %
B.04-05 - Clean-001	1	62.28	9.66	15.34	37.01 %
B.05-05 - Clean-001	1	62.28	9.66	15.34	37.01 %
B.06-05 - Clean-001	1	62.28	9.66	15.34	37.01 %
B.07-05 - Clean-001	1	62.28	9.66	15.34	37.01 %
B.08-05 - Clean-001	1	62.28	11.97	17.67	32.27 %
A.05-04 - Clean-001	1	74.33	9.84	14.90	33.97 %
A.06-04 - Clean-001	1	74.33	9.84	14.90	33.97 %
A.07-04 - Clean-001	1	74.33	9.84	14.90	33.97 %
A.08-04 - Clean-001	1	74.33	9.84	14.90	33.97 %
A.09-04 - Clean-001	1	74.33	11.57	16.62	30.39 %
B.04-04 - Clean-001	1	74.33	10.19	15.65	34.91 %
B.05-04 - Clean-001	1	74.33	10.19	15.65	34.91 %
B.06-04 - Clean-001	1	74.33	10.19	15.65	34.91 %
B.07-04 - Clean-001	1	74.33	10.19	15.65	34.91 %
B.08-04 - Clean-001	1	74.33	11.99	17.43	31.20 %
A.04-03 - Clean-001	1	74.53	9.38	14.94	37.22 %
A.05-03 - Clean-001	1	74.53	9.38	14.94	37.22 %
A.06-03 - Clean-001	1	74.53	9.38	14.94	37.22 %
A.07-03 - Clean-001	1	74.53	9.38	14.94	37.22 %
A.08-03 - Clean-001	1	74.53	9.38	14.94	37.22 %
A.09-03 - Clean-001	1	74.53	10.59	16.15	34.43 %
B.03-03 - Clean-001	1	74.53	9.20	14.44	36.30 %
B.04-03 - Clean-001	1	74.53	9.20	14.44	36.30 %
B.05-03 - Clean-001	1	74.53	9.20	14.44	36.30 %
B.06-03 - Clean-001	1	74.53	9.20	14.44	36.30 %
B.07-03 - Clean-001	1	74.53	9.20	14.44	36.30 %
B.08-03 - Clean-001	1	74.53	11.19	16.42	31.87 %
A.04-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.05-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.06-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.07-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.08-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.09-02 - Clean-001	1	77.23	8.62	15.41	44.08 %
B.03-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
B.04-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
B.05-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
B.06-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
B.07-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
B.08-02 - Clean-001	1	77.23	8.62	13.24	34.91 %
A.07-08 - Clean-001	1	66.06	9.82	14.95	34.31 %
A.03-05 - Clean-001	1	88.26	8.18	12.42	34.12 %

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

B.03-05 - Clean-001	1	88.26	8.48	13.46	37.00 %
A.03-04 - Clean-001	1	93.44	9.67	14.16	31.70 %
B.03-04 - Clean-001	1	93.44	10.13	15.01	32.53 %
Totals:	134	9193.6899999 9998	1,350.45	2,072.74	
Average DER = 10.00 $kgCO_2/m^2$		% DER/TER	PASS		
Average TER = 15.25 $kgCO_2/m^2$		34.43 %			

Block Compliance Report - DFEE

Block Reference: Be Clean		Block Name:			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
A.02-03 - Clean-001	1	54.73	27.46	31.83	13.74 %
C.00-01 - Clean-001	1	99.32	43.11	44.09	2.22 %
C.00-02 - Clean-001	1	99.32	40.28	41.40	2.70 %
C.00-03 - Clean-001	1	99.32	40.28	41.40	2.70 %
C.00-04 - Clean-001	1	99.32	41.91	42.92	2.35 %
C.00-05 - Clean-001	1	105.24	54.10	55.83	3.10 %
C.00-06 - Clean-001	1	105.04	58.07	58.04	-0.04 %
C.00-07 - Clean-001	1	99.46	44.87	52.22	14.08 %
C.00-08 - Clean-001	1	104.28	41.09	45.71	10.10 %
C.00-09 - Clean-001	1	104.28	53.13	53.82	1.28 %
A.01-01 - Clean-001	1	91.27	45.33	43.91	-3.24 %
A.01-02 - Clean-001	1	88.26	38.93	36.06	-7.98 %
A.01-03 - Clean-001	1	71.04	43.44	40.60	-7.00 %
A.01-04 - Clean-001	1	66.06	47.30	45.31	-4.39 %
A.02-01 - Clean-001	1	51.57	26.39	28.47	7.30 %
A.02-02 - Clean-001	1	96.57	26.27	29.23	10.12 %
A.02-04 - Clean-001	1	93.44	36.55	37.23	1.82 %
A.03-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
A.03-03 - Clean-001	1	74.53	30.34	35.21	13.84 %
A.04-04 - Clean-001	1	74.33	33.32	35.11	5.09 %
A.04-05 - Clean-001	1	62.28	22.56	22.63	0.32 %
A.04-06 - Clean-001	1	40.87	22.13	22.62	2.17 %
B.02-06 - Clean-001	1	52.56	34.67	34.51	-0.44 %
B.02-07 - Clean-001	1	58.18	29.94	30.75	2.61 %
B.09-01 - Clean-001	1	88.79	52.14	50.90	-2.44 %
B.09-02 - Clean-001	1	105.54	42.52	41.03	-3.63 %
A.10-01 - Clean-001	1	52.59	58.29	53.67	-8.62 %
A.10-02 - Clean-001	1	52.19	48.99	45.68	-7.24 %
A.10-03 - Clean-001	1	62.28	42.32	39.70	-6.62 %
B.02-03 - Clean-001	1	54.73	25.41	28.53	10.95 %
B.03-07 - Clean-001	1	58.18	29.94	30.75	2.61 %
B.04-08 - Clean-001	1	58.18	29.94	30.75	2.61 %
B.05-08 - Clean-001	1	58.18	29.94	30.75	2.61 %
B.06-08 - Clean-001	1	58.18	29.94	30.75	2.61 %
B.07-08 - Clean-001	1	58.18	29.94	30.75	2.61 %

B.08-08 - Clean-001	1	58.18	29.94	30.75	2.61 %
B.03-06 - Clean-001	1	52.56	34.67	34.51	-0.44 %
B.04-07 - Clean-001	1	52.56	34.67	34.51	-0.44 %
B.05-07 - Clean-001	1	52.56	34.67	34.51	-0.44 %
B.06-07 - Clean-001	1	52.56	34.67	34.51	-0.44 %
B.07-07 - Clean-001	1	52.56	34.67	34.51	-0.44 %
B.08-07 - Clean-001	1	52.56	34.67	34.51	-0.44 %
A.02-05 - Clean-001	1	88.26	22.09	23.87	7.46 %
B.02-05 - Clean-001	1	88.26	24.09	27.08	11.04 %
A.02-06 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.03-06 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.04-07 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.05-07 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.06-07 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.07-07 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.08-07 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.09-07 - Clean-001	1	71.04	27.05	28.86	6.29 %
A.02-07 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.03-07 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.04-08 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.05-08 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.06-08 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.08-08 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.09-08 - Clean-001	1	66.06	28.92	31.04	6.83 %
B.02-04 - Clean-001	1	93.44	38.54	39.81	3.19 %
B.02-02 - Clean-001	1	96.57	26.27	29.23	10.12 %
A.03-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
A.04-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
A.05-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
A.06-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
A.07-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
A.08-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
A.09-01 - Clean-001	1	51.57	40.89	39.28	-4.10 %
B.03-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
B.02-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
B.04-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
B.05-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
B.06-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
B.07-01 - Clean-001	1	51.57	25.12	27.57	8.90 %
B.08-01 - Clean-001	1	51.57	30.57	31.58	3.22 %
A.05-06 - Clean-001	1	40.87	22.13	22.62	2.17 %
A.06-06 - Clean-001	1	40.87	22.13	22.62	2.17 %
A.07-06 - Clean-001	1	40.87	22.13	22.62	2.17 %
A.08-06 - Clean-001	1	40.87	22.13	22.62	2.17 %
A.09-06 - Clean-001	1	40.87	37.75	35.63	-5.95 %
B.04-06 - Clean-001	1	40.87	27.06	32.02	15.50 %
B.05-06 - Clean-001	1	40.87	27.06	32.02	15.50 %

B.06-06 - Clean-001	1	40.87	27.06	32.02	15.50 %
B.07-06 - Clean-001	1	40.87	27.06	32.02	15.50 %
B.08-06 - Clean-001	1	40.87	27.06	44.35	38.98 %
A.05-05 - Clean-001	1	62.28	22.56	22.63	0.32 %
A.06-05 - Clean-001	1	62.28	22.56	22.63	0.32 %
A.07-05 - Clean-001	1	62.28	22.56	22.63	0.32 %
A.08-05 - Clean-001	1	62.28	22.56	22.63	0.32 %
A.09-05 - Clean-001	1	62.28	22.56	22.63	0.32 %
B.04-05 - Clean-001	1	62.28	27.70	32.19	13.95 %
B.05-05 - Clean-001	1	62.28	27.70	32.19	13.95 %
B.06-05 - Clean-001	1	62.28	27.70	32.19	13.95 %
B.07-05 - Clean-001	1	62.28	27.70	32.19	13.95 %
B.08-05 - Clean-001	1	62.28	43.53	44.14	1.40 %
A.05-04 - Clean-001	1	74.33	33.32	35.11	5.09 %
A.06-04 - Clean-001	1	74.33	33.32	35.11	5.09 %
A.07-04 - Clean-001	1	74.33	33.32	35.11	5.09 %
A.08-04 - Clean-001	1	74.33	33.32	35.11	5.09 %
A.09-04 - Clean-001	1	74.33	44.80	43.79	-2.31 %
B.04-04 - Clean-001	1	74.33	36.08	38.92	7.29 %
B.05-04 - Clean-001	1	74.33	36.08	38.92	7.29 %
B.06-04 - Clean-001	1	74.33	36.08	38.92	7.29 %
B.07-04 - Clean-001	1	74.33	36.08	38.92	7.29 %
B.08-04 - Clean-001	1	74.33	47.72	47.83	0.23 %
A.04-03 - Clean-001	1	74.53	30.34	35.21	13.84 %
A.05-03 - Clean-001	1	74.53	30.34	35.21	13.84 %
A.06-03 - Clean-001	1	74.53	30.34	35.21	13.84 %
A.07-03 - Clean-001	1	74.53	30.34	35.21	13.84 %
A.08-03 - Clean-001	1	74.53	30.34	35.21	13.84 %
A.09-03 - Clean-001	1	74.53	38.51	41.35	6.87 %
B.03-03 - Clean-001	1	74.53	28.74	32.65	11.97 %
B.04-03 - Clean-001	1	74.53	28.74	32.65	11.97 %
B.05-03 - Clean-001	1	74.53	28.74	32.65	11.97 %
B.06-03 - Clean-001	1	74.53	28.74	32.65	11.97 %
B.07-03 - Clean-001	1	74.53	28.74	32.65	11.97 %
B.08-03 - Clean-001	1	74.53	42.28	42.74	1.10 %
A.04-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
A.05-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
A.06-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
A.07-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
A.08-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
A.09-02 - Clean-001	1	77.23	24.54	38.50	36.25 %
B.03-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
B.04-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
B.05-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
B.06-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
B.07-02 - Clean-001	1	77.23	24.54	27.38	10.37 %
B.08-02 - Clean-001	1	77.23	24.54	27.38	10.37 %

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

A.07-08 - Clean-001	1	66.06	28.92	31.04	6.83 %
A.03-05 - Clean-001	1	88.26	22.09	23.87	7.46 %
B.03-05 - Clean-001	1	88.26	25.44	29.34	13.28 %
A.03-04 - Clean-001	1	93.44	36.55	37.23	1.82 %
B.03-04 - Clean-001	1	93.44	39.80	41.47	4.04 %
Totals:	134	9193.6899999 9998	4,188.38	4,455.66	
Average DFEE = 32.07 kWh/m²/yr		**% DFEE/TFEE**	PASS		
Average TFEE = 34.07 kWh/m²/yr		5.87 %			

Appendix C

Be Green SAP Block Compliance

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

Block Reference	Be Green	**Issued on Date**	29/11/2022
Block Name			

Assessor Details	Mr. Adrian Fell, Compass Energy Solutions Limited, Tel: 01440785794, mail@compass-energy.co.uk	**Assessor ID**	N222-0001
Client			

Block Compliance Report - DER

Block Reference: Be Green		Block Name:			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DER ($kgCO_2/m^2$)**	**TER ($kgCO_2/m^2$)**	**% DER/TER**
A.02-03 - Green-001	1	54.73	9.56	16.03	40.38 %
C.00-01 - Green-001	1	99.32	9.97	15.59	36.04 %
C.00-02 - Green-001	1	99.32	9.46	15.07	37.22 %
C.00-03 - Green-001	1	99.32	9.46	15.07	37.22 %
C.00-04 - Green-001	1	99.32	9.73	15.39	36.77 %
C.00-05 - Green-001	1	105.24	11.32	17.48	35.24 %
C.00-06 - Green-001	1	105.04	11.78	17.70	33.43 %
C.00-07 - Green-001	1	99.46	10.63	16.97	37.34 %
C.00-08 - Green-001	1	104.28	9.38	15.62	39.95 %
C.00-09 - Green-001	1	104.28	11.17	16.83	33.64 %
A.01-01 - Green-001	1	91.27	10.69	16.10	33.59 %
A.01-02 - Green-001	1	88.26	9.84	14.78	33.43 %
A.01-03 - Green-001	1	71.04	11.37	16.49	31.04 %
A.01-04 - Green-001	1	66.06	12.09	17.58	31.22 %
A.02-01 - Green-001	1	51.57	9.53	15.82	39.76 %
A.02-02 - Green-001	1	96.57	7.50	12.46	39.79 %
A.02-04 - Green-001	1	93.44	9.03	14.16	36.22 %
A.03-02 - Green-001	1	77.23	7.87	13.24	40.57 %
A.03-03 - Green-001	1	74.53	8.61	14.94	42.37 %
A.04-04 - Green-001	1	74.33	9.49	14.90	36.32 %
A.04-05 - Green-001	1	62.28	8.61	13.87	37.93 %
A.04-06 - Green-001	1	40.87	9.70	18.07	46.33 %
B.02-06 - Green-001	1	52.56	10.52	16.65	36.81 %
B.02-07 - Green-001	1	58.18	9.68	15.35	36.95 %
B.09-01 - Green-001	1	88.79	11.62	17.09	32.01 %
B.09-02 - Green-001	1	105.54	9.69	14.30	32.25 %
A.10-01 - Green-001	1	52.59	14.15	20.38	30.58 %
A.10-02 - Green-001	1	52.19	12.77	18.82	32.16 %
A.10-03 - Green-001	1	62.28	11.49	16.82	31.68 %
B.02-03 - Green-001	1	54.73	9.22	15.43	40.25 %
B.03-07 - Green-001	1	58.18	9.68	15.35	36.95 %
B.04-08 - Green-001	1	58.18	9.68	15.35	36.95 %
B.05-08 - Green-001	1	58.18	9.68	15.35	36.95 %
B.06-08 - Green-001	1	58.18	9.68	15.35	36.95 %
B.07-08 - Green-001	1	58.18	9.68	15.35	36.95 %
B.08-08 - Green-001	1	58.18	9.68	15.35	36.95 %
B.03-06 - Green-001	1	52.56	10.52	16.65	36.81 %

B.04-07 - Green-001	1	52.56	10.52	16.65	36.81 %
B.05-07 - Green-001	1	52.56	10.52	16.65	36.81 %
B.06-07 - Green-001	1	52.56	10.52	16.65	36.81 %
B.07-07 - Green-001	1	52.56	10.52	16.65	36.81 %
B.08-07 - Green-001	1	52.56	10.52	16.65	36.81 %
A.02-05 - Green-001	1	88.26	7.51	12.42	39.52 %
B.02-05 - Green-001	1	88.26	7.68	13.02	41.03 %
A.02-06 - Green-001	1	71.04	8.91	14.21	37.31 %
A.03-06 - Green-001	1	71.04	8.91	14.21	37.31 %
A.04-07 - Green-001	1	71.04	8.91	14.21	37.31 %
A.05-07 - Green-001	1	71.04	8.91	14.21	37.31 %
A.06-07 - Green-001	1	71.04	8.91	14.21	37.31 %
A.07-07 - Green-001	1	71.04	8.91	14.21	37.31 %
A.08-07 - Green-001	1	71.04	8.91	14.21	37.31 %
A.09-07 - Green-001	1	71.04	8.91	14.21	37.31 %
A.02-07 - Green-001	1	66.06	9.38	14.95	37.26 %
A.03-07 - Green-001	1	66.06	9.38	14.95	37.26 %
A.04-08 - Green-001	1	66.06	9.38	14.95	37.26 %
A.05-08 - Green-001	1	66.06	9.38	14.95	37.26 %
A.06-08 - Green-001	1	66.06	9.38	14.95	37.26 %
A.08-08 - Green-001	1	66.06	9.38	14.95	37.26 %
A.09-08 - Green-001	1	66.06	9.38	14.95	37.26 %
B.02-04 - Green-001	1	93.44	9.30	14.68	36.64 %
B.02-02 - Green-001	1	96.57	7.50	12.46	39.79 %
A.03-01 - Green-001	1	51.57	9.37	15.65	40.14 %
A.04-01 - Green-001	1	51.57	9.37	15.65	40.14 %
A.05-01 - Green-001	1	51.57	9.37	15.65	40.14 %
A.06-01 - Green-001	1	51.57	9.37	15.65	40.14 %
A.07-01 - Green-001	1	51.57	9.37	15.65	40.14 %
A.08-01 - Green-001	1	51.57	9.37	15.65	40.14 %
A.09-01 - Green-001	1	51.57	11.62	17.88	35.01 %
B.02-01 - Green-001	1	51.57	9.37	15.65	40.14 %
B.03-01 - Green-001	1	51.57	9.37	15.65	40.14 %
B.04-01 - Green-001	1	51.57	9.37	15.65	40.14 %
B.05-01 - Green-001	1	51.57	9.37	15.65	40.14 %
B.06-01 - Green-001	1	51.57	9.37	15.65	40.14 %
B.07-01 - Green-001	1	51.57	9.37	15.65	40.14 %
B.08-01 - Green-001	1	51.57	10.09	16.41	38.50 %
A.05-06 - Green-001	1	40.87	9.70	18.07	46.33 %
A.06-06 - Green-001	1	40.87	9.70	18.07	46.33 %
A.07-06 - Green-001	1	40.87	9.70	18.07	46.33 %
A.08-06 - Green-001	1	40.87	9.70	18.07	46.33 %
A.09-06 - Green-001	1	40.87	11.69	20.51	42.99 %
B.04-06 - Green-001	1	40.87	10.11	19.58	48.37 %
B.05-06 - Green-001	1	40.87	10.11	19.58	48.37 %
B.06-06 - Green-001	1	40.87	10.11	19.58	48.37 %
B.07-06 - Green-001	1	40.87	10.11	19.58	48.37 %

B.08-06 - Green-001	1	40.87	10.11	22.33	54.72 %
A.05-05 - Green-001	1	62.28	8.61	13.87	37.93 %
A.06-05 - Green-001	1	62.28	8.61	13.87	37.93 %
A.07-05 - Green-001	1	62.28	8.61	13.87	37.93 %
A.08-05 - Green-001	1	62.28	8.61	13.87	37.93 %
A.09-05 - Green-001	1	62.28	8.61	13.87	37.93 %
B.04-05 - Green-001	1	62.28	9.16	15.34	40.27 %
B.05-05 - Green-001	1	62.28	9.16	15.34	40.27 %
B.06-05 - Green-001	1	62.28	9.16	15.34	40.27 %
B.07-05 - Green-001	1	62.28	9.16	15.34	40.27 %
B.08-05 - Green-001	1	62.28	11.56	17.67	34.59 %
A.05-04 - Green-001	1	74.33	9.49	14.90	36.32 %
A.06-04 - Green-001	1	74.33	9.49	14.90	36.32 %
A.07-04 - Green-001	1	74.33	9.49	14.90	36.32 %
A.08-04 - Green-001	1	74.33	9.49	14.90	36.32 %
A.09-04 - Green-001	1	74.33	11.25	16.62	32.31 %
B.04-04 - Green-001	1	74.33	9.87	15.65	36.95 %
B.05-04 - Green-001	1	74.33	9.87	15.65	36.95 %
B.06-04 - Green-001	1	74.33	9.87	15.65	36.95 %
B.07-04 - Green-001	1	74.33	9.87	15.65	36.95 %
B.08-04 - Green-001	1	74.33	11.69	17.43	32.92 %
A.04-03 - Green-001	1	74.53	8.61	14.94	42.37 %
A.05-03 - Green-001	1	74.53	8.61	14.94	42.37 %
A.06-03 - Green-001	1	74.53	8.61	14.94	42.37 %
A.07-03 - Green-001	1	74.53	8.61	14.94	42.37 %
A.08-03 - Green-001	1	74.53	8.61	14.94	42.37 %
A.09-03 - Green-001	1	74.53	9.81	16.15	39.26 %
B.03-03 - Green-001	1	74.53	8.43	14.44	41.63 %
B.04-03 - Green-001	1	74.53	8.43	14.44	41.63 %
B.05-03 - Green-001	1	74.53	8.43	14.44	41.63 %
B.06-03 - Green-001	1	74.53	8.43	14.44	41.63 %
B.07-03 - Green-001	1	74.53	8.43	14.44	41.63 %
B.08-03 - Green-001	1	74.53	10.42	16.42	36.56 %
A.04-02 - Green-001	1	77.23	7.87	13.24	40.57 %
A.05-02 - Green-001	1	77.23	8.14	13.24	38.53 %
A.06-02 - Green-001	1	77.23	7.87	13.24	40.57 %
A.07-02 - Green-001	1	77.23	7.87	13.24	40.57 %
A.08-02 - Green-001	1	77.23	7.87	13.24	40.57 %
A.09-02 - Green-001	1	77.23	7.87	15.41	48.94 %
B.03-02 - Green-001	1	77.23	7.87	13.24	40.57 %
B.04-02 - Green-001	1	77.23	7.87	13.24	40.57 %
B.05-02 - Green-001	1	77.23	7.87	13.24	40.57 %
B.06-02 - Green-001	1	77.23	7.87	13.24	40.57 %
B.07-02 - Green-001	1	77.23	7.87	13.24	40.57 %
B.08-02 - Green-001	1	77.23	7.87	13.24	40.57 %
A.07-08 - Green-001	1	66.06	9.38	14.95	37.26 %
A.03-05 - Green-001	1	88.26	7.51	12.42	39.52 %

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

B.03-05 - Green-001	1	88.26	7.81	13.46	41.97 %
A.03-04 - Green-001	1	93.44	9.03	14.16	36.22 %
B.03-04 - Green-0001	1	93.44	9.48	15.01	36.86 %
Totals:	134	9193.689999999998	1,266.23	2,072.74	
Average DER = 9.39 $kgCO_2/m^2$		% DER/TER	PASS		
Average TER = 15.25 $kgCO_2/m^2$		38.43 %			

Block Compliance Report - DFEE

Block Reference: Be Green		Block Name:			
Property-Assessment Reference	**Multiplier**	**Floor Area (m^2)**	**DFEE ($kWh/m^2/yr$)**	**TFEE ($kWh/m^2/yr$)**	**% DFEE/TFEE**
A.02-03 - Green-001	1	54.73	27.46	31.83	13.74 %
C.00-01 - Green-001	1	99.32	42.92	44.09	2.65 %
C.00-02 - Green-001	1	99.32	39.71	41.40	4.08 %
C.00-03 - Green-001	1	99.32	39.71	41.40	4.08 %
C.00-04 - Green-001	1	99.32	41.34	42.92	3.68 %
C.00-05 - Green-001	1	105.24	53.51	55.83	4.15 %
C.00-06 - Green-001	1	105.04	57.50	58.04	0.95 %
C.00-07 - Green-001	1	99.46	44.70	52.22	14.40 %
C.00-08 - Green-001	1	104.28	40.67	45.71	11.02 %
C.00-09 - Green-001	1	104.28	52.94	53.82	1.64 %
A.01-01 - Green-001	1	91.27	45.33	43.91	-3.24 %
A.01-02 - Green-001	1	88.26	38.93	36.06	-7.98 %
A.01-03 - Green-001	1	71.04	43.44	40.60	-7.00 %
A.01-04 - Green-001	1	66.06	47.30	45.31	-4.39 %
A.02-01 - Green-001	1	51.57	26.39	28.47	7.30 %
A.02-02 - Green-001	1	96.57	26.27	29.23	10.12 %
A.02-04 - Green-001	1	93.44	36.55	37.23	1.82 %
A.03-02 - Green-001	1	77.23	24.54	27.38	10.37 %
A.03-03 - Green-001	1	74.53	30.34	35.21	13.84 %
A.04-04 - Green-001	1	74.33	33.32	35.11	5.09 %
A.04-05 - Green-001	1	62.28	22.56	22.63	0.32 %
A.04-06 - Green-001	1	40.87	22.13	22.62	2.17 %
B.02-06 - Green-001	1	52.56	34.67	34.51	-0.44 %
B.02-07 - Green-001	1	58.18	29.94	30.75	2.61 %
B.09-01 - Green-001	1	88.79	52.14	50.90	-2.44 %
B.09-02 - Green-001	1	105.54	42.52	41.03	-3.63 %
A.10-01 - Green-001	1	52.59	58.29	53.67	-8.62 %
A.10-02 - Green-001	1	52.19	48.99	45.68	-7.24 %
A.10-03 - Green-001	1	62.28	42.32	39.70	-6.62 %
B.02-03 - Green-001	1	54.73	25.41	28.53	10.95 %
B.03-07 - Green-001	1	58.18	29.94	30.75	2.61 %
B.04-08 - Green-001	1	58.18	29.94	30.75	2.61 %
B.05-08 - Green-001	1	58.18	29.94	30.75	2.61 %
B.06-08 - Green-001	1	58.18	29.94	30.75	2.61 %
B.07-08 - Green-001	1	58.18	29.94	30.75	2.61 %

B.08-08 - Green-001	1	58.18	29.94	30.75	2.61 %
B.03-06 - Green-001	1	52.56	34.67	34.51	-0.44 %
B.04-07 - Green-001	1	52.56	34.67	34.51	-0.44 %
B.05-07 - Green-001	1	52.56	34.67	34.51	-0.44 %
B.06-07 - Green-001	1	52.56	34.67	34.51	-0.44 %
B.07-07 - Green-001	1	52.56	34.67	34.51	-0.44 %
B.08-07 - Green-001	1	52.56	34.67	34.51	-0.44 %
A.02-05 - Green-001	1	88.26	22.09	23.87	7.46 %
B.02-05 - Green-001	1	88.26	24.09	27.08	11.04 %
A.02-06 - Green-001	1	71.04	27.05	28.86	6.29 %
A.03-06 - Green-001	1	71.04	27.05	28.86	6.29 %
A.04-07 - Green-001	1	71.04	27.05	28.86	6.29 %
A.05-07 - Green-001	1	71.04	27.05	28.86	6.29 %
A.06-07 - Green-001	1	71.04	27.05	28.86	6.29 %
A.07-07 - Green-001	1	71.04	27.05	28.86	6.29 %
A.08-07 - Green-001	1	71.04	27.05	28.86	6.29 %
A.09-07 - Green-001	1	71.04	27.05	28.86	6.29 %
A.02-07 - Green-001	1	66.06	28.92	31.04	6.83 %
A.03-07 - Green-001	1	66.06	28.92	31.04	6.83 %
A.04-08 - Green-001	1	66.06	28.92	31.04	6.83 %
A.05-08 - Green-001	1	66.06	28.92	31.04	6.83 %
A.06-08 - Green-001	1	66.06	28.92	31.04	6.83 %
A.08-08 - Green-001	1	66.06	28.92	31.04	6.83 %
A.09-08 - Green-001	1	66.06	28.92	31.04	6.83 %
B.02-04 - Green-001	1	93.44	38.54	39.81	3.19 %
B.02-02 - Green-001	1	96.57	26.27	29.23	10.12 %
A.03-01 - Green-001	1	51.57	25.12	27.57	8.90 %
A.04-01 - Green-001	1	51.57	25.12	27.57	8.90 %
A.05-01 - Green-001	1	51.57	25.12	27.57	8.90 %
A.06-01 - Green-001	1	51.57	25.12	27.57	8.90 %
A.07-01 - Green-001	1	51.57	25.12	27.57	8.90 %
A.08-01 - Green-001	1	51.57	25.12	27.57	8.90 %
A.09-01 - Green-001	1	51.57	40.89	39.28	-4.10 %
B.02-01 - Green-001	1	51.57	25.12	27.57	8.90 %
B.03-01 - Green-001	1	51.57	25.12	27.57	8.90 %
B.04-01 - Green-001	1	51.57	25.12	27.57	8.90 %
B.05-01 - Green-001	1	51.57	25.12	27.57	8.90 %
B.06-01 - Green-001	1	51.57	25.12	27.57	8.90 %
B.07-01 - Green-001	1	51.57	25.12	27.57	8.90 %
B.08-01 - Green-001	1	51.57	30.57	31.58	3.22 %
A.05-06 - Green-001	1	40.87	22.13	22.62	2.17 %
A.06-06 - Green-001	1	40.87	22.13	22.62	2.17 %
A.07-06 - Green-001	1	40.87	22.13	22.62	2.17 %
A.08-06 - Green-001	1	40.87	22.13	22.62	2.17 %
A.09-06 - Green-001	1	40.87	37.75	35.63	-5.95 %
B.04-06 - Green-001	1	40.87	27.06	32.02	15.50 %
B.05-06 - Green-001	1	40.87	27.06	32.02	15.50 %

B.06-06 - Green-001	1	40.87	27.06	32.02	15.50 %
B.07-06 - Green-001	1	40.87	27.06	32.02	15.50 %
B.08-06 - Green-001	1	40.87	27.06	44.35	38.98 %
A.05-05 - Green-001	1	62.28	22.56	22.63	0.32 %
A.06-05 - Green-001	1	62.28	22.56	22.63	0.32 %
A.07-05 - Green-001	1	62.28	22.56	22.63	0.32 %
A.08-05 - Green-001	1	62.28	22.56	22.63	0.32 %
A.09-05 - Green-001	1	62.28	22.56	22.63	0.32 %
B.04-05 - Green-001	1	62.28	27.70	32.19	13.95 %
B.05-05 - Green-001	1	62.28	27.70	32.19	13.95 %
B.06-05 - Green-001	1	62.28	27.70	32.19	13.95 %
B.07-05 - Green-001	1	62.28	27.70	32.19	13.95 %
B.08-05 - Green-001	1	62.28	43.53	44.14	1.40 %
A.05-04 - Green-001	1	74.33	33.32	35.11	5.09 %
A.06-04 - Green-001	1	74.33	33.32	35.11	5.09 %
A.07-04 - Green-001	1	74.33	33.32	35.11	5.09 %
A.08-04 - Green-001	1	74.33	33.32	35.11	5.09 %
A.09-04 - Green-001	1	74.33	44.80	43.79	-2.31 %
B.04-04 - Green-001	1	74.33	36.08	38.92	7.29 %
B.05-04 - Green-001	1	74.33	36.08	38.92	7.29 %
B.06-04 - Green-001	1	74.33	36.08	38.92	7.29 %
B.07-04 - Green-001	1	74.33	36.08	38.92	7.29 %
B.08-04 - Green-001	1	74.33	47.72	47.83	0.23 %
A.04-03 - Green-001	1	74.53	30.34	35.21	13.84 %
A.05-03 - Green-001	1	74.53	30.34	35.21	13.84 %
A.06-03 - Green-001	1	74.53	30.34	35.21	13.84 %
A.07-03 - Green-001	1	74.53	30.34	35.21	13.84 %
A.08-03 - Green-001	1	74.53	30.34	35.21	13.84 %
A.09-03 - Green-001	1	74.53	38.51	41.35	6.87 %
B.03-03 - Green-001	1	74.53	28.74	32.65	11.97 %
B.04-03 - Green-001	1	74.53	28.74	32.65	11.97 %
B.05-03 - Green-001	1	74.53	28.74	32.65	11.97 %
B.06-03 - Green-001	1	74.53	28.74	32.65	11.97 %
B.07-03 - Green-001	1	74.53	28.74	32.65	11.97 %
B.08-03 - Green-001	1	74.53	42.28	42.74	1.10 %
A.04-02 - Green-001	1	77.23	24.54	27.38	10.37 %
A.05-02 - Green-001	1	77.23	24.54	27.38	10.37 %
A.06-02 - Green-001	1	77.23	24.54	27.38	10.37 %
A.07-02 - Green-001	1	77.23	24.54	27.38	10.37 %
A.08-02 - Green-001	1	77.23	24.54	27.38	10.37 %
A.09-02 - Green-001	1	77.23	24.54	38.50	36.25 %
B.03-02 - Green-001	1	77.23	24.54	27.38	10.37 %
B.04-02 - Green-001	1	77.23	24.54	27.38	10.37 %
B.05-02 - Green-001	1	77.23	24.54	27.38	10.37 %
B.06-02 - Green-001	1	77.23	24.54	27.38	10.37 %
B.07-02 - Green-001	1	77.23	24.54	27.38	10.37 %
B.08-02 - Green-001	1	77.23	24.54	27.38	10.37 %

BLOCK COMPLIANCE
Calculation Type: New Build (As Designed)

A.07-08 - Green-001	1	66.06	28.92	31.04	6.83 %
A.03-05 - Green-001	1	88.26	22.09	23.87	7.46 %
B.03-05 - Green-001	1	88.26	25.44	29.34	13.28 %
A.03-04 - Green-001	1	93.44	36.55	37.23	1.82 %
B.03-04 - Green-0001	1	93.44	39.80	41.47	4.04 %
Totals:	134	9193.689999999998	4,184.53	4,455.66	
Average DFEE = 32.03 kWh/m²/yr		**% DFEE/TFEE**	PASS		
Average TFEE = 34.07 kWh/m²/yr		5.99 %			

Appendix D

Be Lean BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name **Shell and Core**

Commercial Unit (Be Lean)

As designed

Date: Wed Nov 30 12:59:09 2022

Administrative information

Building Details

Address: 1 Vinyl Square, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.17

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.17

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

Certifier details

Name: CCA Environmental

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	28.5
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	28.5
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	17.1
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.12	0.12	CM000001:Surf[4]
Floor	0.25	0.13	0.13	CM000001:Surf[0]
Roof	0.25	0.11	0.11	CM000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	CM000001:Surf[2]
Personnel doors	2.2	2.2	2.2	G_000008:Surf[2]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

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

Building services

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

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

1- Commercial System

	Heating efficiency	**Cooling efficiency**	**Radiant efficiency**	**SFP [W/(l/s)]**	**HR efficiency**
This system	0.91	3.5	0	-	0.75
Standard value	0.91*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

Local mechanical ventilation, exhaust, and terminal units

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

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

Shell and core configuration

Zone	**Assumed shell?**
COMMERCIAL	YES
COMMERCIAL CYCLE/REFUSE STORAGE	NO
COMMERCIAL BOH & PLANT	NO

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
COMMERCIAL	-	95	60	2874
COMMERCIAL CYCLE/REFUSE STORAGE	95	-	-	34
COMMERCIAL BOH & PLANT	95	-	-	243

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
COMMERCIAL	NO (-14.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m²]	407.8	407.8
External area [m²]	673.5	673.5
Weather	LON	LON
Infiltration [m³/hm²@ 50Pa]	3	3
Average conductance [W/K]	175.03	249.28
Average U-value [W/m²K]	0.26	0.37
Alpha value* [%]	10	10

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

Building Use

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

Energy Consumption by End Use [kWh/m²]

	Actual	Notional
Heating	0.35	1.19
Cooling	13.98	12.2
Auxiliary	3.65	2.28
Lighting	15.29	40.55
Hot water	1.26	1.33
Equipment*	62.75	62.75
TOTAL**	**34.55**	**57.55**

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

Energy Production by Technology [kWh/m²]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m²]	132.83	170.16
Primary energy* [kWh/m²]	100.52	167.76
Total emissions [kg/m²]	17.1	28.5

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	1.5	176.8	0.5	18.8	4.9	0.89	2.62	0.91	3.5
	Notional	5	223.5	1.6	16.4	3.1	0.86	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.12	CM000001:Surf[4]
Floor	0.2	0.13	CM000001:Surf[0]
Roof	0.15	0.11	CM000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.2	CM000001:Surf[2]
Personnel doors	1.5	2.2	G_000008:Surf[2]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	3

Appendix E

Be Green BRUKL

BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name **Shell and Core**

Commercial Unit (Be Green)

As designed

Date: Wed Nov 30 12:52:14 2022

Administrative information

Building Details

Address: 1 Vinyl Square, LONDON,

Certification tool

Calculation engine: Apache

Calculation engine version: 7.0.17

Interface to calculation engine: IES Virtual Environment

Interface to calculation engine version: 7.0.17

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

Certifier details

Name: CCA Environmental

Telephone number:

Address: , ,

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

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	27.4
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	27.4
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	16.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

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

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

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.12	0.12	CM000001:Surf[4]
Floor	0.25	0.13	0.13	CM000001:Surf[0]
Roof	0.25	0.11	0.11	CM000001:Surf[1]
Windows***, roof windows, and rooflights	2.2	1.2	1.2	CM000001:Surf[2]
Personnel doors	2.2	2.2	2.2	G_000008:Surf[2]
Vehicle access & similar large doors	1.5	-	-	No Vehicle access doors in building
High usage entrance doors	3.5	-	-	No High usage entrance doors in building

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

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

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

Building services

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

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

1- Commercial System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	3	3.5	0	-	0.75
Standard value	2.5*	2.6	N/A	N/A	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

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

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

Local mechanical ventilation, exhaust, and terminal units

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

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

Shell and core configuration

Zone	Assumed shell?
COMMERCIAL	YES
COMMERCIAL CYCLE/REFUSE STORAGE	NO
COMMERCIAL BOH & PLANT	NO

General lighting and display lighting

	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
COMMERCIAL	-	95	60	2874
COMMERCIAL CYCLE/REFUSE STORAGE	95	-	-	34
COMMERCIAL BOH & PLANT	95	-	-	243

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

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
COMMERCIAL	NO (-14.1%)	NO

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

Separate submission

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

Separate submission

EPBD (Recast): Consideration of alternative energy systems

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

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	407.8	407.8
External area [m^2]	673.5	673.5
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	3	3
Average conductance [W/K]	175.03	0
Average U-value [W/m^2K]	0.26	0
Alpha value* [%]	10	10

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

Building Use

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

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

	Actual	Notional
Heating	0.12	0.43
Cooling	13.82	12.02
Auxiliary	3.65	2.28
Lighting	14.23	38.75
Hot water	1.26	1.33
Equipment*	62.75	62.75
TOTAL**	**33.09**	**54.8**

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

Energy Production by Technology [kWh/m^2]

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

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	131.43	167.86
Primary energy* [kWh/m^2]	96.77	161.65
Total emissions [kg/m^2]	16.5	27.4

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

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	1.7	174.8	0.2	18.6	4.9	2.94	2.62	3	3.5
	Notional	5.3	220.1	0.6	16.1	3.1	2.56	3.79	----	----
[ST] No Heating or Cooling										
	Actual	0	0	0	0	0	0	0	0	0
	Notional	0	0	0	0	0	0	0	----	----

Key to terms

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

Key Features

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

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.12	CM000001:Surf[4]
Floor	0.2	0.13	CM000001:Surf[0]
Roof	0.15	0.11	CM000001:Surf[1]
Windows, roof windows, and rooflights	1.5	1.2	CM000001:Surf[2]
Personnel doors	1.5	2.2	G_000008:Surf[2]
Vehicle access & similar large doors	1.5	-	No Vehicle access doors in building
High usage entrance doors	1.5	-	No High usage entrance doors in building

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

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

Air Permeability	Typical value	This building
$m^3/(h.m^2)$ at 50 Pa	5	3

Appendix F

Commercial area shell fit-out

Minimum MEP fit out for ground floor non-domestic area

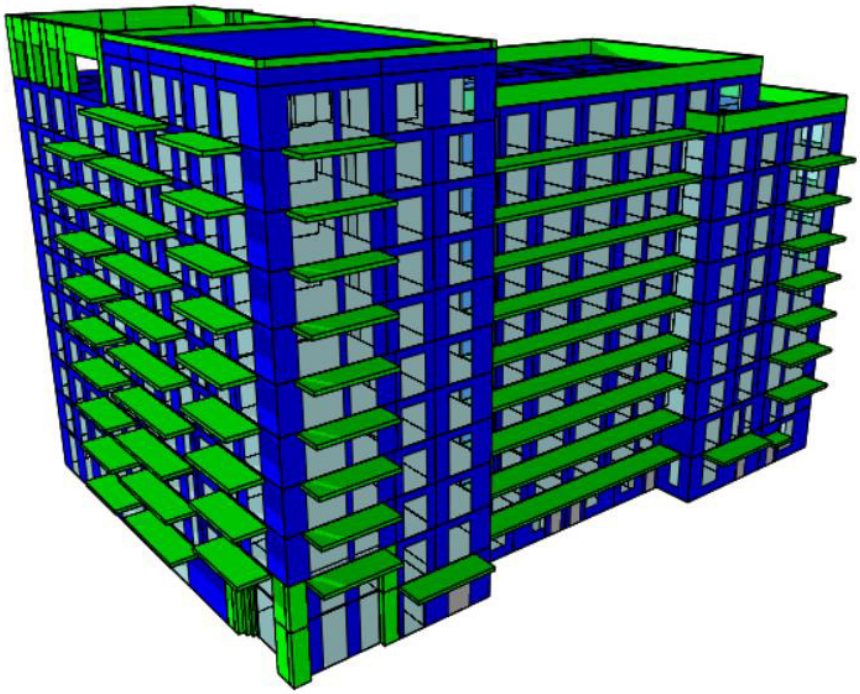
Element		Details	Comments
Fabric U-Values (W/m2K)	Ground Floor	0.13 W/m²K	
	External Walls	0.12 W/m²K	
	Roof	0.11 W/m²K	
Opening U-Values (W/m2K)	Glazing	1.2 W/m²K G value: 0.40	
Ventilation	Air Tightness	3.0 $m^3/hr.m^2$	
	Mechanical Ventilation	MVHR – minimum efficiency of 75%. Limiting SFP: 1.1 W/l/s	
Heating	Primary Heating System	Split System / VRF SCOP: 3.0 (minimum)	
	Domestic Hot Water	Point of use electric	
Cooling		Split System / VRF SEER: 3.5 (minimum)	
Lighting		All areas	Minimum efficacy of 95 Lumens per circuit Watt
		Controls	Photoelectric dimming with occupancy control
Electric Power Factor		> 0.95	

Appendix G

Overheating analysis report

1 Vinyl Square
Overheating Analysis Report

June 2022



Report prepared by CCA Environmental Limited on behalf of
SJS Engineering Limited

Client: ARJ Construction Limited

Executive Summary

An overheating analysis has been carried out on behalf of the Client to show that the proposed development at 1 Vinyl Square located in Hayes, West London meets the CIBSE TM59 thermal comfort criteria for residential homes.

Based on the modelling conducted, the results show that all habitable rooms for all of the apartments comply with the thermal comfort criteria as set out by CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes”.

The proposed building design incorporates external solar shading via balconies, natural ventilation via openable windows/doors and solar control internal blinds as part of the overheating prevention strategy for summertime. Please note multiple design iterations were undertaken of the thermal model in order to arrive at the proposed design which reduces the overheating risk as far as practicable.

Please note that in accordance with the findings from the Environmental & Intrusive Noise Study (Document P2022-REP01-JPR P01 dated 11th April 2022), we have two scenarios for mitigating overheating:

1. In zones of the development where external noise is expected to be lower, apartments can rely on natural ventilation via openable doors and windows.
2. In higher-noise zones of the development, apartments can rely on mechanical ventilation.

Whilst not mandatory, the results show that all of the communal corridors are meeting the CIBSE TM59 recommendations.

Whilst not mandatory, two further simulations have been performed to assess overheating risk under heatwave or future climate conditions using more extreme weather files DSY 2 and DSY 3. Please see Appendix D for results which have been included here for information purposes only.

As solar control internal blinds are part of the overheating prevention strategy for summertime, please see Appendix E for the results for the analysis without blinds which must be reported for reference in accordance with CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” guidelines.

The building thermal model estimates the buildings environmental conditions, and the calculation results are based on the modelling inputs and parameters as detailed herein this report in Section 3. Section 3 includes fabric u values, internal heat gains, occupancy patterns, air permeability rate, ventilation strategy and openings used for the thermal model. The required MVHR ventilation rate and the openable area for each opening type to mitigate overheating has been included in this report.

This analysis has been performed using IES software which provides full dynamic thermal analysis and is a CIBSE certified Level 5 approved Dynamic Simulation Modelling Software. This analysis has been carried out in accordance with user instructions set out in IES manuals and CIBSE AM11 Building Energy and Environmental Modelling. The most current CIBSE Design Summer Year (DSY) Weather File for London was chosen for the simulation (London Heathrow CIBSE DSY 1 2020’s high emissions 50th percentile range weather file), in accordance with CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” guidelines.

The building occupancy profiles & parameters published in CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” has been used as guidance. Within the apartments thermal comfort has been assessed against the criteria identified within CIBSE TM59:2017.

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1.0 SCENARIO

An overheating analysis has been carried out on behalf of the Client to show that the proposed development at 1 Vinyl Square located in Hayes, West London meets the thermal comfort criteria as set out in CIBSE TM59 for all the residential apartments.

The proposed building design incorporates external solar shading via balconies, natural ventilation via openable windows/doors and solar control internal blinds as part of the overheating prevention strategy for summertime. For general background ventilation, each apartment will have a MVHR unit to supply the minimum ventilation required to comply with Part F Building Regulations.

Please note that in accordance with the findings from the Environmental & Intrusive Noise Study (Document P2022-REP01-JPR P01 dated 11th April 2022), we have three scenarios for mitigating overheating:

1. Natural ventilation via openable doors and windows with no restrictions on window opening times.
2. Natural ventilation via openable doors and windows restricted to daytime hours only between 07:00 – 23:00.
3. Mechanical ventilation for apartments identified as high risk for noise in the Environmental & Intrusive Noise Study.

Please note multiple design iterations were undertaken of the thermal model in order to arrive at the proposed design which reduces the overheating risk as far as practicable. This analysis has been performed using IES software (version 2021.3.1.0) which provides full dynamic thermal analysis and is a CIBSE certified Level 5 approved Dynamic Simulation Modelling Software. This analysis has been carried out in accordance with user instructions set out in IES manuals and CIBSE AM11 Building Energy and Environmental Modelling. This analysis has been undertaken using the thermal simulation program ApacheSIM Dynamic Simulation and Macroflo (IESVE, 2021) to predict the buildings environmental performance. Solar Penetration Analysis was performed using Suncast (IESVE, 2021). Results were assessed under Building Category 2 for new buildings in accordance with CIBSE TM59:2017 guidelines.

The most current CIBSE Design Summer Year (DSY) Weather File for London was chosen for the simulation (London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file), in accordance with CIBSE guide TM59:2017 "Design methodology for the assessment of overheating risk in homes" guidelines.

Whilst not mandatory, two further simulations have been performed to assess overheating risk under heatwave or future climate conditions using more extreme weather files DSY 2 and DSY 3. Please see Appendix D for results which have been included here for information purposes only.

As solar control internal blinds are part of the overheating prevention strategy for summertime, please see Appendix E for the results for the analysis without blinds which must be reported for reference in accordance with CIBSE guide TM59:2017 "Design methodology for the assessment of overheating risk in homes" guidelines.

The building occupancy profiles & parameters published in CIBSE guide TM59:2017 "Design methodology for the assessment of overheating risk in homes" has been used as guidance. Within the apartments thermal comfort has been assessed against the criteria identified within CIBSE TM59:2017.

Please see Figures 1 – 5 below for images from the thermal model.

Figure 1: Image showing Plan view of thermal model.

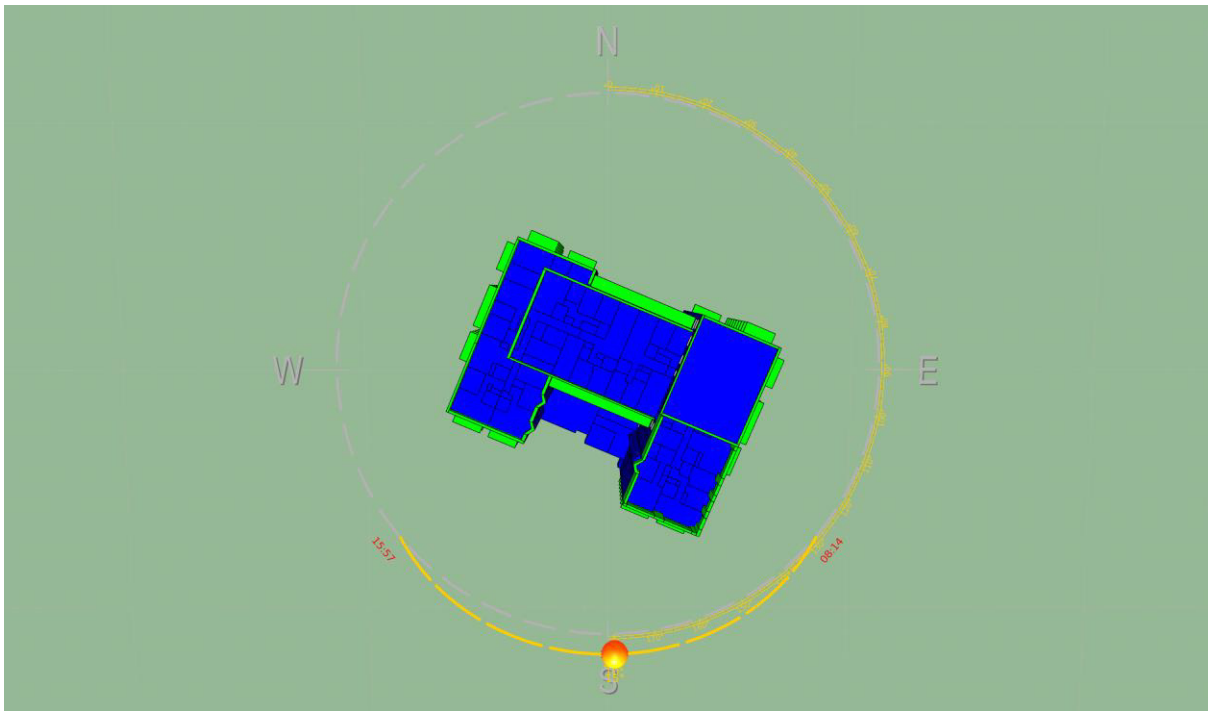


Figure 2: Image showing South West elevation view of thermal model.

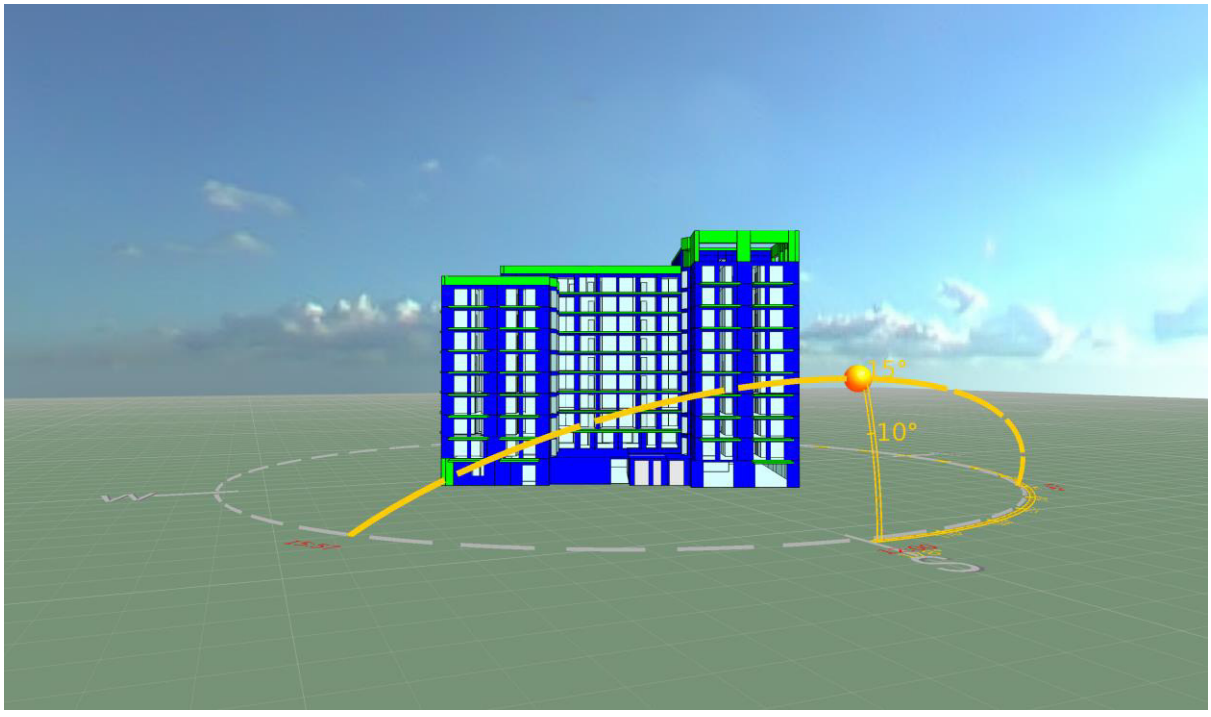


Figure 3: Image showing North West elevation view of thermal model.

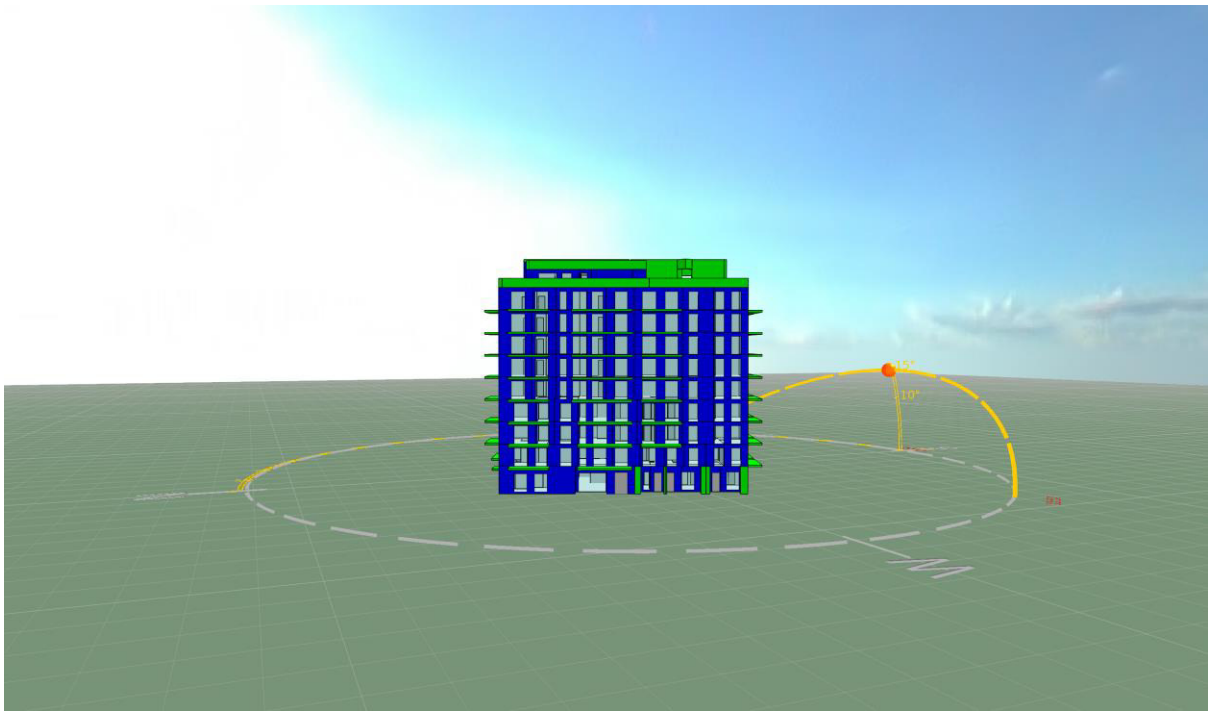


Figure 4: Image showing North East elevation view of thermal model.

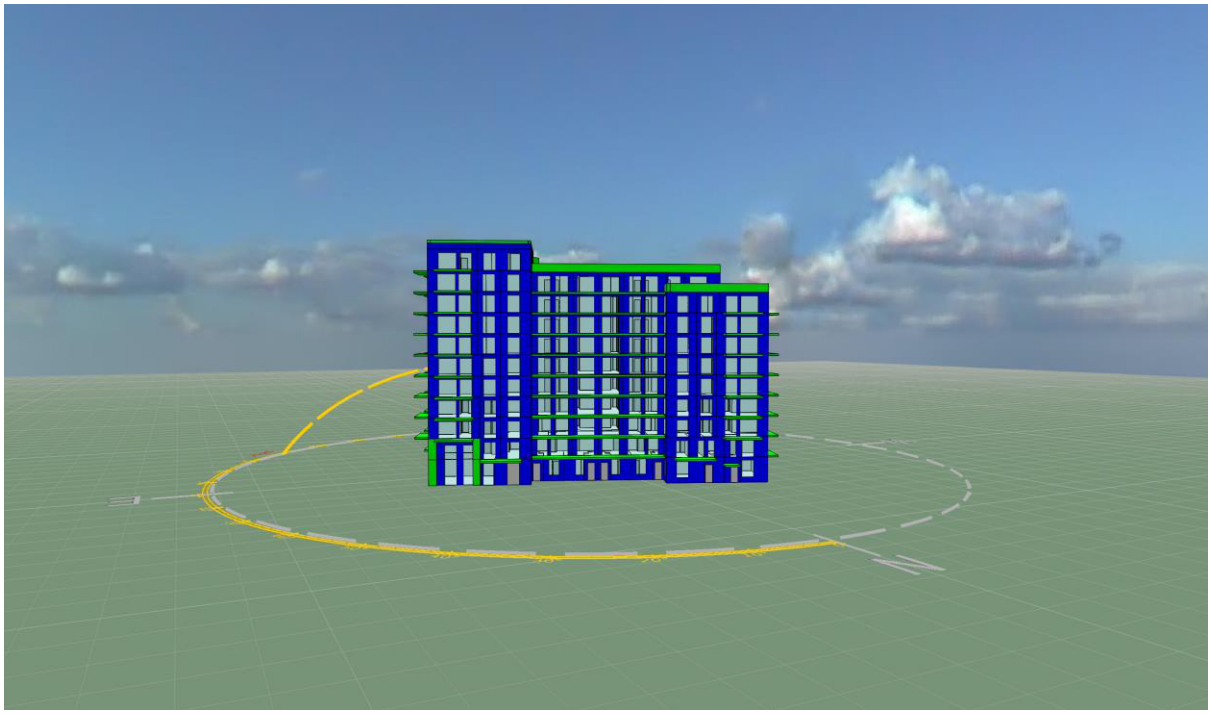
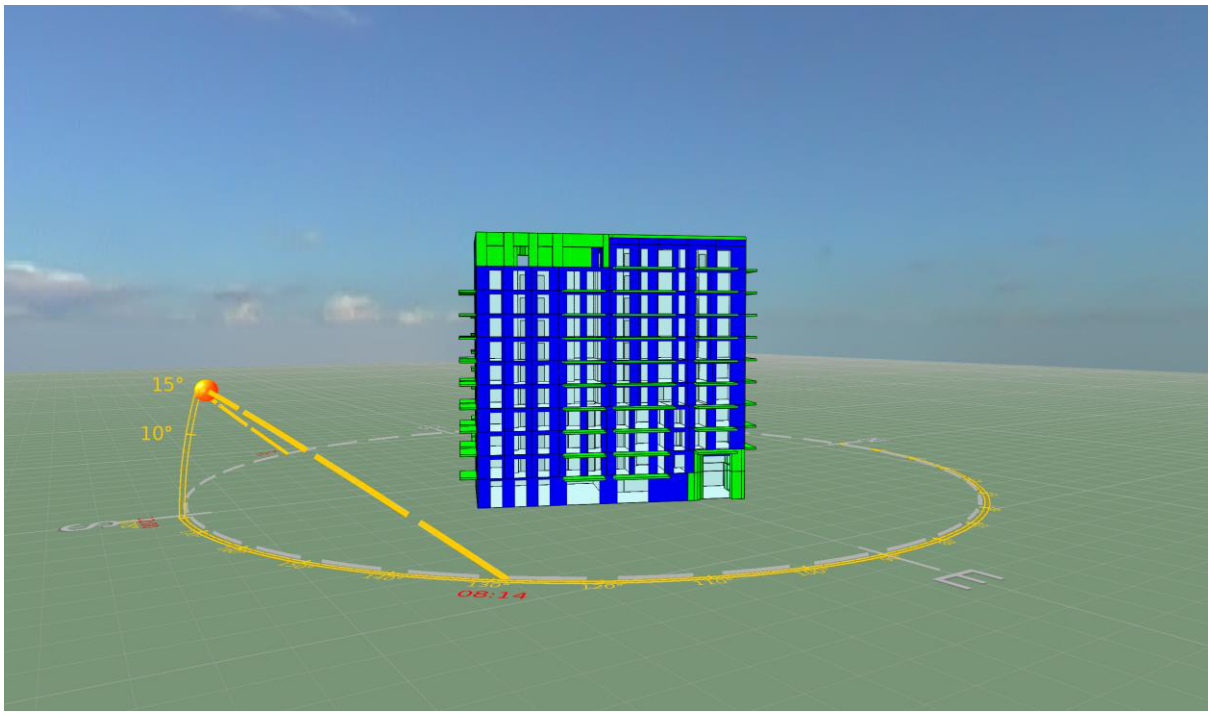


Figure 5: Image showing South East view of thermal model.



2.0 COMPLIANCE REQUIREMENT

Within the apartments, thermal comfort has been assessed against the criteria identified within CIBSE TM59:2017 'Design methodology for the assessment of overheating risk in homes'.

The method for assessment differs depending on whether a room is predominately naturally ventilated or mechanically ventilated. In this instance, both methods apply as in accordance with the findings from the Environmental & Intrusive Noise Study (Document P2022-REP01-JPR P01 dated 11th April 2022), we have three scenarios for mitigating overheating:

1. Natural ventilation via openable doors and windows with no restrictions on window opening times.
2. Natural ventilation via openable doors and windows restricted to daytime hours only between 07:00 – 23:00.
3. Mechanical ventilation for apartments identified as high risk for noise in the Environmental & Intrusive Noise Study.

Method for naturally ventilated rooms – CIBSE TM59:2017

Section 4.2 of CIBSE TM59:2017 applies, which requires both of the following two criteria to be met for domestic properties:

Criteria 1 – Hours of Exceedance (He) for Living Rooms, Kitchens and Bedrooms:

The number of hours, during which the temperature difference (between indoor and outdoor) is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours (TM52 Criterion 1: Hours of exceedance).

Criteria 2 – For Bedrooms Only:

To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am 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 equates to 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

Criteria's 2 and 3 of CIBSE TM52:2013 may fail to be met, but both the above criteria must be met for apartment bedrooms and apartment living and kitchen areas to pass the overheating check.

Section 4.1 of CIBSE TM59:2017 states that homes that are predominately mechanically ventilated because they have either no opportunity or extremely limited opportunities for opening windows (e.g. due to noise levels or air quality) should be assessed for overheating using the fixed temperature method based on CIBSE Guide A (2015a) as described in section 4.3. That condition applies in this case for those rooms identified as high risk for noise in the Environmental & Intrusive Noise Study.

Method for mechanically ventilated rooms – CIBSE TM59:2017

Section 4.3 of CIBSE TM59:2017 requires the following criteria to be met for domestic properties:

Criteria for homes that are predominately mechanically ventilated

For homes with restricted openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied hours (CIBSE Guide A (2015a)).

The unoccupied rooms, such as bathrooms, circulation spaces, store rooms, do not have overheating criteria or a suggested maximum temperature as it is envisaged that no one will occupy these rooms for a significant period of time.
As solar control internal blinds are part of the overheating prevention strategy for summertime, please see Appendix E for the results for the analysis without blinds which must be reported for reference in

accordance with CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” guidelines.

3.0 THERMAL MODEL

Please note the thermal modelling is based on the design information available on the 31/05/2022. Specifications have been taken from current information provided by the Client. Please see Appendix C for images of internal layouts for each apartment.

3.1 Weather Files

The most current CIBSE Design Summer Year (DSY) Weather File for London was chosen for the simulation (London Heathrow DSY 1 2020’s high emissions 50th percentile range weather file), in accordance with CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” guidelines.

Figure 6 and 7 below illustrate the summertime temperature range (May – September) for both the dry bulb and wet bulb temperature for London Heathrow DSY 1 from the weather file.

Figure 6: Graph showing summertime temperature range (May – September) for dry bulb temperature for London Heathrow DSY 1 from the weather file.

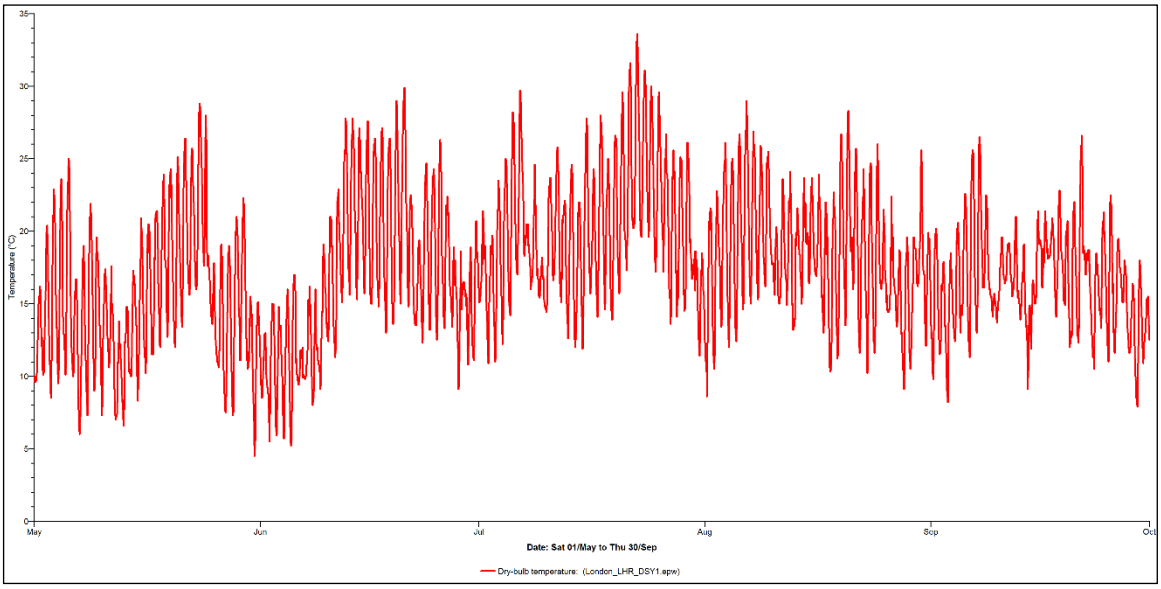


Figure 7: Graph showing summertime temperature range (May – September) for wet bulb temperature for London Heathrow DSY 1 from the weather file.

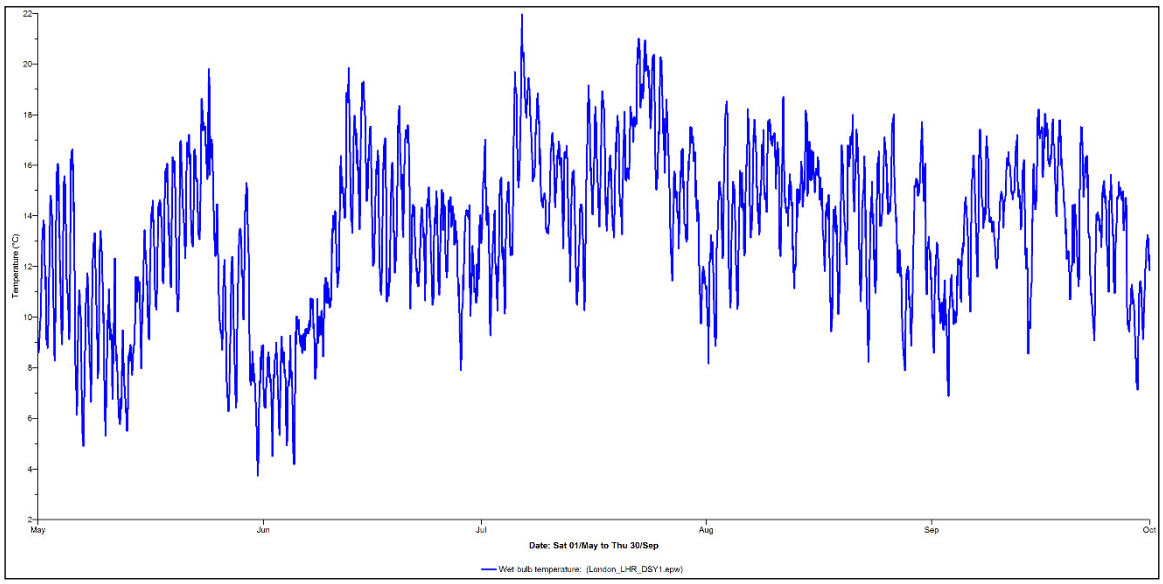


Table 1 below illustrates the maximum dry bulb and wet bulb temperature for London Heathrow DSY 1 from the weather file.

Table 1: Summary of maximum dry bulb and wet bulb temperature for London Heathrow DSY 1 from the weather file.

Weather File	Max. Dry Bulb Temperature	Max. Wet Bulb Temperature
London Heathrow _DSY1_2020High50	33.60	21.97

3.2 Building Fabric Parameters

Please see Table 2 for a summary of the building fabric elements used in the thermal model. Please also refer to model images in Appendix A.

Table 2: Summary of fabric elements used in the thermal model for the proposed residential development at 1 Vinyl Square.

Fabric Element	U-value ($W/m^2.K$)	G-value
External Wall	0.12	-
Roof	0.11	-
Ground Floor	0.13	-
Windows/Glazed Doors	1.20	0.40
Fabric Details: Full Brick Outer Leaf, SFS Inner with blade columns lined, SFS internal party walls lined, concrete around cores as required by SE either exposed or wet plaster, lined/insulated to units, lightweight metal stud interior partitions		
Air Permeability rate = $3m^3/hr.m^2$ @ 50 Pa (equivalent to 0.25 air changes per hour)		
All glazed elements are to be fitted with Internal Blinds with the following properties: Shading coefficient = 0.25 Short-wave radiant fraction = 0.30 Operational Profile = Blinds are fully lowered whenever the internal room operative temperature is greater than 23°C and are fully raised when the temperature drops back down.		

3.3 Room Input Data

Please see Table 3 for a summary of room input data used for thermal modelling calculations.

The building occupancy profiles & parameters published in CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” has been used as guidance.

Please note that in accordance with the findings from the Environmental & Intrusive Noise Study (Document P2022-REP01-JPR P01 dated 11th April 2022), we have three scenarios for mitigating overheating:

1. Natural ventilation via openable doors and windows with no restrictions on window opening times.
2. Natural ventilation via openable doors and windows restricted to daytime hours only between 07:00 – 23:00.
3. Mechanical ventilation for apartments identified as high risk for noise in the Environmental & Intrusive Noise Study.

Table 3: Summary of room input data used for thermal modelling calculations.

Environmental Room Type	Gain Type	Details
Studio	Lighting	2 W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with the hours of operation assumed to be between 1800-2300, this assumes good day light is available in the summer months where overheating is assessed. (CIBSE TM59, 2017, Table 2)
	Occupancy	2 occupants, each generating 75W sensible, 55W latent heat gain with a constant occupancy profile of 100% between 0800 to 2300 and 70% between 2300 to 0800 (CIBSE TM59, 2017, Table 2)
	Equipment	Peak Sensible Gain of 450W between 1800 to 2000, 200W Sensible Gain between 2000 to 2200, 110W Sensible Gain between 0900 to 1800 and 2200 to 2400, with a base load of 85W for the rest of the day (CIBSE TM59, 2017, Table 2)
	Ventilation	13l/s Mechanical Ventilation in accordance with Part F Natural Ventilation via Openable Windows/Doors during Summertime
1 Bedroom Living/Dining/Kitchen	Lighting	2 W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with the hours of operation assumed to be between 1800-2300, this assumes good day light is available in the summer months where overheating is assessed. (CIBSE TM59, 2017, Table 2)
	Occupancy	1 occupant, each generating 75W sensible, 55W latent heat gain with a constant occupancy profile of 100% between 0900 to 2200 (CIBSE TM59, 2017, Table 2)
	Equipment	Peak Sensible Gain of 450W between 1800 to 2000, 200W Sensible Gain between 2000 to 2200, 110W Sensible Gain between 0900 to 1800 and 2200 to 2400, with a base load of 85W for the rest of the day (CIBSE TM59, 2017, Table 2)
	Ventilation	13l/s Mechanical Ventilation in accordance with Part F

		Natural Ventilation via Openable Windows/Doors during Summertime
2 Bedroom Living/Dining/Kitchen	Lighting	2 W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with the hours of operation assumed to be between 1800-2300, this assumes good day light is available in the summer months where overheating is assessed. (CIBSE TM59, 2017, Table 2)
	Occupancy	2 occupants, each generating 75W sensible, 55W latent heat gain with a constant occupancy profile of 100% between 0900 to 2200 (CIBSE TM59, 2017, Table 2)
	Equipment	Peak Sensible Gain of 450W between 1800 to 2000, 200W Sensible Gain between 2000 to 2200, 110W Sensible Gain between 0900 to 1800 and 2200 to 2400, with a base load of 85W for the rest of the day (CIBSE TM59, 2017, Table 2)
	Ventilation	13l/s Mechanical Ventilation in accordance with Part F Natural Ventilation via Openable Windows/Doors during Summertime for rooms identified as 'low risk' in the Environmental & Intrusive Noise Study 42l/s Elevated Mechanical Ventilation during summertime for rooms identified as 'high risk' in the Environmental & Intrusive Noise Study
3 Bedroom Living/Dining/Kitchen	Lighting	2 W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with the hours of operation assumed to be between 1800-2300, this assumes good day light is available in the summer months where overheating is assessed. (CIBSE TM59, 2017, Table 2)
	Occupancy	3 occupants, each generating 75W sensible, 55W latent heat gain with a constant occupancy profile of 100% between 0900 to 2200 (CIBSE TM59, 2017, Table 2)
	Equipment	Peak Sensible Gain of 450W between 1800 to 2000, 200W Sensible Gain between 2000 to 2200, 110W Sensible Gain between 0900 to 1800 and 2200 to 2400, with a base load of 85W for the rest of the day (CIBSE TM59, 2017, Table 2)
	Ventilation	13l/s Mechanical Ventilation in accordance with Part F Natural Ventilation via Openable Windows/Doors during Summertime for rooms identified as 'low risk' in the Environmental & Intrusive Noise Study 42l/s Elevated Mechanical Ventilation during summertime for rooms identified as 'high risk' in the Environmental & Intrusive Noise Study

Single Bedroom	Lighting	2 W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with the hours of operation assumed to be between 1800-2300, this assumes good day light is available in the summer months where overheating is assessed. (CIBSE TM59, 2017, Table 2)
	Occupancy	1 occupant, generating 75W sensible, 55W latent heat gain with a modulating occupancy profile of 100% between 0800 to 2300 and 70% between 2300 to 0800 (CIBSE TM59, 2017, Table 2). An allowance of 30% reduced gains is allowed during sleep.
	Equipment	Peak Sensible Gain of 80W between 0800 to 2300, with a 10W Sensible Gain between 2300 to 0800 (CIBSE TM59, 2017, Table 2)
	Ventilation	8l/s Mechanical Ventilation in accordance with Part F Natural Ventilation via Openable Windows/Doors during Summertime for rooms identified as 'low risk' in the Environmental & Intrusive Noise Study 12.5l/s Elevated Mechanical Ventilation during summertime for rooms identified as 'high risk' in the Environmental & Intrusive Noise Study
Double/Twin Bedroom	Lighting	2 W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with the hours of operation assumed to be between 1800-2300, this assumes good day light is available in the summer months where overheating is assessed. (CIBSE TM59, 2017, Table 2)
	Occupancy	2 occupants, each generating 75W sensible, 55W latent heat gain with a modulating occupancy profile of 100% between 0800 to 0900 and 2200 to 2300 and 70% between 2300 to 0800 (CIBSE TM59, 2017, Table 2). 1 occupant, generating 75W sensible, 55W latent heat gain with a modulating occupancy profile of 100% between 0900 and 2200 (CIBSE TM59, 2017, Table 2). An allowance of 30% reduced gains is allowed during sleep.
	Equipment	Peak Sensible Gain of 80W between 0800 to 2300, with a 10W Sensible Gain between 2300 to 0800 (CIBSE TM59, 2017, Table 2)
	Ventilation	8l/s Mechanical Ventilation in accordance with Part F Natural Ventilation via Openable Windows/Doors during Summertime for rooms identified as 'low risk' in the Environmental & Intrusive Noise Study

		12.5l/s Elevated Mechanical Ventilation during summertime for rooms identified as 'high risk' in the Environmental & Intrusive Noise Study
Bathroom	Lighting	2W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with a modulating lighting profile of 100% between 1800 to 2300
	Occupancy	Transient Space - No Constant Occupation
	Equipment	1.75W/m² Sensible Heat Gain with a 0.22 Radiant fraction has been applied with a profile of 'on continuously'
	Ventilation	Mechanical Extract Ventilation in accordance with Part F
Flat Hallway	Lighting	2W/m² Sensible Heat Gain with a 0.45 Radiant fraction has been applied with a modulating lighting profile of 100% between 1800 to 2300
	Occupancy	Transient Space - No Constant Occupation
	Equipment	N/a
	Ventilation	N/a
Communal Corridors	Lighting	Zero as assume PIR sensors are present
	Occupancy	Transient Space - No Constant Occupation
	Equipment	Pipework Heat loss assumed to be 10W/m² Sensible Heat Gain with a profile of 'on continuously'
	Ventilation	Extract ventilation via AOV
Utility Cupboard	Lighting	Zero as assume PIR sensors are present
	Occupancy	Transient Space - No Constant Occupation
	Equipment	Heat loss assumed to be 150W Sensible Heat Gain with a profile of 'on continuously'
	Ventilation	Mechanical Extract Ventilation in accordance with Part F

3.4 Window Openings

Please see Table 4 for a summary of openings and profiles used for thermal modelling calculations. Please also refer to model images in Appendix B.

Please note all windows and doors have a restricted opening of 100mm to allow for purge ventilation during warmer temperatures in summertime. Please note all opening profiles have been assigned in accordance with the findings from the Environmental & Intrusive Noise Study (Document P2022-REP01-JPR P01 dated 11th April 2022).

Table 4: Summary of openings and profiles used for thermal modelling calculations.

Opening Type	Equivalent Free Area (% of total area)	Opening Profile over a 24 hour period (Scenario 1)	Opening Profile over a 24 hour period for apartments with restricted opening times (Scenario 2)
Window	Restricted to 10%	open when room air temperature exceeds 22°C and room air temperature > external air temperature or when room carbon dioxide level exceeds 500ppm (parts per million)	open when room air temperature exceeds 22°C and room air temperature > external air temperature during the daytime hours of 7am – 11pm only or when room carbon dioxide level exceeds 500ppm (parts per million) during the daytime hours of 7am – 11pm only
Balcony/Patio Door	Restricted to 10%	open when room air temperature exceeds 22°C and room air temperature > external air temperature or when room carbon dioxide level exceeds 500ppm (parts per million)	open when room air temperature exceeds 22°C and room air temperature > external air temperature during the daytime hours of 7am – 11pm only or when room carbon dioxide level exceeds 500ppm (parts per million) during the daytime hours of 7am – 11pm only

4.0 RESULTS AND CONCLUSIONS

4.1 Results for CIBSE TM59 for living, kitchen and bedrooms for naturally ventilated rooms

As detailed within section 2 of this report, for the naturally ventilated living, kitchen and bedrooms to achieve compliance with CIBSE TM59:2017, each habitable room must achieve compliance with:

- Criteria 1 of CIBSE TM52:2013 which states the external to internal temperature difference must not exceed 1K for more than 3% of the year between May to September

And in addition, each bedroom must also achieve compliance with:

- CIBSE TM59:2017 which states the bedrooms operative temperature must not exceed 26°C for more than 32 hours per year between the hours of 10pm until 7am daily.

Table 5 below shows the predicted thermal comfort results against the TM59 criteria 1 for each naturally ventilated living, kitchen and bedroom within the proposed development at 1 Vinyl Square.

Table 6 below shows the predicted thermal comfort results against the TM59 criteria for each naturally ventilated bedroom within the proposed development at 1 Vinyl Square.

Table 5: Results showing performance against the TM59 criteria 1 for each naturally ventilated living, kitchen and bedroom within the proposed residential development at 1 Vinyl Square using the London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file.

Room Name	TM59 Analysis	
	Criteria 1:	Pass/Fail
	Hours of exceedance (He)	
C-00-04 3B5P M DB1	0	PASS
C-00-03 3B5P M DB1	0	PASS
C-00-02 3B5P M DB1	0	PASS
C-00-01 3B5P M DB1	0	PASS
C-00-05 3B5P M LDK	0	PASS
C-00-06 3B5P M LDK	0	PASS
C-00-07 3B5P M SB	0	PASS
C-00-08 3B5P M DB1	0	PASS
C-00-09 3B5P M DB1	0	PASS
A-01-04 2B3P DB	0	PASS
A-01-04 2B3P SB	0	PASS
A-01-04 2B3P LDK	0	PASS
A-01-03 2B4P LDK	0	PASS
A-01-03 2B4P DB1	0	PASS
A-01-03 2B4P DB2	0	PASS
A-01-02 3B5P DB2	0	PASS
A-01-02 3B5P SB	0	PASS
A-01-02 3B5P DB1	0	PASS
A-01-02 3B5P LDK	0	PASS
A-01-01 2B4P DB1	0	PASS
C-00-01 3B5P M SB	0	PASS

C-00-01 3B5P M LDK	0	PASS
C-00-01 3B5P M DB2	0	PASS
C-00-02 3B5P M DB2	0	PASS
C-00-02 3B5P M LDK	0	PASS
C-00-02 3B5P M SB	0	PASS
C-00-03 3B5P M DB2	0	PASS
C-00-03 3B5P M LDK	0	PASS
C-00-03 3B5P M SB	0	PASS
C-00-04 3B5P M DB2	0	PASS
C-00-04 3B5P M SB	0	PASS
C-00-04 3B5P M LDK	0	PASS
C-00-06 3B5P M DB1	0	PASS
C-00-06 3B5P M DB2	0	PASS
C-00-06 3B5P M SB	0.1	PASS
C-00-07 3B5P M LDK	0	PASS
C-00-07 3B5P M DB2	0	PASS
C-00-07 3B5P M DB1	0	PASS
C-00-08 3B5P M SB	0	PASS
C-00-08 3B5P M DB2	0	PASS
C-00-08 3B5P M LDK	0	PASS
C-00-09 3B5P M SB	0	PASS
C-00-09 3B5P M DB2	0	PASS
C-00-09 3B5P M LDK	0	PASS
A-02-06 2B4P LDK	0	PASS
A-02-06 2B4P DB1	0	PASS
A-02-06 2B4P DB2	0	PASS
A-02-05 3B5P DB2	0	PASS
A-02-05 3B5P SB	0	PASS
A-02-05 3B5P DB1	0	PASS
A-02-05 3B5P LDK	0	PASS
A-02-01 1B2P LDK	0	PASS
B-02-04 3B5P DB2	0.1	PASS
B-02-04 3B5P SB	0.3	PASS
B-02-04 3B5P LDK	0.2	PASS
B-02-05 3B5P LDK	0	PASS
B-02-05 3B5P SB	0.1	PASS
B-02-05 3B5P DB2	0.1	PASS
B-02-05 3B5P DB1	0	PASS
B-02-06 1B2P DB	0	PASS
B-02-06 1B2P LDK	0	PASS
B-02-07 1B2P DB	0	PASS
B-02-07 1B2P LDK	0	PASS
B-02-01 1B2P DB	0	PASS
B-02-03 1B2P DB	0	PASS
B-02-03 1B2P LDK	0	PASS

B-02-02 3B6P LDK	0	PASS
B-02-02 3B6P DB1	0	PASS
B-02-02 3B6P DB2	0	PASS
B-02-02 3B6P DB3	0	PASS
A-02-02 3B6P DB2	0	PASS
A-02-02 3B6P DB1	0	PASS
A-02-02 3B6P LDK	0	PASS
A-02-02 3B6P DB3	0	PASS
A-02-03 1B2P DB	0	PASS
A-02-04 3B5P SB	0.4	PASS
A-02-04 3B5P DB2	0.1	PASS
A-02-04 3B5P LDK	0.3	PASS
A-02-01 1B2P DB	0	PASS
A-02-07 1B2P DB	0	PASS
B-02-01 1B2P LDK	0	PASS
A-02-07 1B2P LDK	0	PASS
A-02-03 1B2P LDK	0	PASS
A-04-07 2B4P LDK	0	PASS
A-04-07 2B4P DB1	0	PASS
A-04-07 2B4P DB2	0	PASS
A-04-01 1B2P LDK	0	PASS
B-04-07 1B2P DB	0	PASS
B-04-07 1B2P LDK	0	PASS
B-04-08 1B2P DB	0	PASS
B-04-08 1B2P LDK	0	PASS
B-04-01 1B2P DB	0	PASS
B-04-02 2B4P LDK	0	PASS
B-04-02 2B4P DB1	0	PASS
B-04-02 2B4P DB2	0	PASS
A-04-02 2B4P DB2	0	PASS
A-04-02 2B4P DB1	0	PASS
A-04-01 1B2P DB	0	PASS
A-04-08 1B2P DB	0	PASS
B-04-01 1B2P LDK	0	PASS
A-04-08 1B2P LDK	0	PASS
B-04-03 2B4P DB2	0	PASS
B-04-03 2B4P LDK	0	PASS
B-04-03 2B4P DB1	0	PASS
A-04-03 2B4P DB1	0	PASS
A-04-03 2B4P DB2	0	PASS
A-04-03 2B4P LDK	0	PASS
B-04-04 2B3P SB	0	PASS
B-04-04 2B3P LDK	0	PASS
B-04-04 2B3P DB	0.1	PASS
B-04-05 2B3P DB	0.1	PASS

B-04-05 2B3P SB	0.2	PASS
B-04-05 2B3P LDK	0.2	PASS
B-04-06 STUDIO	0.1	PASS
A-04-04 2B3P DB	0	PASS
A-04-05 2B3P LDK	0	PASS
A-04-05 2B3P SB	0.1	PASS
A-04-05 2B3P DB	0	PASS
A-04-06 STUDIO	0	PASS
A-04-02 2B4P LDK	0	PASS
A-04-04 2B3P SB	0	PASS
A-04-04 2B3P LDK	0	PASS
A-06-07 2B4P DB1	0	PASS
A-06-07 2B4P DB2	0	PASS
A-06-01 1B2P LDK	0	PASS
B-06-07 1B2P DB	0	PASS
B-06-07 1B2P LDK	0	PASS
B-06-08 1B2P DB	0	PASS
B-06-08 1B2P LDK	0	PASS
B-06-01 1B2P DB	0	PASS
B-06-02 2B4P DB1	0	PASS
B-06-02 2B4P DB2	0	PASS
A-06-02 2B4P DB2	0	PASS
A-06-02 2B4P DB1	0	PASS
A-06-02 2B4P LDK	0	PASS
A-06-01 1B2P DB	0	PASS
A-06-08 1B2P DB	0	PASS
B-06-01 1B2P LDK	0	PASS
A-06-08 1B2P LDK	0	PASS
B-06-03 2B4P DB2	0	PASS
B-06-03 2B4P LDK	0	PASS
B-06-03 2B4P DB1	0	PASS
A-06-03 2B4P DB1	0	PASS
A-06-03 2B4P DB2	0	PASS
A-06-03 2B4P LDK	0	PASS
B-06-04 2B3P SB	0	PASS
B-06-04 2B3P LDK	0	PASS
B-06-04 2B3P DB	0	PASS
B-06-05 2B3P DB	0.1	PASS
B-06-05 2B3P SB	0.2	PASS
B-06-05 2B3P LDK	0.2	PASS
B-06-06 STUDIO	0.1	PASS
A-06-05 2B3P LDK	0	PASS
A-06-05 2B3P SB	0.1	PASS
A-06-05 2B3P DB	0	PASS
A-06-06 STUDIO	0	PASS

A-06-07 2B4P LDK	0	PASS
A-06-04 2B4P DB2	0	PASS
A-06-04 2B4P DB1	0	PASS
A-06-04 2B4P LDK	0	PASS
A-08-07 2B4P DB1	0	PASS
A-08-07 2B4P DB2	0	PASS
A-08-01 1B2P LDK	0	PASS
B-08-07 1B2P DB	0.1	PASS
B-08-07 1B2P LDK	0.1	PASS
B-08-08 1B2P DB	0	PASS
B-08-08 1B2P LDK	0	PASS
B-08-01 1B2P DB	0	PASS
B-08-02 2B4P LDK	0	PASS
B-08-02 2B4P DB1	0	PASS
B-08-02 2B4P DB2	0	PASS
A-08-02 2B4P DB2	0	PASS
A-08-02 2B4P DB1	0	PASS
A-08-02 2B4P LDK	0	PASS
A-08-01 1B2P DB	0	PASS
A-08-08 1B2P DB	0	PASS
B-08-01 1B2P LDK	0	PASS
A-08-08 1B2P LDK	0	PASS
B-08-03 2B4P DB2	0	PASS
B-08-03 2B4P LDK	0	PASS
B-08-03 2B4P DB1	0	PASS
A-08-03 2B4P DB1	0	PASS
A-08-03 2B4P DB2	0	PASS
A-08-03 2B4P LDK	0	PASS
B-08-05 2B3P DB	0.1	PASS
B-08-05 2B3P SB	0.4	PASS
B-08-05 2B3P LDK	0.2	PASS
B-08-06 STUDIO	0.1	PASS
A-08-05 2B3P LDK	0	PASS
A-08-05 2B3P SB	0.1	PASS
A-08-05 2B3P DB	0	PASS
A-08-06 STUDIO	0	PASS
A-08-07 2B4P LDK	0	PASS
A-08-04 2B4P DB2	0	PASS
A-08-04 2B4P DB1	0	PASS
A-08-04 2B4P LDK	0	PASS
B-08-04 2B4P B1	0	PASS
B-08-04 2B4P LDK	0	PASS
B-08-04 2B4P B2	0	PASS
B-06-02 2B4P LDK	0	PASS
A-09-07 2B4P DB1	0	PASS

A-09-07 2B4P DB2	0	PASS
A-09-01 1B2P LDK	0	PASS
A-09-02 2B4P DB2	0	PASS
A-09-02 2B4P DB1	0	PASS
A-09-02 2B4P LDK	0	PASS
A-09-01 1B2P DB	0	PASS
A-09-08 1B2P DB	0	PASS
A-09-08 1B2P LDK	0	PASS
A-09-03 2B4P DB1	0	PASS
A-09-03 2B4P DB2	0	PASS
A-09-03 2B4P LDK	0	PASS
A-09-05 2B3P LDK	0	PASS
A-09-05 2B3P SB	0.1	PASS
A-09-05 2B3P DB	0	PASS
A-09-06 STUDIO	0	PASS
A-09-07 2B4P LDK	0	PASS
A-09-04 2B4P DB2	0	PASS
A-09-04 2B4P DB1	0	PASS
A-09-04 2B4P LDK	0	PASS
B-09-01 3B5P LDK	0.4	PASS
B-09-01 3B5P SB	0	PASS
B-09-01 3B5P DB1	0	PASS
B-09-01 3B5P DB2	0	PASS
B-09-02 3B6P DB3	0	PASS
B-09-02 3B6P DB1	0	PASS
B-09-02 3B6P LDK	0	PASS
B-09-02 3B6P DB2	0	PASS
A-10-03 2B3P LDK	0	PASS
A-10-03 2B3P SB	0	PASS
A-10-03 2B3P DB	0	PASS
A-10-01 1B2P DB	0.1	PASS
A-10-01 1B2P LDK	0	PASS
A-10-02 1B2P DB	0	PASS
A-10-02 1B2P LDK	0	PASS
A-03-06 2B4P LDK	0	PASS
A-03-06 2B4P DB1	0	PASS
A-03-06 2B4P DB2	0	PASS
A-03-05 3B5P DB2	0	PASS
A-03-05 3B5P SB	0.1	PASS
A-03-05 3B5P DB1	0	PASS
A-03-05 3B5P LDK	0	PASS
A-03-01 1B2P LDK	0	PASS
B-03-04 3B5P DB2	0.1	PASS
B-03-04 3B5P SB	0.3	PASS
B-03-04 3B5P LDK	0.2	PASS

B-03-05 3B5P LDK	0.2	PASS
B-03-05 3B5P SB	0.3	PASS
B-03-05 3B5P DB2	0.2	PASS
B-03-05 3B5P DB1	0.1	PASS
B-03-06 1B2P DB	0.1	PASS
B-03-06 1B2P LDK	0.1	PASS
B-03-07 1B2P DB	0	PASS
B-03-07 1B2P LDK	0	PASS
B-03-01 1B2P DB	0	PASS
B-03-03 1B2P DB	0	PASS
B-03-03 1B2P LDK	0	PASS
B-03-02 3B6P LDK	0	PASS
B-03-02 3B6P DB1	0	PASS
B-03-02 3B6P DB2	0	PASS
B-03-02 3B6P DB3	0	PASS
A-03-02 3B6P DB2	0	PASS
A-03-02 3B6P DB1	0	PASS
A-03-02 3B6P LDK	0	PASS
A-03-02 3B6P DB3	0	PASS
A-03-03 1B2P DB	0	PASS
A-03-04 3B5P SB	0.3	PASS
A-03-04 3B5P DB2	0.1	PASS
A-03-04 3B5P LDK	0.2	PASS
A-03-01 1B2P DB	0	PASS
A-03-07 1B2P DB	0	PASS
B-03-01 1B2P LDK	0	PASS
A-03-07 1B2P LDK	0	PASS
A-03-03 1B2P LDK	0	PASS
A-05-07 2B4P LDK	0	PASS
A-05-07 2B4P DB1	0	PASS
A-05-07 2B4P DB2	0	PASS
A-05-01 1B2P LDK	0	PASS
B-05-07 1B2P DB	0.1	PASS
B-05-07 1B2P LDK	0.1	PASS
B-05-08 1B2P DB	0	PASS
B-05-08 1B2P LDK	0	PASS
B-05-01 1B2P DB	0	PASS
B-05-02 2B4P LDK	0	PASS
B-05-02 2B4P DB1	0	PASS
B-05-02 2B4P DB2	0	PASS
A-05-02 2B4P DB2	0	PASS
A-05-02 2B4P DB1	0	PASS
A-05-01 1B2P DB	0	PASS
A-05-08 1B2P DB	0	PASS
B-05-01 1B2P LDK	0	PASS

A-05-08 1B2P LDK	0	PASS
B-05-03 2B4P DB2	0	PASS
B-05-03 2B4P LDK	0	PASS
B-05-03 2B4P DB1	0	PASS
A-05-03 2B4P DB1	0	PASS
A-05-03 2B4P DB2	0	PASS
A-05-03 2B4P LDK	0	PASS
B-05-04 2B3P SB	0	PASS
B-05-04 2B3P LDK	0	PASS
B-05-04 2B3P DB	0.1	PASS
B-05-05 2B3P DB	0.1	PASS
B-05-05 2B3P SB	0.3	PASS
B-05-05 2B3P LDK	0.4	PASS
B-05-06 STUDIO	0.1	PASS
A-05-04 2B3P DB	0	PASS
A-05-05 2B3P LDK	0.3	PASS
A-05-05 2B3P SB	0.2	PASS
A-05-05 2B3P DB	0	PASS
A-05-06 STUDIO	0	PASS
A-05-02 2B4P LDK	0	PASS
A-05-04 2B3P SB	0	PASS
A-05-04 2B3P LDK	0	PASS
A-07-07 2B4P DB1	0	PASS
A-07-07 2B4P DB2	0	PASS
A-07-01 1B2P LDK	0	PASS
B-07-07 1B2P DB	0.1	PASS
B-07-07 1B2P LDK	0.1	PASS
B-07-08 1B2P DB	0	PASS
B-07-08 1B2P LDK	0	PASS
B-07-01 1B2P DB	0	PASS
B-07-02 2B4P DB1	0	PASS
B-07-02 2B4P DB2	0	PASS
A-07-02 2B4P DB2	0	PASS
A-07-02 2B4P DB1	0	PASS
A-07-02 2B4P LDK	0	PASS
A-07-01 1B2P DB	0	PASS
A-07-08 1B2P DB	0	PASS
B-07-01 1B2P LDK	0	PASS
A-07-08 1B2P LDK	0	PASS
B-07-03 2B4P DB2	0	PASS
B-07-03 2B4P LDK	0	PASS
B-07-03 2B4P DB1	0	PASS
A-07-03 2B4P DB1	0	PASS
A-07-03 2B4P DB2	0	PASS
A-07-03 2B4P LDK	0	PASS

B-07-04 2B3P SB	0	PASS
B-07-04 2B3P LDK	0	PASS
B-07-04 2B3P DB	0.1	PASS
B-07-05 2B3P DB	0.2	PASS
B-07-05 2B3P SB	0.3	PASS
B-07-05 2B3P LDK	0.4	PASS
B-07-06 STUDIO	0.1	PASS
A-07-05 2B3P LDK	0.2	PASS
A-07-05 2B3P SB	0.2	PASS
A-07-05 2B3P DB	0	PASS
A-07-06 STUDIO	0	PASS
A-07-07 2B4P LDK	0	PASS
A-07-04 2B4P DB2	0	PASS
A-07-04 2B4P DB1	0	PASS
A-07-04 2B4P LDK	0	PASS
B-07-02 2B4P LDK	0	PASS

Table 6: Results showing performance against the TM59 criteria for each naturally ventilated bedroom within the proposed residential development at 1 Vinyl Square using the London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file.

Room Name	TM59 Analysis	
	Criteria 2: Operative Temperature Hours >26°C between 10pm to 7am daily must not exceed 32 hours	**Pass/Fail**
C-00-04 3B5P M DB1	20	PASS
C-00-03 3B5P M DB1	21	PASS
C-00-02 3B5P M DB1	21	PASS
C-00-01 3B5P M DB1	19	PASS
C-00-07 3B5P M SB	14	PASS
C-00-08 3B5P M DB1	13	PASS
C-00-09 3B5P M DB1	8	PASS
A-01-04 2B3P DB	20	PASS
A-01-04 2B3P SB	12	PASS
A-01-03 2B4P DB1	15	PASS
A-01-03 2B4P DB2	16	PASS
A-01-02 3B5P DB2	21	PASS
A-01-02 3B5P SB	17	PASS
A-01-02 3B5P DB1	16	PASS
A-01-01 2B4P DB1	22	PASS
C-00-01 3B5P M SB	16	PASS
C-00-01 3B5P M DB2	16	PASS
C-00-02 3B5P M DB2	15	PASS
C-00-02 3B5P M SB	10	PASS
C-00-03 3B5P M DB2	15	PASS
C-00-03 3B5P M SB	10	PASS

C-00-04 3B5P M DB2	16	PASS
C-00-04 3B5P M SB	15	PASS
C-00-06 3B5P M DB1	27	PASS
C-00-06 3B5P M DB2	22	PASS
C-00-06 3B5P M SB	23	PASS
C-00-07 3B5P M DB2	16	PASS
C-00-07 3B5P M DB1	16	PASS
C-00-08 3B5P M SB	17	PASS
C-00-08 3B5P M DB2	20	PASS
C-00-09 3B5P M SB	14	PASS
C-00-09 3B5P M DB2	8	PASS
A-02-06 2B4P DB1	16	PASS
A-02-06 2B4P DB2	17	PASS
A-02-05 3B5P DB2	23	PASS
A-02-05 3B5P SB	19	PASS
A-02-05 3B5P DB1	18	PASS
B-02-04 3B5P DB2	27	PASS
B-02-04 3B5P SB	31	PASS
B-02-05 3B5P SB	18	PASS
B-02-05 3B5P DB2	22	PASS
B-02-05 3B5P DB1	18	PASS
B-02-06 1B2P DB	18	PASS
B-02-07 1B2P DB	15	PASS
B-02-01 1B2P DB	16	PASS
B-02-03 1B2P DB	21	PASS
B-02-02 3B6P DB1	12	PASS
B-02-02 3B6P DB2	12	PASS
B-02-02 3B6P DB3	16	PASS
A-02-02 3B6P DB2	12	PASS
A-02-02 3B6P DB1	12	PASS
A-02-02 3B6P DB3	16	PASS
A-02-03 1B2P DB	21	PASS
A-02-04 3B5P SB	30	PASS
A-02-04 3B5P DB2	28	PASS
A-02-01 1B2P DB	17	PASS
A-02-07 1B2P DB	15	PASS
A-04-07 2B4P DB1	16	PASS
A-04-07 2B4P DB2	18	PASS
B-04-07 1B2P DB	19	PASS
B-04-08 1B2P DB	15	PASS
B-04-01 1B2P DB	16	PASS
B-04-02 2B4P DB1	12	PASS
B-04-02 2B4P DB2	12	PASS
A-04-02 2B4P DB2	12	PASS
A-04-02 2B4P DB1	12	PASS
A-04-01 1B2P DB	17	PASS

A-04-08 1B2P DB	15	PASS
B-04-03 2B4P DB2	26	PASS
B-04-03 2B4P DB1	26	PASS
A-04-03 2B4P DB1	26	PASS
A-04-03 2B4P DB2	27	PASS
B-04-04 2B3P SB	20	PASS
B-04-04 2B3P DB	29	PASS
B-04-05 2B3P DB	24	PASS
B-04-05 2B3P SB	24	PASS
B-04-06 STUDIO	20	PASS
A-04-04 2B3P DB	27	PASS
A-04-05 2B3P SB	28	PASS
A-04-05 2B3P DB	25	PASS
A-04-06 STUDIO	17	PASS
A-04-04 2B3P SB	19	PASS
A-06-07 2B4P DB1	16	PASS
A-06-07 2B4P DB2	18	PASS
B-06-07 1B2P DB	19	PASS
B-06-08 1B2P DB	16	PASS
B-06-01 1B2P DB	16	PASS
B-06-02 2B4P DB1	12	PASS
B-06-02 2B4P DB2	12	PASS
A-06-02 2B4P DB2	12	PASS
A-06-02 2B4P DB1	13	PASS
A-06-01 1B2P DB	17	PASS
A-06-08 1B2P DB	15	PASS
B-06-03 2B4P DB2	16	PASS
B-06-03 2B4P DB1	16	PASS
A-06-03 2B4P DB1	16	PASS
A-06-03 2B4P DB2	17	PASS
B-06-04 2B3P SB	13	PASS
B-06-04 2B3P DB	18	PASS
B-06-05 2B3P DB	25	PASS
B-06-05 2B3P SB	24	PASS
B-06-06 STUDIO	20	PASS
A-06-05 2B3P SB	28	PASS
A-06-05 2B3P DB	25	PASS
A-06-06 STUDIO	17	PASS
A-06-04 2B4P DB2	18	PASS
A-06-04 2B4P DB1	15	PASS
A-08-07 2B4P DB1	16	PASS
A-08-07 2B4P DB2	18	PASS
B-08-07 1B2P DB	20	PASS
B-08-08 1B2P DB	18	PASS
B-08-01 1B2P DB	16	PASS
B-08-02 2B4P DB1	13	PASS

B-08-02 2B4P DB2	12	PASS
A-08-02 2B4P DB2	12	PASS
A-08-02 2B4P DB1	13	PASS
A-08-01 1B2P DB	17	PASS
A-08-08 1B2P DB	16	PASS
B-08-03 2B4P DB2	15	PASS
B-08-03 2B4P DB1	16	PASS
A-08-03 2B4P DB1	16	PASS
A-08-03 2B4P DB2	15	PASS
B-08-05 2B3P DB	23	PASS
B-08-05 2B3P SB	24	PASS
B-08-06 STUDIO	21	PASS
A-08-05 2B3P SB	27	PASS
A-08-05 2B3P DB	25	PASS
A-08-06 STUDIO	18	PASS
A-08-04 2B4P DB2	18	PASS
A-08-04 2B4P DB1	15	PASS
B-08-04 2B4P B1	18	PASS
B-08-04 2B4P B2	16	PASS
A-09-07 2B4P DB1	16	PASS
A-09-07 2B4P DB2	17	PASS
A-09-02 2B4P DB2	13	PASS
A-09-02 2B4P DB1	13	PASS
A-09-01 1B2P DB	19	PASS
A-09-08 1B2P DB	17	PASS
A-09-03 2B4P DB1	16	PASS
A-09-03 2B4P DB2	15	PASS
A-09-05 2B3P SB	26	PASS
A-09-05 2B3P DB	23	PASS
A-09-06 STUDIO	20	PASS
A-09-04 2B4P DB2	17	PASS
A-09-04 2B4P DB1	15	PASS
B-09-01 3B5P SB	13	PASS
B-09-01 3B5P DB1	16	PASS
B-09-01 3B5P DB2	15	PASS
B-09-02 3B6P DB3	13	PASS
B-09-02 3B6P DB1	12	PASS
B-09-02 3B6P DB2	13	PASS
A-10-03 2B3P SB	25	PASS
A-10-03 2B3P DB	22	PASS
A-10-01 1B2P DB	19	PASS
A-10-02 1B2P DB	15	PASS
A-03-06 2B4P DB1	17	PASS
A-03-06 2B4P DB2	18	PASS
A-03-05 3B5P DB2	24	PASS
A-03-05 3B5P SB	19	PASS

A-03-05 3B5P DB1	20	PASS
B-03-04 3B5P DB2	26	PASS
B-03-04 3B5P SB	27	PASS
B-03-05 3B5P SB	19	PASS
B-03-05 3B5P DB2	24	PASS
B-03-05 3B5P DB1	21	PASS
B-03-06 1B2P DB	18	PASS
B-03-07 1B2P DB	15	PASS
B-03-01 1B2P DB	19	PASS
B-03-03 1B2P DB	18	PASS
B-03-02 3B6P DB1	12	PASS
B-03-02 3B6P DB2	11	PASS
B-03-02 3B6P DB3	16	PASS
A-03-02 3B6P DB2	11	PASS
A-03-02 3B6P DB1	12	PASS
A-03-02 3B6P DB3	16	PASS
A-03-03 1B2P DB	20	PASS
A-03-04 3B5P SB	27	PASS
A-03-04 3B5P DB2	25	PASS
A-03-01 1B2P DB	17	PASS
A-03-07 1B2P DB	15	PASS
A-05-07 2B4P DB1	17	PASS
A-05-07 2B4P DB2	18	PASS
B-05-07 1B2P DB	18	PASS
B-05-08 1B2P DB	17	PASS
B-05-01 1B2P DB	19	PASS
B-05-02 2B4P DB1	12	PASS
B-05-02 2B4P DB2	12	PASS
A-05-02 2B4P DB2	12	PASS
A-05-02 2B4P DB1	12	PASS
A-05-01 1B2P DB	17	PASS
A-05-08 1B2P DB	15	PASS
B-05-03 2B4P DB2	22	PASS
B-05-03 2B4P DB1	20	PASS
A-05-03 2B4P DB1	21	PASS
A-05-03 2B4P DB2	23	PASS
B-05-04 2B3P SB	15	PASS
B-05-04 2B3P DB	27	PASS
B-05-05 2B3P DB	24	PASS
B-05-05 2B3P SB	23	PASS
B-05-06 STUDIO	21	PASS
A-05-04 2B3P DB	23	PASS
A-05-05 2B3P SB	26	PASS
A-05-05 2B3P DB	24	PASS
A-05-06 STUDIO	19	PASS
A-05-04 2B3P SB	17	PASS

A-07-07 2B4P DB1	17	PASS
A-07-07 2B4P DB2	18	PASS
B-07-07 1B2P DB	18	PASS
B-07-08 1B2P DB	17	PASS
B-07-01 1B2P DB	19	PASS
B-07-02 2B4P DB1	12	PASS
B-07-02 2B4P DB2	12	PASS
A-07-02 2B4P DB2	12	PASS
A-07-02 2B4P DB1	12	PASS
A-07-01 1B2P DB	18	PASS
A-07-08 1B2P DB	15	PASS
B-07-03 2B4P DB2	13	PASS
B-07-03 2B4P DB1	13	PASS
A-07-03 2B4P DB1	13	PASS
A-07-03 2B4P DB2	14	PASS
B-07-04 2B3P SB	12	PASS
B-07-04 2B3P DB	19	PASS
B-07-05 2B3P DB	24	PASS
B-07-05 2B3P SB	23	PASS
B-07-06 STUDIO	21	PASS
A-07-05 2B3P SB	25	PASS
A-07-05 2B3P DB	24	PASS
A-07-06 STUDIO	19	PASS
A-07-04 2B4P DB2	15	PASS
A-07-04 2B4P DB1	15	PASS

4.2 Results for CIBSE TM59 for living, kitchen and bedrooms for mechanically ventilated rooms

As detailed within section 2 of this report, for the mechanically ventilated living, kitchen and bedrooms to achieve compliance with CIBSE TM59:2017, each habitable room must satisfy the following criteria for homes that are predominately mechanically ventilated:

- For homes with restricted openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied hours (CIBSE Guide A (2015a)).

Multiple iterations of the thermal model were undertaken to determine the amount of mechanical ventilation needed for the rooms identified as high risk for noise to pass the TM59 thermal comfort requirements. Based on the modelling conducted, the results in Table 7 show the elevated mechanical ventilation rate required to pass the thermal comfort criteria as set out by CIBSE TM59 for those habitable rooms identified as high risk for noise in the Environmental & Intrusive Noise Study.

Table 7: Summary of results showing the elevated mechanical ventilation rate required to pass the TM59 criteria for those habitable rooms identified as high risk for noise in the Environmental & Intrusive Noise Study within the proposed residential development at 1 Vinyl Square using the London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file.

Room Type	Elevated MVHR rate required to pass the TM59 criteria for those apartments identified as high risk for noise in the Environmental & Intrusive Noise Study
Living/Dining/Kitchen	42 l/s
Bedroom	12.5 l/s

Conclusions

Based on the modelling conducted, the results in Tables 5 and 6 show that the thermal comfort criteria as set out by CIBSE TM59 for all naturally ventilated habitable rooms within the residential apartments has been satisfied.

Multiple iterations of the thermal model were undertaken to determine the amount of mechanical ventilation needed for the rooms identified as high risk for noise to pass the TM59 thermal comfort requirements. Based on the modelling conducted, the results in Table 7 show the elevated mechanical ventilation rate required to pass the thermal comfort criteria as set out by CIBSE TM59 for those habitable rooms identified as high risk for noise in the Environmental & Intrusive Noise Study.

4.3 Results for Non-Mandatory Assessment – Corridors

As corridors can contribute to overheating within occupied rooms, they have been assessed on a non-mandatory basis. Whilst there are no mandatory targets for communal corridors, CIBSE suggest each corridor should not have an operative temperature exceeding 28°C for more than 3% of the total annual hours.

Table 8 shows the predicted thermal comfort results against the TM59 criteria for each corridor within the proposed residential development at 1 Vinyl Square.

Whilst not mandatory, the results from Table 8 show that all of the communal corridors are meeting the CIBSE TM59 recommendations.

Table 8: Results showing performance against the TM59 criteria for each communal corridor within the proposed residential development at 1 Vinyl Square using the London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file.

Room Name	TM59 Analysis	
	Percentage of Hours Annually Where Operative Temperature > 28°C	Pass/Fail
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS

5.0 LIMITATIONS OF THIS REPORT

This analysis has been performed using IES software which provides full dynamic thermal analysis and is a CIBSE certified Level 5 approved Dynamic Simulation Modelling Software. This analysis has been carried out in accordance with user instructions set out in IES manuals and CIBSE AM11 Building Energy and Environmental Modelling.

The most current CIBSE Design Summer (DSY) Weather File for London was chosen for the simulation (London Heathrow CIBSE DSY 1 2020's high emissions 50th percentile range weather file), in accordance with CIBSE guide TM59:2017 "Design methodology for the assessment of overheating risk in homes" guidelines.

The parameters used in this calculation are provided within this report in Section 3 and Appendices and are deemed to be approved by the Client unless advised to the contrary. The required MVHR ventilation rate and the openable area for each opening type to mitigate overheating has been included in this report.

The building occupancy profiles & parameters published in CIBSE guide TM59:2017 "Design methodology for the assessment of overheating risk in homes" has been used as guidance. Within the apartments thermal comfort has been assessed against the criteria identified within CIBSE TM59:2017.

It should be noted that as occupancy and building use is based on set parameters outlined in TM59 there is no guarantee the temperatures estimated will match the actual building temperatures as the 'real' building may have differing operations and heat gain patterns with external weather conditions not normal to the historical data provided by the standard CIBSE weather files. It therefore should be noted that there is no guarantee that the thermal comfort assessment will match the occupied building.

SUMMARY

An overheating analysis has been carried out on behalf of the Client to show that the proposed development at 1 Vinyl Square located in Hayes, West London meets the thermal comfort criteria as set out in CIBSE TM59 for all of the residential apartments.

Based on the modelling conducted, the results show that all habitable rooms for all of the apartments comply with the thermal comfort criteria as set out by CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes”.

Whilst not mandatory, the results show that all of the communal corridors are meeting the CIBSE TM59 recommendations.

Whilst not mandatory, two further simulations have been performed to assess overheating risk under heatwave or future climate conditions using more extreme weather files DSY 2 and DSY 3. Please see Appendix D for results which have been included here for information purposes only.

As solar control internal blinds are part of the overheating prevention strategy for summertime, please see Appendix E for the results for the analysis without blinds which must be reported for reference in accordance with CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” guidelines.

REFERENCES

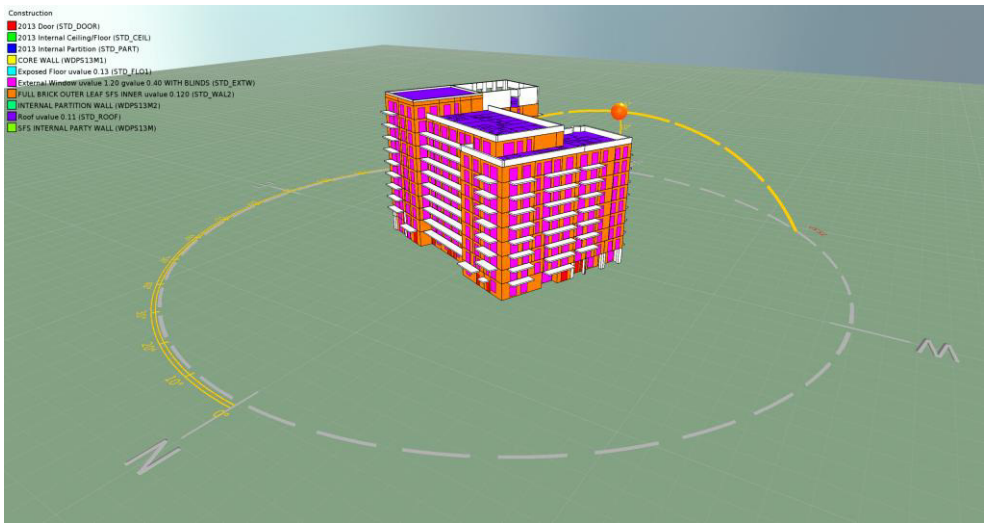
CIBSE, (1998), *Building Energy and Environmental Modelling Applications Manual AM11.* Birmingham, CIBSE.

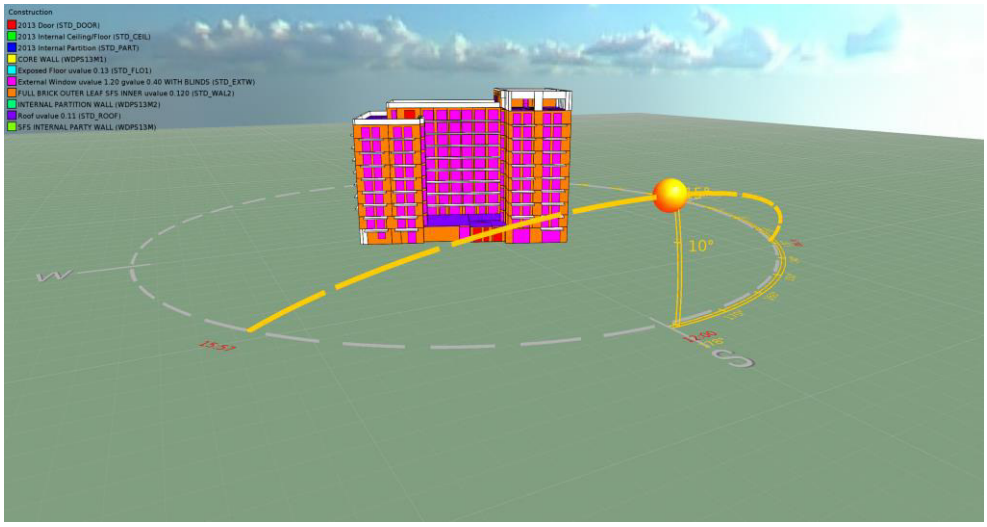
CIBSE, (2015), *CIBSE Guide A: Environmental Criteria for Design.* Birmingham, CIBSE.

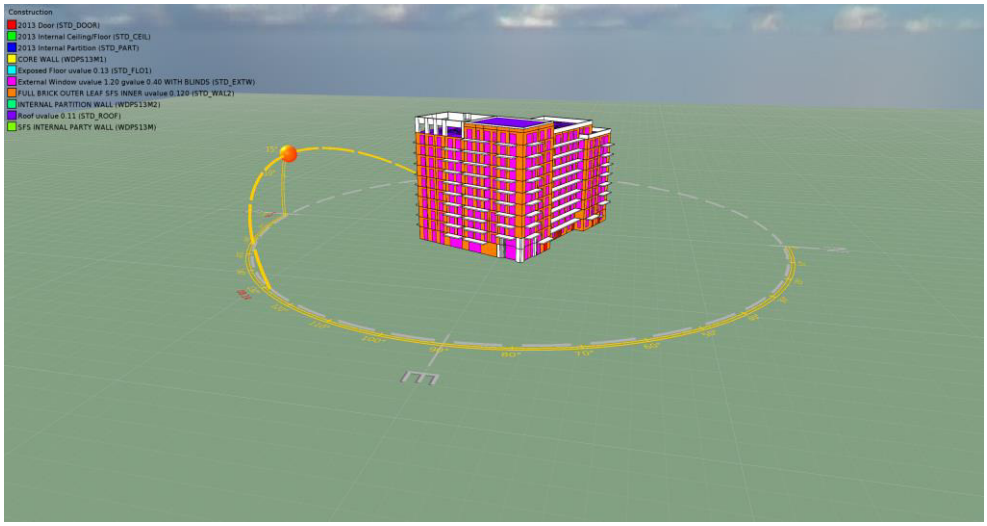
CIBSE, (2017), *Design methodology for the assessment of overheating risk in homes CIBSE TM59.* Birmingham, CIBSE.

APPENDIX A

THERMAL MODEL IMAGES SHOWING THE FABRIC TYPE ASSIGNED

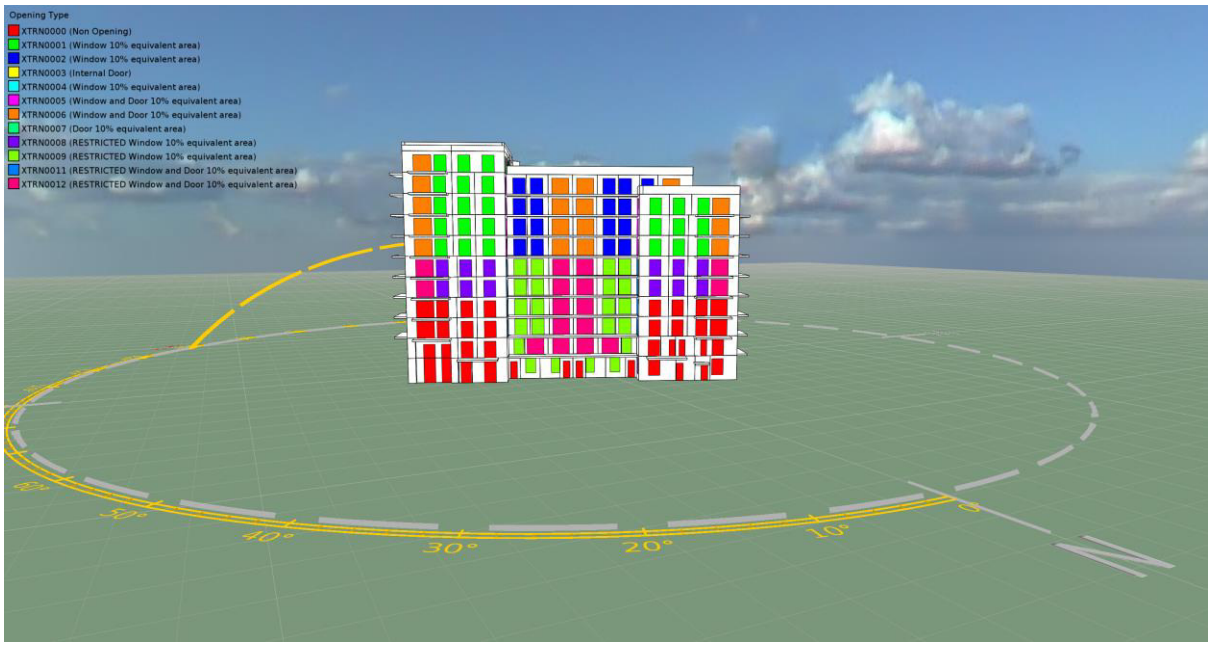


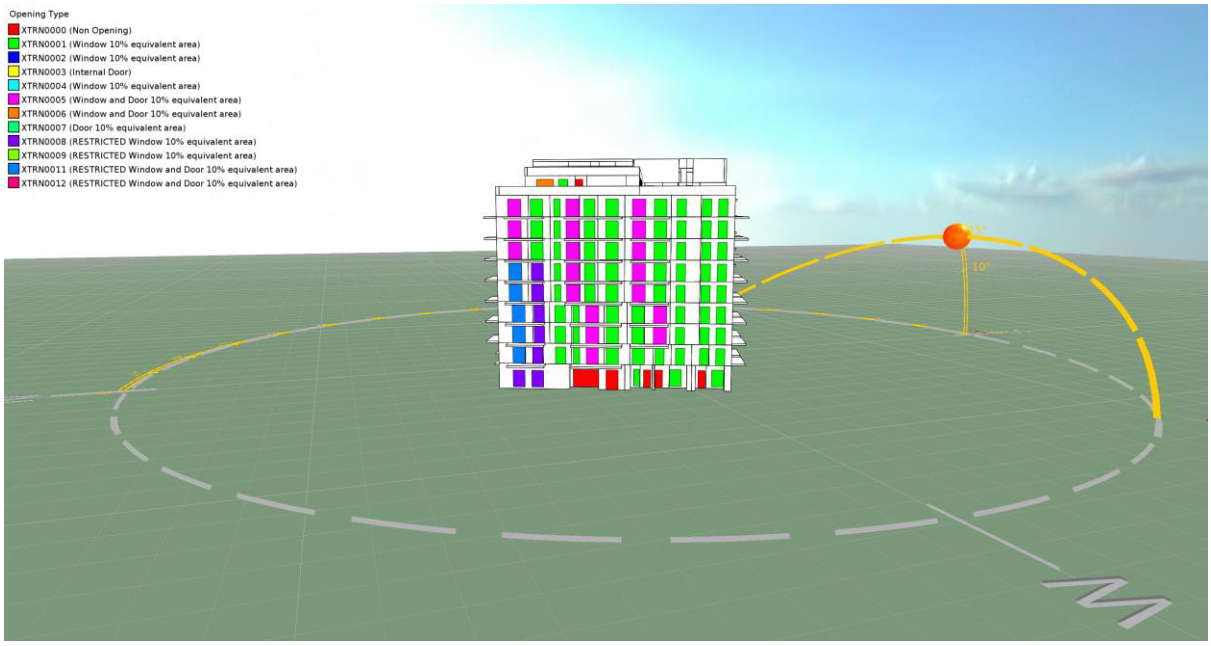


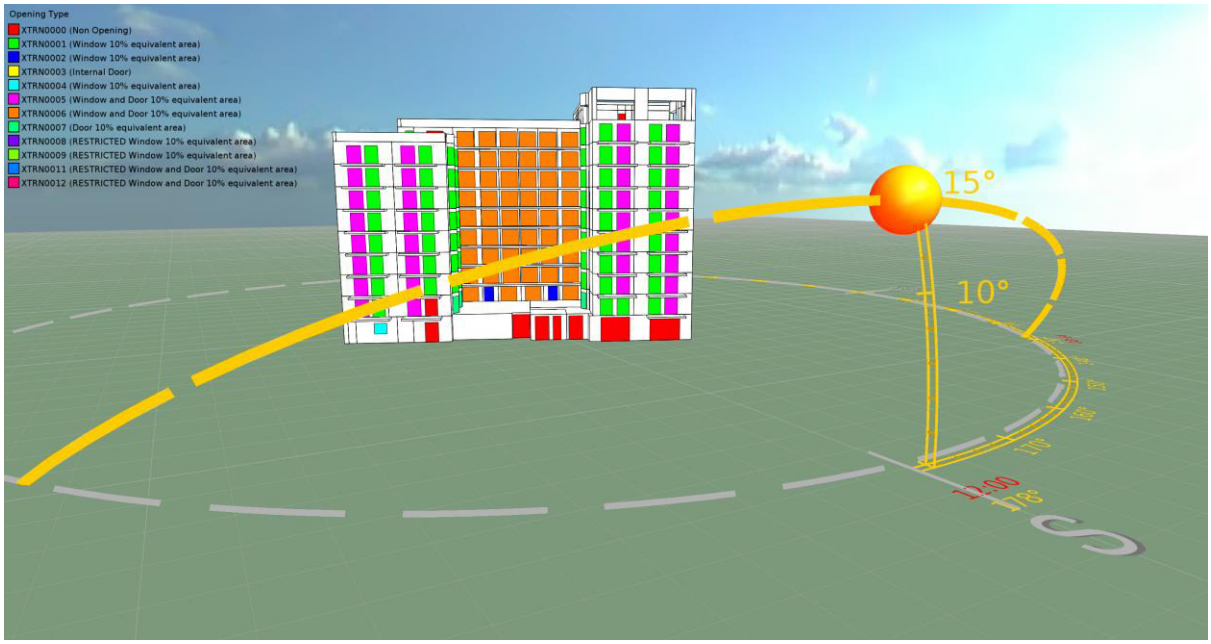


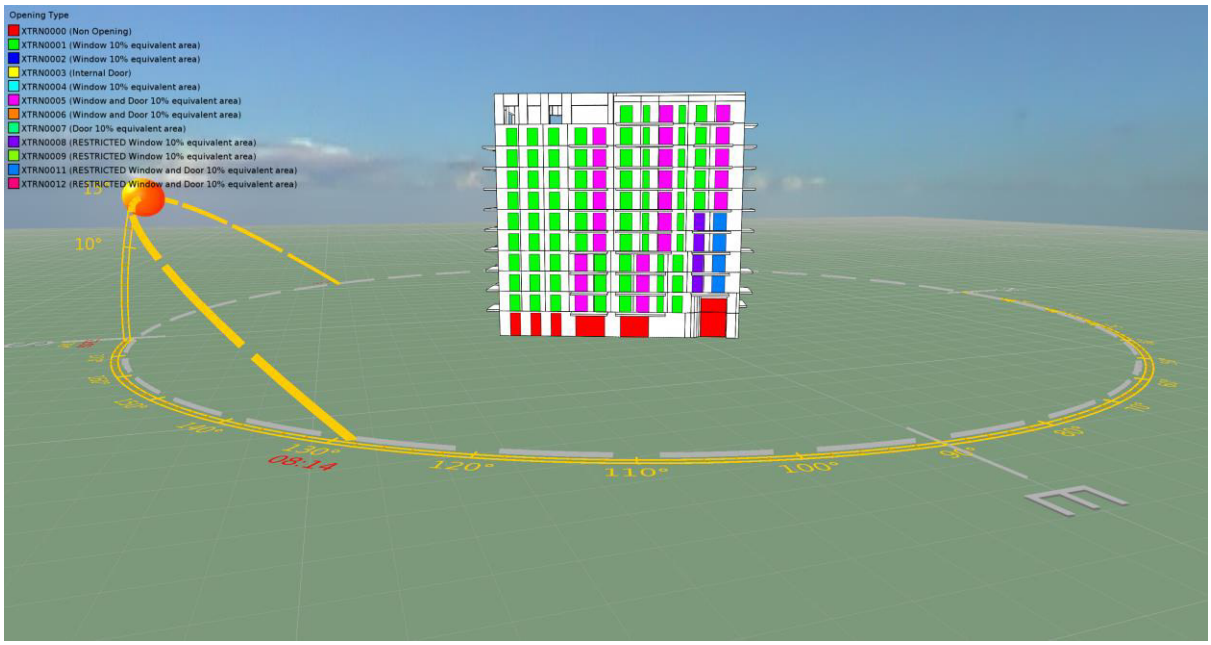
APPENDIX B

THERMAL MODEL IMAGES SHOWING WINDOW AND DOOR OPENABLE TYPES ASSIGNED





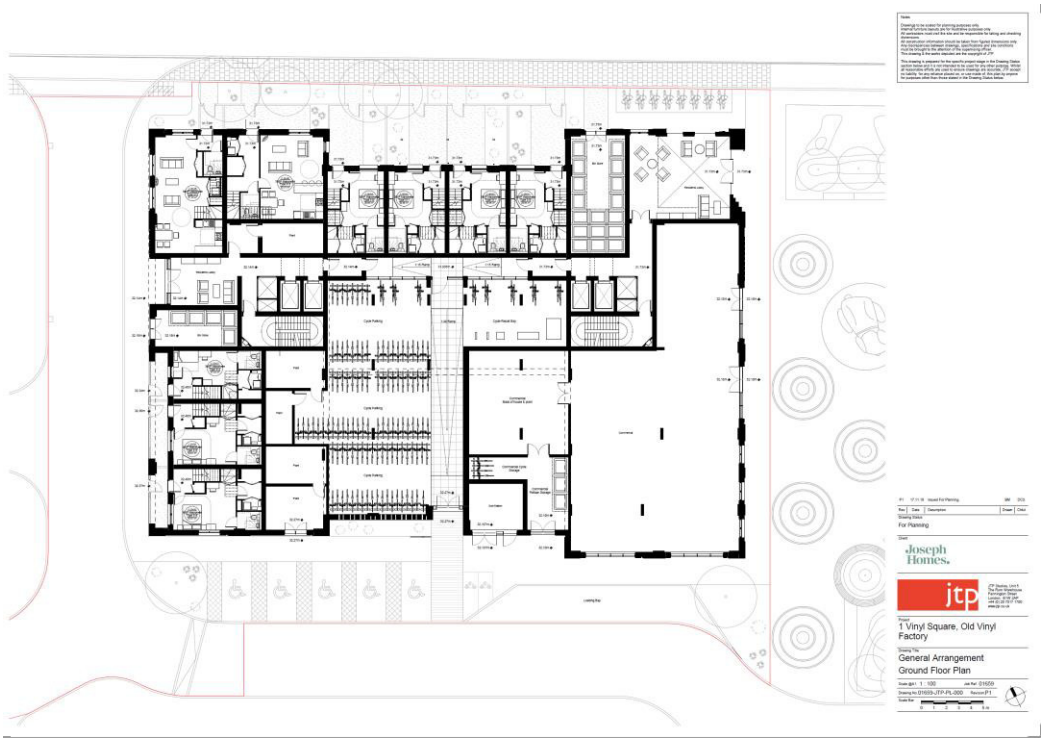

Opening Type
XTRN0000 (Non Opening)
XTRN0001 (Window 10% equivalent area)
XTRN0002 (Window 10% equivalent area)
XTRN0003 (Internal Door)
XTRN0004 (Window 10% equivalent area)
XTRN0005 (Window and Door 10% equivalent area)
XTRN0006 (Window and Door 10% equivalent area)
XTRN0007 (Door 10% equivalent area)
XTRN0008 (RESTRICTED Window 10% equivalent area)
XTRN0009 (RESTRICTED Window 10% equivalent area)
XTRN0011 (RESTRICTED Window and Door 10% equivalent area)
XTRN0012 (RESTRICTED Window and Door 10% equivalent area)
15°
10°
S


Opening Type
XTRN0000 (Non Opening)
XTRN0001 (Window 10% equivalent area)
XTRN0002 (Window 10% equivalent area)
XTRN0003 (Internal Door)
XTRN0004 (Window 10% equivalent area)
XTRN0005 (Window and Door 10% equivalent area)
XTRN0006 (Window and Door 10% equivalent area)
XTRN0007 (Door 10% equivalent area)
XTRN0008 (RESTRICTED Window 10% equivalent area)
XTRN0009 (RESTRICTED Window 10% equivalent area)
XTRN0011 (RESTRICTED Window and Door 10% equivalent area)
XTRN0012 (RESTRICTED Window and Door 10% equivalent area)
10°
130°
120°
110°
100°
E

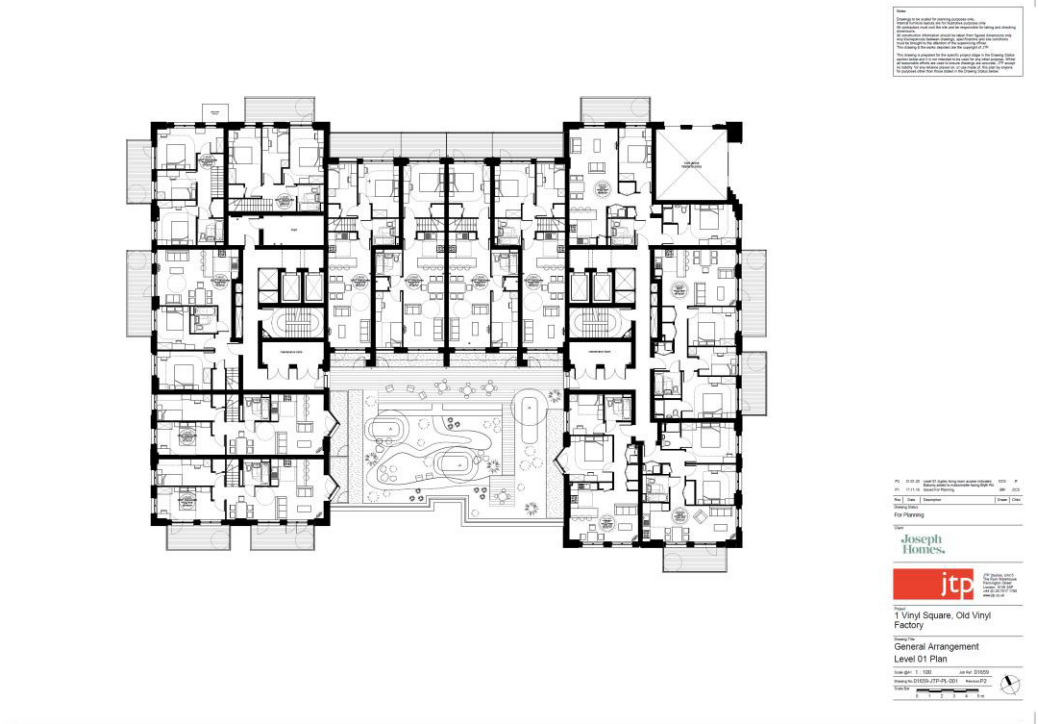
APPENDIX C

IMAGES SHOWING INTERNAL LAYOUTS FOR EACH APARTMENT

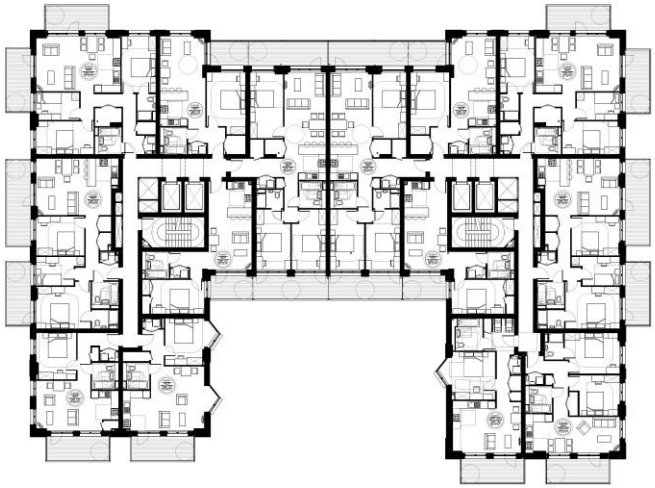
GROUND FLOOR PLAN



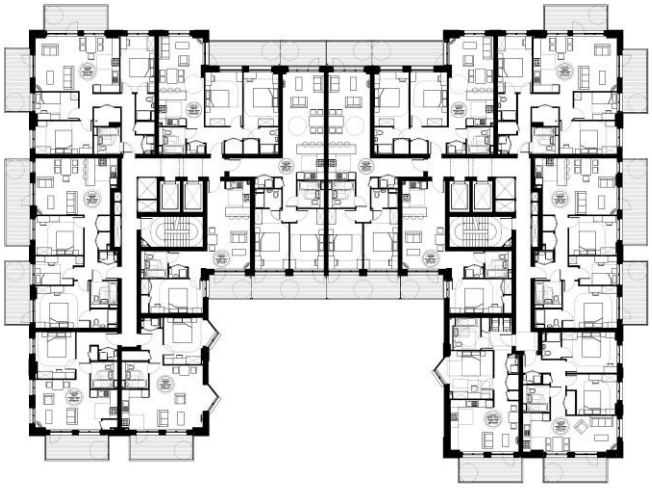
FIRST FLOOR PLAN



SECOND FLOOR PLAN

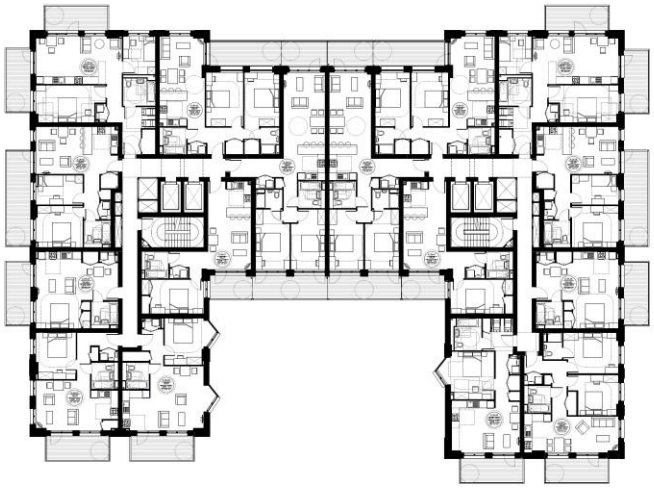


THIRD FLOOR PLAN



FOURTH FLOOR PLAN

FIFTH FLOOR PLAN



SIXTH FLOOR PLAN

Joseph Homes

jtp

1 Vinyl Square, Old Vinyl Factory

General Arrangement Level 06 Plan

SEVENTH FLOOR PLAN

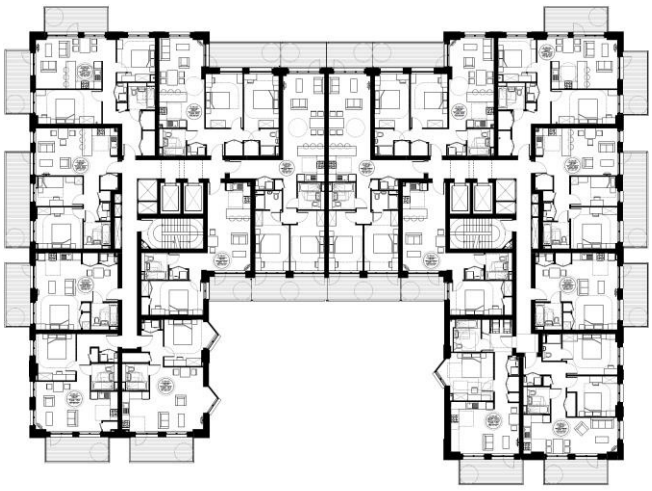
Joseph Homes

jtp

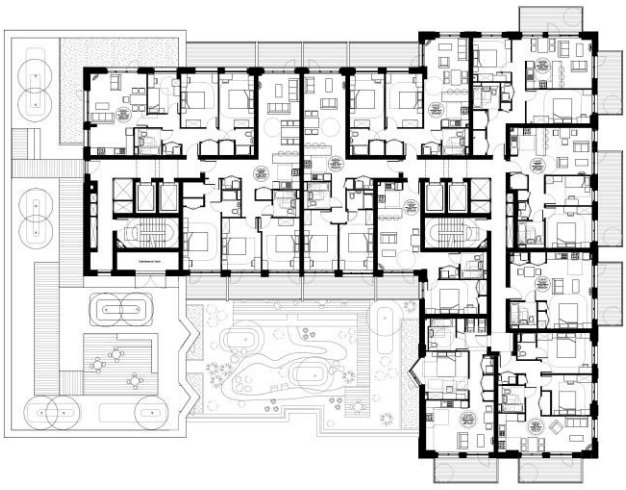
1 Vinyl Square, Old Vinyl Factory

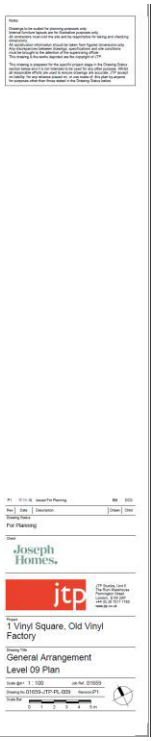
General Arrangement Level 07 Plan

EIGHT FLOOR PLAN

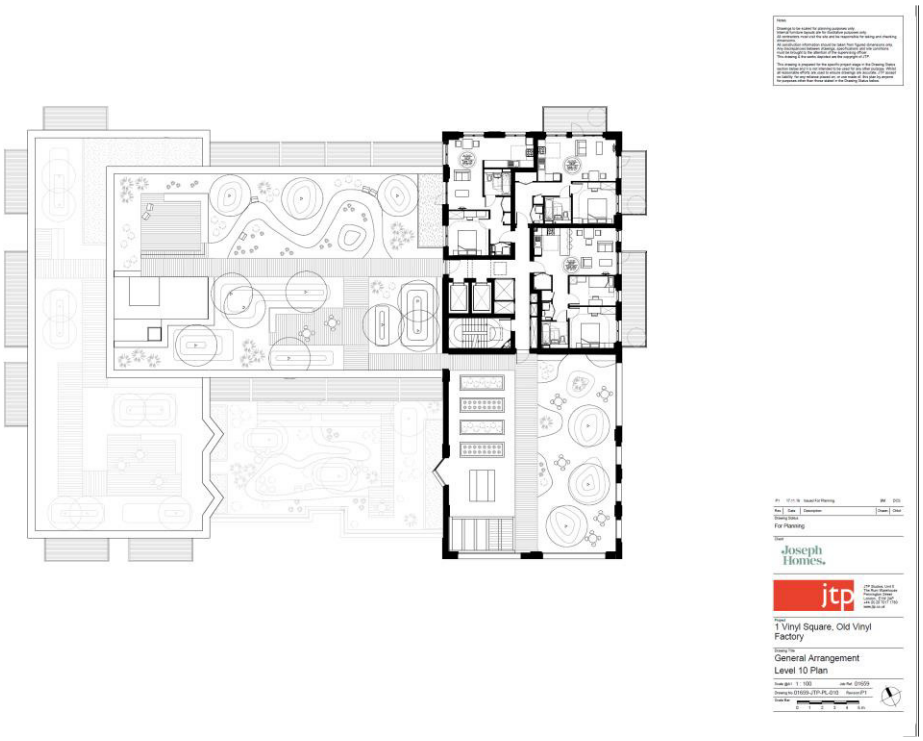


NINTH FLOOR PLAN

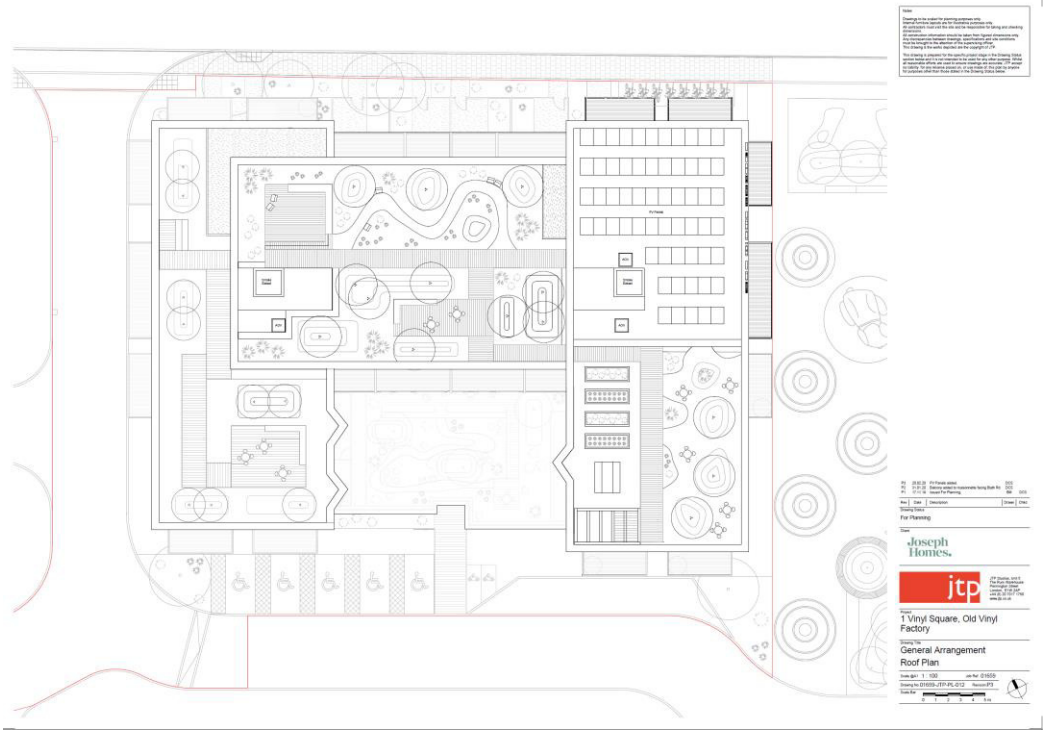




TENTH FLOOR PLAN



ROOF PLAN



APPENDIX D

THERMAL MODELLING RESULTS FOR MORE EXTREME WEATHER FILES TO ASSESS OVERHEATING RISK UNDER HEATWAVE OR FUTURE CLIMATE CHANGE CONDITIONS

Whilst not mandatory, two further simulations have been performed to assess overheating risk under heatwave or future climate conditions using more extreme weather files DSY2 and DSY3. The tables of raw results have been included here for information purposes only. All of the residential units were assessed.

THERMAL MODELLING RAW RESULTS FOR CIBSE LONDON HEATHROW DSY2 2020'S HIGH EMISSIONS 50TH PERCENTILE RANGE WEATHER FILE

RESULTS FOR CRITERIA 1 FOR LIVING/KITCHENS/BEDROOMS – OUT OF 352 TOTAL HABITABLE ROOMS, ALL 352 ROOMS ARE PASSING CRITERIA 1

Room Name	TM59 Analysis	
	Criteria 1: Hours of exceedance (He)	Pass/Fail
C-00-04 3B5P M DB1	0	PASS
C-00-03 3B5P M DB1	0	PASS
C-00-02 3B5P M DB1	0	PASS
C-00-01 3B5P M DB1	0	PASS
C-00-05 3B5P M LDK	0.3	PASS
C-00-06 3B5P M LDK	0.1	PASS
C-00-07 3B5P M SB	0	PASS
C-00-08 3B5P M DB1	0	PASS
C-00-09 3B5P M DB1	0	PASS
A-01-04 2B3P DB	0.2	PASS
A-01-04 2B3P SB	0.5	PASS
A-01-04 2B3P LDK	0.1	PASS
A-01-03 2B4P LDK	0.2	PASS
A-01-03 2B4P DB1	0.1	PASS
A-01-03 2B4P DB2	0.2	PASS
A-01-02 3B5P DB2	0.2	PASS
A-01-02 3B5P SB	0.4	PASS
A-01-02 3B5P DB1	0	PASS
A-01-02 3B5P LDK	0.2	PASS
A-01-01 2B4P DB1	0	PASS
C-00-01 3B5P M SB	0	PASS
C-00-01 3B5P M LDK	0	PASS
C-00-01 3B5P M DB2	0	PASS
C-00-02 3B5P M DB2	0	PASS
C-00-02 3B5P M LDK	0	PASS
C-00-02 3B5P M SB	0	PASS
C-00-03 3B5P M DB2	0	PASS
C-00-03 3B5P M LDK	0	PASS

C-00-03 3B5P M SB	0	PASS
C-00-04 3B5P M DB2	0	PASS
C-00-04 3B5P M SB	0	PASS
C-00-04 3B5P M LDK	0	PASS
C-00-06 3B5P M DB1	0.4	PASS
C-00-06 3B5P M DB2	0.3	PASS
C-00-06 3B5P M SB	0.5	PASS
C-00-07 3B5P M LDK	0	PASS
C-00-07 3B5P M DB2	0	PASS
C-00-07 3B5P M DB1	0	PASS
C-00-08 3B5P M SB	0	PASS
C-00-08 3B5P M DB2	0	PASS
C-00-08 3B5P M LDK	0	PASS
C-00-09 3B5P M SB	0.1	PASS
C-00-09 3B5P M DB2	0.4	PASS
C-00-09 3B5P M LDK	0.1	PASS
A-02-06 2B4P LDK	0.3	PASS
A-02-06 2B4P DB1	0.1	PASS
A-02-06 2B4P DB2	0.4	PASS
A-02-05 3B5P DB2	0.5	PASS
A-02-05 3B5P SB	0.6	PASS
A-02-05 3B5P DB1	0.1	PASS
A-02-05 3B5P LDK	0.4	PASS
A-02-01 1B2P LDK	0	PASS
B-02-04 3B5P DB2	0.6	PASS
B-02-04 3B5P SB	1	PASS
B-02-04 3B5P LDK	1	PASS
B-02-05 3B5P LDK	0.5	PASS
B-02-05 3B5P SB	0.6	PASS
B-02-05 3B5P DB2	0.5	PASS
B-02-05 3B5P DB1	0.1	PASS
B-02-06 1B2P DB	0.1	PASS
B-02-06 1B2P LDK	0.2	PASS
B-02-07 1B2P DB	0	PASS
B-02-07 1B2P LDK	0.1	PASS
B-02-01 1B2P DB	0	PASS
B-02-03 1B2P DB	0	PASS
B-02-03 1B2P LDK	0.1	PASS
B-02-02 3B6P LDK	0	PASS
B-02-02 3B6P DB1	0	PASS
B-02-02 3B6P DB2	0	PASS
B-02-02 3B6P DB3	0	PASS
A-02-02 3B6P DB2	0	PASS
A-02-02 3B6P DB1	0	PASS
A-02-02 3B6P LDK	0	PASS

A-02-02 3B6P DB3	0	PASS
A-02-03 1B2P DB	0	PASS
A-02-04 3B5P SB	1.1	PASS
A-02-04 3B5P DB2	0.8	PASS
A-02-04 3B5P LDK	1.2	PASS
A-02-01 1B2P DB	0	PASS
A-02-07 1B2P DB	0.1	PASS
B-02-01 1B2P LDK	0	PASS
A-02-07 1B2P LDK	0.1	PASS
A-02-03 1B2P LDK	0.1	PASS
A-04-07 2B4P LDK	0.5	PASS
A-04-07 2B4P DB1	0.1	PASS
A-04-07 2B4P DB2	0.4	PASS
A-04-01 1B2P LDK	0	PASS
B-04-07 1B2P DB	0.1	PASS
B-04-07 1B2P LDK	0.2	PASS
B-04-08 1B2P DB	0.1	PASS
B-04-08 1B2P LDK	0.1	PASS
B-04-01 1B2P DB	0	PASS
B-04-02 2B4P LDK	0	PASS
B-04-02 2B4P DB1	0	PASS
B-04-02 2B4P DB2	0	PASS
A-04-02 2B4P DB2	0	PASS
A-04-02 2B4P DB1	0	PASS
A-04-01 1B2P DB	0	PASS
A-04-08 1B2P DB	0.1	PASS
B-04-01 1B2P LDK	0	PASS
A-04-08 1B2P LDK	0.1	PASS
B-04-03 2B4P DB2	0.1	PASS
B-04-03 2B4P LDK	0.1	PASS
B-04-03 2B4P DB1	0.1	PASS
A-04-03 2B4P DB1	0.1	PASS
A-04-03 2B4P DB2	0.2	PASS
A-04-03 2B4P LDK	0.1	PASS
B-04-04 2B3P SB	0.4	PASS
B-04-04 2B3P LDK	0.2	PASS
B-04-04 2B3P DB	0.4	PASS
B-04-05 2B3P DB	0.5	PASS
B-04-05 2B3P SB	0.6	PASS
B-04-05 2B3P LDK	0.8	PASS
B-04-06 STUDIO	0.3	PASS
A-04-04 2B3P DB	0.2	PASS
A-04-05 2B3P LDK	1	PASS
A-04-05 2B3P SB	0.7	PASS
A-04-05 2B3P DB	0.5	PASS

A-04-06 STUDIO	0.3	PASS
A-04-02 2B4P LDK	0	PASS
A-04-04 2B3P SB	0.4	PASS
A-04-04 2B3P LDK	0.2	PASS
A-06-07 2B4P DB1	0.1	PASS
A-06-07 2B4P DB2	0.4	PASS
A-06-01 1B2P LDK	0	PASS
B-06-07 1B2P DB	0.1	PASS
B-06-07 1B2P LDK	0.2	PASS
B-06-08 1B2P DB	0.1	PASS
B-06-08 1B2P LDK	0.1	PASS
B-06-01 1B2P DB	0	PASS
B-06-02 2B4P DB1	0	PASS
B-06-02 2B4P DB2	0	PASS
A-06-02 2B4P DB2	0	PASS
A-06-02 2B4P DB1	0	PASS
A-06-02 2B4P LDK	0	PASS
A-06-01 1B2P DB	0	PASS
A-06-08 1B2P DB	0.1	PASS
B-06-01 1B2P LDK	0	PASS
A-06-08 1B2P LDK	0.1	PASS
B-06-03 2B4P DB2	0.1	PASS
B-06-03 2B4P LDK	0	PASS
B-06-03 2B4P DB1	0.1	PASS
A-06-03 2B4P DB1	0.1	PASS
A-06-03 2B4P DB2	0.1	PASS
A-06-03 2B4P LDK	0	PASS
B-06-04 2B3P SB	0.1	PASS
B-06-04 2B3P LDK	0.1	PASS
B-06-04 2B3P DB	0.1	PASS
B-06-05 2B3P DB	0.5	PASS
B-06-05 2B3P SB	0.6	PASS
B-06-05 2B3P LDK	0.8	PASS
B-06-06 STUDIO	0.3	PASS
A-06-05 2B3P LDK	1	PASS
A-06-05 2B3P SB	0.7	PASS
A-06-05 2B3P DB	0.5	PASS
A-06-06 STUDIO	0.3	PASS
A-06-07 2B4P LDK	0.5	PASS
A-06-04 2B4P DB2	0.2	PASS
A-06-04 2B4P DB1	0.1	PASS
A-06-04 2B4P LDK	0.1	PASS
A-08-07 2B4P DB1	0.1	PASS
A-08-07 2B4P DB2	0.5	PASS
A-08-01 1B2P LDK	0	PASS

B-08-07 1B2P DB	0.4	PASS
B-08-07 1B2P LDK	0.7	PASS
B-08-08 1B2P DB	0.4	PASS
B-08-08 1B2P LDK	0.5	PASS
B-08-01 1B2P DB	0	PASS
B-08-02 2B4P LDK	0	PASS
B-08-02 2B4P DB1	0	PASS
B-08-02 2B4P DB2	0	PASS
A-08-02 2B4P DB2	0	PASS
A-08-02 2B4P DB1	0	PASS
A-08-02 2B4P LDK	0	PASS
A-08-01 1B2P DB	0	PASS
A-08-08 1B2P DB	0.1	PASS
B-08-01 1B2P LDK	0	PASS
A-08-08 1B2P LDK	0.1	PASS
B-08-03 2B4P DB2	0.1	PASS
B-08-03 2B4P LDK	0	PASS
B-08-03 2B4P DB1	0.1	PASS
A-08-03 2B4P DB1	0.1	PASS
A-08-03 2B4P DB2	0.1	PASS
A-08-03 2B4P LDK	0	PASS
B-08-05 2B3P DB	0.6	PASS
B-08-05 2B3P SB	0.8	PASS
B-08-05 2B3P LDK	0.9	PASS
B-08-06 STUDIO	0.4	PASS
A-08-05 2B3P LDK	0.9	PASS
A-08-05 2B3P SB	0.7	PASS
A-08-05 2B3P DB	0.5	PASS
A-08-06 STUDIO	0.3	PASS
A-08-07 2B4P LDK	0.5	PASS
A-08-04 2B4P DB2	0.1	PASS
A-08-04 2B4P DB1	0.1	PASS
A-08-04 2B4P LDK	0.1	PASS
B-08-04 2B4P B1	0.1	PASS
B-08-04 2B4P LDK	0.1	PASS
B-08-04 2B4P B2	0.1	PASS
B-06-02 2B4P LDK	0	PASS
A-09-07 2B4P DB1	0.2	PASS
A-09-07 2B4P DB2	0.6	PASS
A-09-01 1B2P LDK	0	PASS
A-09-02 2B4P DB2	0.4	PASS
A-09-02 2B4P DB1	0.2	PASS
A-09-02 2B4P LDK	0.1	PASS
A-09-01 1B2P DB	0.1	PASS
A-09-08 1B2P DB	0.6	PASS

A-09-08 1B2P LDK	0.4	PASS
A-09-03 2B4P DB1	0.1	PASS
A-09-03 2B4P DB2	0.1	PASS
A-09-03 2B4P LDK	0	PASS
A-09-05 2B3P LDK	0.8	PASS
A-09-05 2B3P SB	0.6	PASS
A-09-05 2B3P DB	0.5	PASS
A-09-06 STUDIO	0.5	PASS
A-09-07 2B4P LDK	1.1	PASS
A-09-04 2B4P DB2	0.1	PASS
A-09-04 2B4P DB1	0.1	PASS
A-09-04 2B4P LDK	0.1	PASS
B-09-01 3B5P LDK	1	PASS
B-09-01 3B5P SB	0.1	PASS
B-09-01 3B5P DB1	0.1	PASS
B-09-01 3B5P DB2	0.1	PASS
B-09-02 3B6P DB3	0.6	PASS
B-09-02 3B6P DB1	0	PASS
B-09-02 3B6P LDK	0.1	PASS
B-09-02 3B6P DB2	0.7	PASS
A-10-03 2B3P LDK	0.4	PASS
A-10-03 2B3P SB	0.5	PASS
A-10-03 2B3P DB	0.3	PASS
A-10-01 1B2P DB	0.3	PASS
A-10-01 1B2P LDK	0.2	PASS
A-10-02 1B2P DB	0.1	PASS
A-10-02 1B2P LDK	0.1	PASS
A-03-06 2B4P LDK	1	PASS
A-03-06 2B4P DB1	0.3	PASS
A-03-06 2B4P DB2	0.5	PASS
A-03-05 3B5P DB2	0.7	PASS
A-03-05 3B5P SB	0.8	PASS
A-03-05 3B5P DB1	0.4	PASS
A-03-05 3B5P LDK	1	PASS
A-03-01 1B2P LDK	0.1	PASS
B-03-04 3B5P DB2	0.6	PASS
B-03-04 3B5P SB	0.9	PASS
B-03-04 3B5P LDK	1	PASS
B-03-05 3B5P LDK	0.9	PASS
B-03-05 3B5P SB	0.8	PASS
B-03-05 3B5P DB2	0.6	PASS
B-03-05 3B5P DB1	0.4	PASS
B-03-06 1B2P DB	0.4	PASS
B-03-06 1B2P LDK	0.4	PASS
B-03-07 1B2P DB	0.1	PASS

B-03-07 1B2P LDK	0.1	PASS
B-03-01 1B2P DB	0.1	PASS
B-03-03 1B2P DB	0.1	PASS
B-03-03 1B2P LDK	0.2	PASS
B-03-02 3B6P LDK	0.1	PASS
B-03-02 3B6P DB1	0.1	PASS
B-03-02 3B6P DB2	0.1	PASS
B-03-02 3B6P DB3	0.1	PASS
A-03-02 3B6P DB2	0.1	PASS
A-03-02 3B6P DB1	0.1	PASS
A-03-02 3B6P LDK	0.1	PASS
A-03-02 3B6P DB3	0	PASS
A-03-03 1B2P DB	0.1	PASS
A-03-04 3B5P SB	0.9	PASS
A-03-04 3B5P DB2	0.8	PASS
A-03-04 3B5P LDK	1.1	PASS
A-03-01 1B2P DB	0.1	PASS
A-03-07 1B2P DB	0.3	PASS
B-03-01 1B2P LDK	0.1	PASS
A-03-07 1B2P LDK	0.2	PASS
A-03-03 1B2P LDK	0.2	PASS
A-05-07 2B4P LDK	1	PASS
A-05-07 2B4P DB1	0.3	PASS
A-05-07 2B4P DB2	0.5	PASS
A-05-01 1B2P LDK	0.1	PASS
B-05-07 1B2P DB	0.4	PASS
B-05-07 1B2P LDK	0.4	PASS
B-05-08 1B2P DB	0.1	PASS
B-05-08 1B2P LDK	0.1	PASS
B-05-01 1B2P DB	0.1	PASS
B-05-02 2B4P LDK	0.1	PASS
B-05-02 2B4P DB1	0.1	PASS
B-05-02 2B4P DB2	0.1	PASS
A-05-02 2B4P DB2	0.1	PASS
A-05-02 2B4P DB1	0.1	PASS
A-05-01 1B2P DB	0.1	PASS
A-05-08 1B2P DB	0.3	PASS
B-05-01 1B2P LDK	0.1	PASS
A-05-08 1B2P LDK	0.2	PASS
B-05-03 2B4P DB2	0.1	PASS
B-05-03 2B4P LDK	0.1	PASS
B-05-03 2B4P DB1	0.1	PASS
A-05-03 2B4P DB1	0.1	PASS
A-05-03 2B4P DB2	0.1	PASS
A-05-03 2B4P LDK	0.1	PASS

B-05-04 2B3P SB	0.4	PASS
B-05-04 2B3P LDK	0.2	PASS
B-05-04 2B3P DB	0.5	PASS
B-05-05 2B3P DB	0.6	PASS
B-05-05 2B3P SB	0.7	PASS
B-05-05 2B3P LDK	1	PASS
B-05-06 STUDIO	0.5	PASS
A-05-04 2B3P DB	0.4	PASS
A-05-05 2B3P LDK	1.1	PASS
A-05-05 2B3P SB	0.8	PASS
A-05-05 2B3P DB	0.6	PASS
A-05-06 STUDIO	0.5	PASS
A-05-02 2B4P LDK	0.1	PASS
A-05-04 2B3P SB	0.4	PASS
A-05-04 2B3P LDK	0.3	PASS
A-07-07 2B4P DB1	0.3	PASS
A-07-07 2B4P DB2	0.6	PASS
A-07-01 1B2P LDK	0.1	PASS
B-07-07 1B2P DB	0.4	PASS
B-07-07 1B2P LDK	0.4	PASS
B-07-08 1B2P DB	0.2	PASS
B-07-08 1B2P LDK	0.1	PASS
B-07-01 1B2P DB	0.1	PASS
B-07-02 2B4P DB1	0.1	PASS
B-07-02 2B4P DB2	0.1	PASS
A-07-02 2B4P DB2	0.1	PASS
A-07-02 2B4P DB1	0.1	PASS
A-07-02 2B4P LDK	0.1	PASS
A-07-01 1B2P DB	0.1	PASS
A-07-08 1B2P DB	0.4	PASS
B-07-01 1B2P LDK	0.1	PASS
A-07-08 1B2P LDK	0.2	PASS
B-07-03 2B4P DB2	0.1	PASS
B-07-03 2B4P LDK	0.1	PASS
B-07-03 2B4P DB1	0.1	PASS
A-07-03 2B4P DB1	0.1	PASS
A-07-03 2B4P DB2	0.1	PASS
A-07-03 2B4P LDK	0.1	PASS
B-07-04 2B3P SB	0.2	PASS
B-07-04 2B3P LDK	0.2	PASS
B-07-04 2B3P DB	0.3	PASS
B-07-05 2B3P DB	0.6	PASS
B-07-05 2B3P SB	0.7	PASS
B-07-05 2B3P LDK	1	PASS
B-07-06 STUDIO	0.5	PASS

A-07-05 2B3P LDK	1	PASS
A-07-05 2B3P SB	0.8	PASS
A-07-05 2B3P DB	0.6	PASS
A-07-06 STUDIO	0.5	PASS
A-07-07 2B4P LDK	1	PASS
A-07-04 2B4P DB2	0.2	PASS
A-07-04 2B4P DB1	0.1	PASS
A-07-04 2B4P LDK	0.2	PASS
B-07-02 2B4P LDK	0.1	PASS

RESULTS FOR CRITERIA FOR BEDROOMS – OUT OF 230 BEDROOMS, 76 PASS WITH 154 MARGINALLY FAILING. PLEASE NOTE AS THE 154 BEDROOMS ARE ONLY MARGINALLY FAILING, IT IS EXPECTED THAT THIS WOULD BE EASILY RESOLVED BY ADDITIONAL VENTILATION. FOR EXAMPLE, OCCUPANTS COULD TEMPORARILY REMOVE THE 100MM RESTRICTORS ON THE DOORS/WINDOWS TO ALLOW ADDITIONAL AIRFLOW INTO THE ROOM.

Room Name	TM59 Analysis	
	Criteria 2: Operative Temperature Hours >26°C between 10pm to 7am daily must not exceed 32 hours	Pass/Fail
C-00-04 3B5P M DB1	48	FAIL
C-00-03 3B5P M DB1	53	FAIL
C-00-02 3B5P M DB1	53	FAIL
C-00-01 3B5P M DB1	47	FAIL
C-00-07 3B5P M SB	35	FAIL
C-00-08 3B5P M DB1	33	FAIL
C-00-09 3B5P M DB1	18	PASS
A-01-04 2B3P DB	36	FAIL
A-01-04 2B3P SB	24	PASS
A-01-03 2B4P DB1	37	FAIL
A-01-03 2B4P DB2	34	FAIL
A-01-02 3B5P DB2	33	FAIL
A-01-02 3B5P SB	27	PASS
A-01-02 3B5P DB1	34	FAIL
A-01-01 2B4P DB1	48	FAIL
C-00-01 3B5P M SB	36	FAIL
C-00-01 3B5P M DB2	35	FAIL
C-00-02 3B5P M DB2	35	FAIL
C-00-02 3B5P M SB	26	PASS
C-00-03 3B5P M DB2	35	FAIL
C-00-03 3B5P M SB	26	PASS
C-00-04 3B5P M DB2	35	FAIL
C-00-04 3B5P M SB	36	FAIL
C-00-06 3B5P M DB1	55	FAIL
C-00-06 3B5P M DB2	43	FAIL

C-00-06 3B5P M SB	43	FAIL
C-00-07 3B5P M DB2	32	PASS
C-00-07 3B5P M DB1	33	FAIL
C-00-08 3B5P M SB	32	PASS
C-00-08 3B5P M DB2	41	FAIL
C-00-09 3B5P M SB	30	PASS
C-00-09 3B5P M DB2	16	PASS
A-02-06 2B4P DB1	38	FAIL
A-02-06 2B4P DB2	35	FAIL
A-02-05 3B5P DB2	38	FAIL
A-02-05 3B5P SB	30	PASS
A-02-05 3B5P DB1	37	FAIL
B-02-04 3B5P DB2	47	FAIL
B-02-04 3B5P SB	47	FAIL
B-02-05 3B5P SB	28	PASS
B-02-05 3B5P DB2	35	FAIL
B-02-05 3B5P DB1	35	FAIL
B-02-06 1B2P DB	36	FAIL
B-02-07 1B2P DB	35	FAIL
B-02-01 1B2P DB	39	FAIL
B-02-03 1B2P DB	43	FAIL
B-02-02 3B6P DB1	24	PASS
B-02-02 3B6P DB2	24	PASS
B-02-02 3B6P DB3	40	FAIL
A-02-02 3B6P DB2	24	PASS
A-02-02 3B6P DB1	24	PASS
A-02-02 3B6P DB3	40	FAIL
A-02-03 1B2P DB	40	FAIL
A-02-04 3B5P SB	50	FAIL
A-02-04 3B5P DB2	48	FAIL
A-02-01 1B2P DB	39	FAIL
A-02-07 1B2P DB	36	FAIL
A-04-07 2B4P DB1	38	FAIL
A-04-07 2B4P DB2	36	FAIL
B-04-07 1B2P DB	36	FAIL
B-04-08 1B2P DB	36	FAIL
B-04-01 1B2P DB	41	FAIL
B-04-02 2B4P DB1	24	PASS
B-04-02 2B4P DB2	24	PASS
A-04-02 2B4P DB2	24	PASS
A-04-02 2B4P DB1	25	PASS
A-04-01 1B2P DB	40	FAIL
A-04-08 1B2P DB	36	FAIL
B-04-03 2B4P DB2	44	FAIL
B-04-03 2B4P DB1	47	FAIL
A-04-03 2B4P DB1	46	FAIL

A-04-03 2B4P DB2	44	FAIL
B-04-04 2B3P SB	38	FAIL
B-04-04 2B3P DB	51	FAIL
B-04-05 2B3P DB	39	FAIL
B-04-05 2B3P SB	34	FAIL
B-04-06 STUDIO	37	FAIL
A-04-04 2B3P DB	55	FAIL
A-04-05 2B3P SB	48	FAIL
A-04-05 2B3P DB	44	FAIL
A-04-06 STUDIO	38	FAIL
A-04-04 2B3P SB	38	FAIL
A-06-07 2B4P DB1	38	FAIL
A-06-07 2B4P DB2	36	FAIL
B-06-07 1B2P DB	36	FAIL
B-06-08 1B2P DB	37	FAIL
B-06-01 1B2P DB	42	FAIL
B-06-02 2B4P DB1	24	PASS
B-06-02 2B4P DB2	24	PASS
A-06-02 2B4P DB2	24	PASS
A-06-02 2B4P DB1	25	PASS
A-06-01 1B2P DB	40	FAIL
A-06-08 1B2P DB	36	FAIL
B-06-03 2B4P DB2	32	PASS
B-06-03 2B4P DB1	32	PASS
A-06-03 2B4P DB1	32	PASS
A-06-03 2B4P DB2	30	PASS
B-06-04 2B3P SB	24	PASS
B-06-04 2B3P DB	36	FAIL
B-06-05 2B3P DB	39	FAIL
B-06-05 2B3P SB	34	FAIL
B-06-06 STUDIO	37	FAIL
A-06-05 2B3P SB	48	FAIL
A-06-05 2B3P DB	43	FAIL
A-06-06 STUDIO	38	FAIL
A-06-04 2B4P DB2	31	PASS
A-06-04 2B4P DB1	35	FAIL
A-08-07 2B4P DB1	38	FAIL
A-08-07 2B4P DB2	36	FAIL
B-08-07 1B2P DB	40	FAIL
B-08-08 1B2P DB	40	FAIL
B-08-01 1B2P DB	41	FAIL
B-08-02 2B4P DB1	25	PASS
B-08-02 2B4P DB2	25	PASS
A-08-02 2B4P DB2	25	PASS
A-08-02 2B4P DB1	25	PASS
A-08-01 1B2P DB	40	FAIL

A-08-08 1B2P DB	36	FAIL
B-08-03 2B4P DB2	31	PASS
B-08-03 2B4P DB1	32	PASS
A-08-03 2B4P DB1	32	PASS
A-08-03 2B4P DB2	30	PASS
B-08-05 2B3P DB	40	FAIL
B-08-05 2B3P SB	33	FAIL
B-08-06 STUDIO	38	FAIL
A-08-05 2B3P SB	48	FAIL
A-08-05 2B3P DB	43	FAIL
A-08-06 STUDIO	39	FAIL
A-08-04 2B4P DB2	31	PASS
A-08-04 2B4P DB1	34	FAIL
B-08-04 2B4P B1	32	PASS
B-08-04 2B4P B2	30	PASS
A-09-07 2B4P DB1	40	FAIL
A-09-07 2B4P DB2	37	FAIL
A-09-02 2B4P DB2	25	PASS
A-09-02 2B4P DB1	25	PASS
A-09-01 1B2P DB	41	FAIL
A-09-08 1B2P DB	39	FAIL
A-09-03 2B4P DB1	32	PASS
A-09-03 2B4P DB2	31	PASS
A-09-05 2B3P SB	48	FAIL
A-09-05 2B3P DB	41	FAIL
A-09-06 STUDIO	42	FAIL
A-09-04 2B4P DB2	31	PASS
A-09-04 2B4P DB1	34	FAIL
B-09-01 3B5P SB	22	PASS
B-09-01 3B5P DB1	31	PASS
B-09-01 3B5P DB2	30	PASS
B-09-02 3B6P DB3	30	PASS
B-09-02 3B6P DB1	28	PASS
B-09-02 3B6P DB2	25	PASS
A-10-03 2B3P SB	43	FAIL
A-10-03 2B3P DB	39	FAIL
A-10-01 1B2P DB	30	PASS
A-10-02 1B2P DB	30	PASS
A-03-06 2B4P DB1	37	FAIL
A-03-06 2B4P DB2	34	FAIL
A-03-05 3B5P DB2	37	FAIL
A-03-05 3B5P SB	30	PASS
A-03-05 3B5P DB1	36	FAIL
B-03-04 3B5P DB2	45	FAIL
B-03-04 3B5P SB	45	FAIL
B-03-05 3B5P SB	29	PASS

B-03-05 3B5P DB2	37	FAIL
B-03-05 3B5P DB1	34	FAIL
B-03-06 1B2P DB	33	FAIL
B-03-07 1B2P DB	33	FAIL
B-03-01 1B2P DB	47	FAIL
B-03-03 1B2P DB	42	FAIL
B-03-02 3B6P DB1	23	PASS
B-03-02 3B6P DB2	22	PASS
B-03-02 3B6P DB3	39	FAIL
A-03-02 3B6P DB2	22	PASS
A-03-02 3B6P DB1	23	PASS
A-03-02 3B6P DB3	38	FAIL
A-03-03 1B2P DB	40	FAIL
A-03-04 3B5P SB	45	FAIL
A-03-04 3B5P DB2	45	FAIL
A-03-01 1B2P DB	39	FAIL
A-03-07 1B2P DB	35	FAIL
A-05-07 2B4P DB1	37	FAIL
A-05-07 2B4P DB2	34	FAIL
B-05-07 1B2P DB	33	FAIL
B-05-08 1B2P DB	35	FAIL
B-05-01 1B2P DB	47	FAIL
B-05-02 2B4P DB1	23	PASS
B-05-02 2B4P DB2	21	PASS
A-05-02 2B4P DB2	21	PASS
A-05-02 2B4P DB1	23	PASS
A-05-01 1B2P DB	39	FAIL
A-05-08 1B2P DB	35	FAIL
B-05-03 2B4P DB2	42	FAIL
B-05-03 2B4P DB1	42	FAIL
A-05-03 2B4P DB1	42	FAIL
A-05-03 2B4P DB2	42	FAIL
B-05-04 2B3P SB	32	PASS
B-05-04 2B3P DB	45	FAIL
B-05-05 2B3P DB	40	FAIL
B-05-05 2B3P SB	34	FAIL
B-05-06 STUDIO	37	FAIL
A-05-04 2B3P DB	47	FAIL
A-05-05 2B3P SB	47	FAIL
A-05-05 2B3P DB	40	FAIL
A-05-06 STUDIO	38	FAIL
A-05-04 2B3P SB	33	FAIL
A-07-07 2B4P DB1	37	FAIL
A-07-07 2B4P DB2	34	FAIL
B-07-07 1B2P DB	34	FAIL
B-07-08 1B2P DB	36	FAIL

B-07-01 1B2P DB	46	FAIL
B-07-02 2B4P DB1	23	PASS
B-07-02 2B4P DB2	21	PASS
A-07-02 2B4P DB2	21	PASS
A-07-02 2B4P DB1	23	PASS
A-07-01 1B2P DB	40	FAIL
A-07-08 1B2P DB	35	FAIL
B-07-03 2B4P DB2	28	PASS
B-07-03 2B4P DB1	29	PASS
A-07-03 2B4P DB1	28	PASS
A-07-03 2B4P DB2	27	PASS
B-07-04 2B3P SB	22	PASS
B-07-04 2B3P DB	31	PASS
B-07-05 2B3P DB	40	FAIL
B-07-05 2B3P SB	34	FAIL
B-07-06 STUDIO	37	FAIL
A-07-05 2B3P SB	46	FAIL
A-07-05 2B3P DB	40	FAIL
A-07-06 STUDIO	39	FAIL
A-07-04 2B4P DB2	28	PASS
A-07-04 2B4P DB1	29	PASS

RESULTS FOR CRITERIA FOR THE NINE ROOMS IDENTIFIED AS HIGH RISK FOR NOISE IN THE ENVIRONMENTAL & INTRUSIVE NOISE STUDY AND WILL BE MECHANICALLY VENTILATED – OUT OF A TOTAL OF 9 ROOMS, ALL ARE MARGINALLY FAILING. PLEASE NOTE AS THE 9 ROOMS ARE ONLY MARGINALLY FAILING, IT IS EXPECTED THAT THIS WOULD BE EASILY RESOLVED BY ADDITIONAL VENTILATION OR A MINIMAL LEVEL OF COMFORT COOLING.

Room Name	**TM59 Analysis for mechanically ventilated rooms identified as high risk for noise in the Environmental & Intrusive Noise Study**	
	Percentage of Occupied Hours Annually Where Operative Temperature > 26°C (Target Criteria is not more than 3%)	**Pass/Fail**
A-01-01 2B4P DB2	9	FAIL
A-01-01 2B4P LDK	6.5	FAIL
C-00-05 3B5P M DB2	10.1	FAIL
C-00-05 3B5P M DB1	9.2	FAIL
C-00-05 3B5P M SB	10.2	FAIL
B-02-04 3B5P DB1	8.8	FAIL
A-02-04 3B5P DB1	9.1	FAIL
B-03-04 3B5P DB1	7.3	FAIL
A-03-04 3B5P DB1	7.4	FAIL

RESULTS FOR COMMUNAL CORRIDORS – ALL CORRIDORS ARE PASSING THE CRITERIA

Room Name	TM59 Analysis	
	Percentage of Hours Annually Where Operative Temperature > 28°C	Pass/Fail
CORRIDOR	0.4	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0.1	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS
CORRIDOR	0	PASS
CORRIDOR	0.1	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0.8	PASS
CORRIDOR	0	PASS
CORRIDOR	0.1	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS
CORRIDOR	0	PASS
CORRIDOR	0.1	PASS

THERMAL MODELLING RAW RESULTS FOR CIBSE LONDON HEATHROW DSY3 2020'S HIGH EMISSIONS 50TH PERCENTILE RANGE WEATHER FILE

RESULTS FOR CRITERIA 1 FOR LIVING/KITCHENS/BEDROOMS – OUT OF 352 TOTAL HABITABLE ROOMS, ALL 352 ROOMS ARE PASSING CRITERIA 1

Room Name	TM59 Analysis	
	Criteria 1: Hours of exceedance (He)	Pass/Fail
C-00-04 3B5P M DB1	0	PASS
C-00-03 3B5P M DB1	0	PASS
C-00-02 3B5P M DB1	0	PASS
C-00-01 3B5P M DB1	0	PASS
C-00-05 3B5P M LDK	0.2	PASS
C-00-06 3B5P M LDK	0.5	PASS
C-00-07 3B5P M SB	0	PASS
C-00-08 3B5P M DB1	0	PASS
C-00-09 3B5P M DB1	0	PASS
A-01-04 2B3P DB	0.5	PASS
A-01-04 2B3P SB	0.5	PASS
A-01-04 2B3P LDK	0.6	PASS
A-01-03 2B4P LDK	0.7	PASS
A-01-03 2B4P DB1	0.4	PASS
A-01-03 2B4P DB2	0.6	PASS
A-01-02 3B5P DB2	0.5	PASS
A-01-02 3B5P SB	0.5	PASS
A-01-02 3B5P DB1	0.1	PASS
A-01-02 3B5P LDK	0.4	PASS
A-01-01 2B4P DB1	0.1	PASS
C-00-01 3B5P M SB	0	PASS
C-00-01 3B5P M LDK	0	PASS
C-00-01 3B5P M DB2	0	PASS
C-00-02 3B5P M DB2	0	PASS
C-00-02 3B5P M LDK	0	PASS
C-00-02 3B5P M SB	0	PASS
C-00-03 3B5P M DB2	0	PASS
C-00-03 3B5P M LDK	0	PASS
C-00-03 3B5P M SB	0	PASS
C-00-04 3B5P M DB2	0	PASS
C-00-04 3B5P M SB	0	PASS
C-00-04 3B5P M LDK	0	PASS
C-00-06 3B5P M DB1	0.7	PASS
C-00-06 3B5P M DB2	0.7	PASS
C-00-06 3B5P M SB	1	PASS
C-00-07 3B5P M LDK	0	PASS

C-00-07 3B5P M DB2	0.3	PASS
C-00-07 3B5P M DB1	0.2	PASS
C-00-08 3B5P M SB	0.1	PASS
C-00-08 3B5P M DB2	0.2	PASS
C-00-08 3B5P M LDK	0.1	PASS
C-00-09 3B5P M SB	0.5	PASS
C-00-09 3B5P M DB2	0.7	PASS
C-00-09 3B5P M LDK	0.6	PASS
A-02-06 2B4P LDK	0.8	PASS
A-02-06 2B4P DB1	0.5	PASS
A-02-06 2B4P DB2	0.7	PASS
A-02-05 3B5P DB2	0.7	PASS
A-02-05 3B5P SB	0.7	PASS
A-02-05 3B5P DB1	0.3	PASS
A-02-05 3B5P LDK	0.7	PASS
A-02-01 1B2P LDK	0	PASS
B-02-04 3B5P DB2	1	PASS
B-02-04 3B5P SB	2	PASS
B-02-04 3B5P LDK	1.6	PASS
B-02-05 3B5P LDK	0.7	PASS
B-02-05 3B5P SB	0.9	PASS
B-02-05 3B5P DB2	0.8	PASS
B-02-05 3B5P DB1	0.5	PASS
B-02-06 1B2P DB	0.6	PASS
B-02-06 1B2P LDK	0.7	PASS
B-02-07 1B2P DB	0.3	PASS
B-02-07 1B2P LDK	0.1	PASS
B-02-01 1B2P DB	0	PASS
B-02-03 1B2P DB	0.1	PASS
B-02-03 1B2P LDK	0.5	PASS
B-02-02 3B6P LDK	0.1	PASS
B-02-02 3B6P DB1	0.1	PASS
B-02-02 3B6P DB2	0.1	PASS
B-02-02 3B6P DB3	0	PASS
A-02-02 3B6P DB2	0.1	PASS
A-02-02 3B6P DB1	0.1	PASS
A-02-02 3B6P LDK	0.1	PASS
A-02-02 3B6P DB3	0	PASS
A-02-03 1B2P DB	0.2	PASS
A-02-04 3B5P SB	1.7	PASS
A-02-04 3B5P DB2	1.2	PASS
A-02-04 3B5P LDK	1.9	PASS
A-02-01 1B2P DB	0	PASS
A-02-07 1B2P DB	0.5	PASS
B-02-01 1B2P LDK	0	PASS

A-02-07 1B2P LDK	0.3	PASS
A-02-03 1B2P LDK	0.4	PASS
A-04-07 2B4P LDK	1	PASS
A-04-07 2B4P DB1	0.6	PASS
A-04-07 2B4P DB2	0.8	PASS
A-04-01 1B2P LDK	0	PASS
B-04-07 1B2P DB	0.7	PASS
B-04-07 1B2P LDK	0.8	PASS
B-04-08 1B2P DB	0.4	PASS
B-04-08 1B2P LDK	0.3	PASS
B-04-01 1B2P DB	0.1	PASS
B-04-02 2B4P LDK	0	PASS
B-04-02 2B4P DB1	0.1	PASS
B-04-02 2B4P DB2	0.1	PASS
A-04-02 2B4P DB2	0.1	PASS
A-04-02 2B4P DB1	0.1	PASS
A-04-01 1B2P DB	0	PASS
A-04-08 1B2P DB	0.5	PASS
B-04-01 1B2P LDK	0	PASS
A-04-08 1B2P LDK	0.4	PASS
B-04-03 2B4P DB2	0.7	PASS
B-04-03 2B4P LDK	0.5	PASS
B-04-03 2B4P DB1	0.5	PASS
A-04-03 2B4P DB1	0.6	PASS
A-04-03 2B4P DB2	0.7	PASS
A-04-03 2B4P LDK	0.2	PASS
B-04-04 2B3P SB	0.8	PASS
B-04-04 2B3P LDK	0.8	PASS
B-04-04 2B3P DB	0.8	PASS
B-04-05 2B3P DB	0.8	PASS
B-04-05 2B3P SB	1	PASS
B-04-05 2B3P LDK	1.3	PASS
B-04-06 STUDIO	0.6	PASS
A-04-04 2B3P DB	0.6	PASS
A-04-05 2B3P LDK	0.9	PASS
A-04-05 2B3P SB	0.8	PASS
A-04-05 2B3P DB	0.7	PASS
A-04-06 STUDIO	0.5	PASS
A-04-02 2B4P LDK	0	PASS
A-04-04 2B3P SB	0.7	PASS
A-04-04 2B3P LDK	0.7	PASS
A-06-07 2B4P DB1	0.6	PASS
A-06-07 2B4P DB2	0.8	PASS
A-06-01 1B2P LDK	0	PASS
B-06-07 1B2P DB	0.7	PASS

B-06-07 1B2P LDK	0.8	PASS
B-06-08 1B2P DB	0.5	PASS
B-06-08 1B2P LDK	0.5	PASS
B-06-01 1B2P DB	0.1	PASS
B-06-02 2B4P DB1	0.1	PASS
B-06-02 2B4P DB2	0.1	PASS
A-06-02 2B4P DB2	0.1	PASS
A-06-02 2B4P DB1	0	PASS
A-06-02 2B4P LDK	0	PASS
A-06-01 1B2P DB	0	PASS
A-06-08 1B2P DB	0.5	PASS
B-06-01 1B2P LDK	0	PASS
A-06-08 1B2P LDK	0.4	PASS
B-06-03 2B4P DB2	0.6	PASS
B-06-03 2B4P LDK	0.1	PASS
B-06-03 2B4P DB1	0.5	PASS
A-06-03 2B4P DB1	0.5	PASS
A-06-03 2B4P DB2	0.7	PASS
A-06-03 2B4P LDK	0.1	PASS
B-06-04 2B3P SB	0.6	PASS
B-06-04 2B3P LDK	0.6	PASS
B-06-04 2B3P DB	0.7	PASS
B-06-05 2B3P DB	0.8	PASS
B-06-05 2B3P SB	1.1	PASS
B-06-05 2B3P LDK	1.3	PASS
B-06-06 STUDIO	0.7	PASS
A-06-05 2B3P LDK	0.8	PASS
A-06-05 2B3P SB	0.8	PASS
A-06-05 2B3P DB	0.7	PASS
A-06-06 STUDIO	0.5	PASS
A-06-07 2B4P LDK	1	PASS
A-06-04 2B4P DB2	0.6	PASS
A-06-04 2B4P DB1	0.4	PASS
A-06-04 2B4P LDK	0.6	PASS
A-08-07 2B4P DB1	0.6	PASS
A-08-07 2B4P DB2	0.8	PASS
A-08-01 1B2P LDK	0	PASS
B-08-07 1B2P DB	0.8	PASS
B-08-07 1B2P LDK	1.3	PASS
B-08-08 1B2P DB	0.7	PASS
B-08-08 1B2P LDK	1.1	PASS
B-08-01 1B2P DB	0	PASS
B-08-02 2B4P LDK	0	PASS
B-08-02 2B4P DB1	0.1	PASS
B-08-02 2B4P DB2	0.1	PASS

A-08-02 2B4P DB2	0.1	PASS
A-08-02 2B4P DB1	0.1	PASS
A-08-02 2B4P LDK	0	PASS
A-08-01 1B2P DB	0.1	PASS
A-08-08 1B2P DB	0.6	PASS
B-08-01 1B2P LDK	0	PASS
A-08-08 1B2P LDK	0.5	PASS
B-08-03 2B4P DB2	0.6	PASS
B-08-03 2B4P LDK	0.1	PASS
B-08-03 2B4P DB1	0.5	PASS
A-08-03 2B4P DB1	0.5	PASS
A-08-03 2B4P DB2	0.6	PASS
A-08-03 2B4P LDK	0	PASS
B-08-05 2B3P DB	1.1	PASS
B-08-05 2B3P SB	1.5	PASS
B-08-05 2B3P LDK	1.5	PASS
B-08-06 STUDIO	0.9	PASS
A-08-05 2B3P LDK	0.8	PASS
A-08-05 2B3P SB	0.8	PASS
A-08-05 2B3P DB	0.7	PASS
A-08-06 STUDIO	0.5	PASS
A-08-07 2B4P LDK	1	PASS
A-08-04 2B4P DB2	0.5	PASS
A-08-04 2B4P DB1	0.4	PASS
A-08-04 2B4P LDK	0.6	PASS
B-08-04 2B4P B1	0.7	PASS
B-08-04 2B4P LDK	0.8	PASS
B-08-04 2B4P B2	0.6	PASS
B-06-02 2B4P LDK	0	PASS
A-09-07 2B4P DB1	0.6	PASS
A-09-07 2B4P DB2	0.9	PASS
A-09-01 1B2P LDK	0	PASS
A-09-02 2B4P DB2	0.7	PASS
A-09-02 2B4P DB1	0.6	PASS
A-09-02 2B4P LDK	0.2	PASS
A-09-01 1B2P DB	0.3	PASS
A-09-08 1B2P DB	0.8	PASS
A-09-08 1B2P LDK	0.8	PASS
A-09-03 2B4P DB1	0.5	PASS
A-09-03 2B4P DB2	0.6	PASS
A-09-03 2B4P LDK	0.1	PASS
A-09-05 2B3P LDK	0.7	PASS
A-09-05 2B3P SB	0.8	PASS
A-09-05 2B3P DB	0.7	PASS
A-09-06 STUDIO	0.6	PASS

A-09-07 2B4P LDK	1.4	PASS
A-09-04 2B4P DB2	0.5	PASS
A-09-04 2B4P DB1	0.4	PASS
A-09-04 2B4P LDK	0.6	PASS
B-09-01 3B5P LDK	1.5	PASS
B-09-01 3B5P SB	0.6	PASS
B-09-01 3B5P DB1	0.5	PASS
B-09-01 3B5P DB2	0.5	PASS
B-09-02 3B6P DB3	0.7	PASS
B-09-02 3B6P DB1	0	PASS
B-09-02 3B6P LDK	0.5	PASS
B-09-02 3B6P DB2	0.7	PASS
A-10-03 2B3P LDK	0.6	PASS
A-10-03 2B3P SB	0.6	PASS
A-10-03 2B3P DB	0.5	PASS
A-10-01 1B2P DB	0.7	PASS
A-10-01 1B2P LDK	0.8	PASS
A-10-02 1B2P DB	0.3	PASS
A-10-02 1B2P LDK	0.3	PASS
A-03-06 2B4P LDK	1.1	PASS
A-03-06 2B4P DB1	0.7	PASS
A-03-06 2B4P DB2	0.8	PASS
A-03-05 3B5P DB2	0.8	PASS
A-03-05 3B5P SB	1	PASS
A-03-05 3B5P DB1	0.6	PASS
A-03-05 3B5P LDK	1	PASS
A-03-01 1B2P LDK	0.1	PASS
B-03-04 3B5P DB2	1	PASS
B-03-04 3B5P SB	1.7	PASS
B-03-04 3B5P LDK	1.4	PASS
B-03-05 3B5P LDK	1.3	PASS
B-03-05 3B5P SB	1.3	PASS
B-03-05 3B5P DB2	1.1	PASS
B-03-05 3B5P DB1	0.7	PASS
B-03-06 1B2P DB	0.8	PASS
B-03-06 1B2P LDK	1	PASS
B-03-07 1B2P DB	0.5	PASS
B-03-07 1B2P LDK	0.5	PASS
B-03-01 1B2P DB	0.4	PASS
B-03-03 1B2P DB	0.4	PASS
B-03-03 1B2P LDK	0.7	PASS
B-03-02 3B6P LDK	0.5	PASS
B-03-02 3B6P DB1	0.4	PASS
B-03-02 3B6P DB2	0.5	PASS
B-03-02 3B6P DB3	0.3	PASS

A-03-02 3B6P DB2	0.5	PASS
A-03-02 3B6P DB1	0.4	PASS
A-03-02 3B6P LDK	0.5	PASS
A-03-02 3B6P DB3	0.3	PASS
A-03-03 1B2P DB	0.4	PASS
A-03-04 3B5P SB	1.3	PASS
A-03-04 3B5P DB2	1	PASS
A-03-04 3B5P LDK	1.5	PASS
A-03-01 1B2P DB	0.3	PASS
A-03-07 1B2P DB	0.6	PASS
B-03-01 1B2P LDK	0.2	PASS
A-03-07 1B2P LDK	0.6	PASS
A-03-03 1B2P LDK	0.7	PASS
A-05-07 2B4P LDK	1.2	PASS
A-05-07 2B4P DB1	0.7	PASS
A-05-07 2B4P DB2	0.8	PASS
A-05-01 1B2P LDK	0.2	PASS
B-05-07 1B2P DB	0.8	PASS
B-05-07 1B2P LDK	1	PASS
B-05-08 1B2P DB	0.5	PASS
B-05-08 1B2P LDK	0.6	PASS
B-05-01 1B2P DB	0.5	PASS
B-05-02 2B4P LDK	0.2	PASS
B-05-02 2B4P DB1	0.3	PASS
B-05-02 2B4P DB2	0.4	PASS
A-05-02 2B4P DB2	0.4	PASS
A-05-02 2B4P DB1	0.3	PASS
A-05-01 1B2P DB	0.3	PASS
A-05-08 1B2P DB	0.6	PASS
B-05-01 1B2P LDK	0.2	PASS
A-05-08 1B2P LDK	0.6	PASS
B-05-03 2B4P DB2	0.6	PASS
B-05-03 2B4P LDK	0.6	PASS
B-05-03 2B4P DB1	0.5	PASS
A-05-03 2B4P DB1	0.5	PASS
A-05-03 2B4P DB2	0.7	PASS
A-05-03 2B4P LDK	0.5	PASS
B-05-04 2B3P SB	0.7	PASS
B-05-04 2B3P LDK	0.9	PASS
B-05-04 2B3P DB	0.8	PASS
B-05-05 2B3P DB	1	PASS
B-05-05 2B3P SB	1.3	PASS
B-05-05 2B3P LDK	1.6	PASS
B-05-06 STUDIO	0.8	PASS
A-05-04 2B3P DB	0.7	PASS

A-05-05 2B3P LDK	1.4	PASS
A-05-05 2B3P SB	1	PASS
A-05-05 2B3P DB	0.8	PASS
A-05-06 STUDIO	0.6	PASS
A-05-02 2B4P LDK	0.2	PASS
A-05-04 2B3P SB	0.7	PASS
A-05-04 2B3P LDK	0.8	PASS
A-07-07 2B4P DB1	0.7	PASS
A-07-07 2B4P DB2	0.8	PASS
A-07-01 1B2P LDK	0.2	PASS
B-07-07 1B2P DB	0.8	PASS
B-07-07 1B2P LDK	1.1	PASS
B-07-08 1B2P DB	0.6	PASS
B-07-08 1B2P LDK	0.7	PASS
B-07-01 1B2P DB	0.5	PASS
B-07-02 2B4P DB1	0.3	PASS
B-07-02 2B4P DB2	0.4	PASS
A-07-02 2B4P DB2	0.4	PASS
A-07-02 2B4P DB1	0.3	PASS
A-07-02 2B4P LDK	0.2	PASS
A-07-01 1B2P DB	0.4	PASS
A-07-08 1B2P DB	0.6	PASS
B-07-01 1B2P LDK	0.2	PASS
A-07-08 1B2P LDK	0.7	PASS
B-07-03 2B4P DB2	0.5	PASS
B-07-03 2B4P LDK	0.5	PASS
B-07-03 2B4P DB1	0.4	PASS
A-07-03 2B4P DB1	0.4	PASS
A-07-03 2B4P DB2	0.6	PASS
A-07-03 2B4P LDK	0.5	PASS
B-07-04 2B3P SB	0.7	PASS
B-07-04 2B3P LDK	0.9	PASS
B-07-04 2B3P DB	0.8	PASS
B-07-05 2B3P DB	1	PASS
B-07-05 2B3P SB	1.3	PASS
B-07-05 2B3P LDK	1.6	PASS
B-07-06 STUDIO	0.9	PASS
A-07-05 2B3P LDK	1.2	PASS
A-07-05 2B3P SB	0.9	PASS
A-07-05 2B3P DB	0.8	PASS
A-07-06 STUDIO	0.6	PASS
A-07-07 2B4P LDK	1.2	PASS
A-07-04 2B4P DB2	0.6	PASS
A-07-04 2B4P DB1	0.5	PASS
A-07-04 2B4P LDK	0.7	PASS

B-07-02 2B4P LDK	0.2	PASS

RESULTS FOR CRITERIA FOR BEDROOMS – OUT OF 230 BEDROOMS, 1 BEDROOM IS PASSING WITH 229 MARGINALLY FAILING. PLEASE NOTE AS THE 229 BEDROOMS ARE ONLY MARGINALLY FAILING, IT IS EXPECTED THAT THIS WOULD BE EASILY RESOLVED BY ADDITIONAL VENTILATION. FOR EXAMPLE, OCCUPANTS COULD TEMPORARILY REMOVE THE 100MM RESTRICTORS ON THE DOORS/WINDOWS TO ALLOW ADDITIONAL AIRFLOW INTO THE ROOM.

Room Name	TM59 Analysis	
	Criteria 2: Operative Temperature Hours >26°C between 10pm to 7am daily must not exceed 32 hours	Pass/Fail
C-00-04 3B5P M DB1	82	FAIL
C-00-03 3B5P M DB1	87	FAIL
C-00-02 3B5P M DB1	87	FAIL
C-00-01 3B5P M DB1	81	FAIL
C-00-07 3B5P M SB	61	FAIL
C-00-08 3B5P M DB1	57	FAIL
C-00-09 3B5P M DB1	36	FAIL
A-01-04 2B3P DB	62	FAIL
A-01-04 2B3P SB	38	FAIL
A-01-03 2B4P DB1	52	FAIL
A-01-03 2B4P DB2	45	FAIL
A-01-02 3B5P DB2	59	FAIL
A-01-02 3B5P SB	48	FAIL
A-01-02 3B5P DB1	57	FAIL
A-01-01 2B4P DB1	78	FAIL
C-00-01 3B5P M SB	58	FAIL
C-00-01 3B5P M DB2	58	FAIL
C-00-02 3B5P M DB2	57	FAIL
C-00-02 3B5P M SB	40	FAIL
C-00-03 3B5P M DB2	57	FAIL
C-00-03 3B5P M SB	41	FAIL
C-00-04 3B5P M DB2	56	FAIL
C-00-04 3B5P M SB	60	FAIL
C-00-06 3B5P M DB1	93	FAIL
C-00-06 3B5P M DB2	73	FAIL
C-00-06 3B5P M SB	75	FAIL
C-00-07 3B5P M DB2	56	FAIL
C-00-07 3B5P M DB1	57	FAIL
C-00-08 3B5P M SB	58	FAIL
C-00-08 3B5P M DB2	66	FAIL
C-00-09 3B5P M SB	46	FAIL
C-00-09 3B5P M DB2	26	PASS
A-02-06 2B4P DB1	50	FAIL
A-02-06 2B4P DB2	47	FAIL

A-02-05 3B5P DB2	61	FAIL
A-02-05 3B5P SB	48	FAIL
A-02-05 3B5P DB1	58	FAIL
B-02-04 3B5P DB2	79	FAIL
B-02-04 3B5P SB	81	FAIL
B-02-05 3B5P SB	48	FAIL
B-02-05 3B5P DB2	61	FAIL
B-02-05 3B5P DB1	59	FAIL
B-02-06 1B2P DB	58	FAIL
B-02-07 1B2P DB	47	FAIL
B-02-01 1B2P DB	54	FAIL
B-02-03 1B2P DB	63	FAIL
B-02-02 3B6P DB1	40	FAIL
B-02-02 3B6P DB2	40	FAIL
B-02-02 3B6P DB3	65	FAIL
A-02-02 3B6P DB2	40	FAIL
A-02-02 3B6P DB1	40	FAIL
A-02-02 3B6P DB3	65	FAIL
A-02-03 1B2P DB	70	FAIL
A-02-04 3B5P SB	82	FAIL
A-02-04 3B5P DB2	81	FAIL
A-02-01 1B2P DB	59	FAIL
A-02-07 1B2P DB	52	FAIL
A-04-07 2B4P DB1	51	FAIL
A-04-07 2B4P DB2	48	FAIL
B-04-07 1B2P DB	58	FAIL
B-04-08 1B2P DB	48	FAIL
B-04-01 1B2P DB	56	FAIL
B-04-02 2B4P DB1	41	FAIL
B-04-02 2B4P DB2	39	FAIL
A-04-02 2B4P DB2	39	FAIL
A-04-02 2B4P DB1	41	FAIL
A-04-01 1B2P DB	59	FAIL
A-04-08 1B2P DB	51	FAIL
B-04-03 2B4P DB2	74	FAIL
B-04-03 2B4P DB1	75	FAIL
A-04-03 2B4P DB1	75	FAIL
A-04-03 2B4P DB2	75	FAIL
B-04-04 2B3P SB	62	FAIL
B-04-04 2B3P DB	83	FAIL
B-04-05 2B3P DB	67	FAIL
B-04-05 2B3P SB	59	FAIL
B-04-06 STUDIO	62	FAIL
A-04-04 2B3P DB	80	FAIL
A-04-05 2B3P SB	78	FAIL
A-04-05 2B3P DB	65	FAIL

A-04-06 STUDIO	62	FAIL
A-04-04 2B3P SB	57	FAIL
A-06-07 2B4P DB1	51	FAIL
A-06-07 2B4P DB2	48	FAIL
B-06-07 1B2P DB	58	FAIL
B-06-08 1B2P DB	48	FAIL
B-06-01 1B2P DB	56	FAIL
B-06-02 2B4P DB1	41	FAIL
B-06-02 2B4P DB2	39	FAIL
A-06-02 2B4P DB2	39	FAIL
A-06-02 2B4P DB1	41	FAIL
A-06-01 1B2P DB	59	FAIL
A-06-08 1B2P DB	51	FAIL
B-06-03 2B4P DB2	50	FAIL
B-06-03 2B4P DB1	53	FAIL
A-06-03 2B4P DB1	53	FAIL
A-06-03 2B4P DB2	50	FAIL
B-06-04 2B3P SB	45	FAIL
B-06-04 2B3P DB	57	FAIL
B-06-05 2B3P DB	67	FAIL
B-06-05 2B3P SB	58	FAIL
B-06-06 STUDIO	62	FAIL
A-06-05 2B3P SB	76	FAIL
A-06-05 2B3P DB	65	FAIL
A-06-06 STUDIO	62	FAIL
A-06-04 2B4P DB2	49	FAIL
A-06-04 2B4P DB1	49	FAIL
A-08-07 2B4P DB1	52	FAIL
A-08-07 2B4P DB2	49	FAIL
B-08-07 1B2P DB	61	FAIL
B-08-08 1B2P DB	55	FAIL
B-08-01 1B2P DB	52	FAIL
B-08-02 2B4P DB1	41	FAIL
B-08-02 2B4P DB2	41	FAIL
A-08-02 2B4P DB2	41	FAIL
A-08-02 2B4P DB1	41	FAIL
A-08-01 1B2P DB	60	FAIL
A-08-08 1B2P DB	52	FAIL
B-08-03 2B4P DB2	49	FAIL
B-08-03 2B4P DB1	52	FAIL
A-08-03 2B4P DB1	51	FAIL
A-08-03 2B4P DB2	48	FAIL
B-08-05 2B3P DB	68	FAIL
B-08-05 2B3P SB	61	FAIL
B-08-06 STUDIO	62	FAIL
A-08-05 2B3P SB	76	FAIL

A-08-05 2B3P DB	65	FAIL
A-08-06 STUDIO	62	FAIL
A-08-04 2B4P DB2	48	FAIL
A-08-04 2B4P DB1	47	FAIL
B-08-04 2B4P B1	53	FAIL
B-08-04 2B4P B2	51	FAIL
A-09-07 2B4P DB1	52	FAIL
A-09-07 2B4P DB2	49	FAIL
A-09-02 2B4P DB2	42	FAIL
A-09-02 2B4P DB1	43	FAIL
A-09-01 1B2P DB	63	FAIL
A-09-08 1B2P DB	54	FAIL
A-09-03 2B4P DB1	52	FAIL
A-09-03 2B4P DB2	48	FAIL
A-09-05 2B3P SB	74	FAIL
A-09-05 2B3P DB	65	FAIL
A-09-06 STUDIO	63	FAIL
A-09-04 2B4P DB2	48	FAIL
A-09-04 2B4P DB1	47	FAIL
B-09-01 3B5P SB	40	FAIL
B-09-01 3B5P DB1	51	FAIL
B-09-01 3B5P DB2	49	FAIL
B-09-02 3B6P DB3	45	FAIL
B-09-02 3B6P DB1	42	FAIL
B-09-02 3B6P DB2	42	FAIL
A-10-03 2B3P SB	67	FAIL
A-10-03 2B3P DB	64	FAIL
A-10-01 1B2P DB	50	FAIL
A-10-02 1B2P DB	45	FAIL
A-03-06 2B4P DB1	49	FAIL
A-03-06 2B4P DB2	45	FAIL
A-03-05 3B5P DB2	62	FAIL
A-03-05 3B5P SB	48	FAIL
A-03-05 3B5P DB1	58	FAIL
B-03-04 3B5P DB2	72	FAIL
B-03-04 3B5P SB	76	FAIL
B-03-05 3B5P SB	50	FAIL
B-03-05 3B5P DB2	63	FAIL
B-03-05 3B5P DB1	60	FAIL
B-03-06 1B2P DB	51	FAIL
B-03-07 1B2P DB	47	FAIL
B-03-01 1B2P DB	59	FAIL
B-03-03 1B2P DB	63	FAIL
B-03-02 3B6P DB1	36	FAIL
B-03-02 3B6P DB2	36	FAIL
B-03-02 3B6P DB3	60	FAIL

A-03-02 3B6P DB2	36	FAIL
A-03-02 3B6P DB1	37	FAIL
A-03-02 3B6P DB3	63	FAIL
A-03-03 1B2P DB	65	FAIL
A-03-04 3B5P SB	76	FAIL
A-03-04 3B5P DB2	70	FAIL
A-03-01 1B2P DB	61	FAIL
A-03-07 1B2P DB	51	FAIL
A-05-07 2B4P DB1	49	FAIL
A-05-07 2B4P DB2	46	FAIL
B-05-07 1B2P DB	51	FAIL
B-05-08 1B2P DB	48	FAIL
B-05-01 1B2P DB	60	FAIL
B-05-02 2B4P DB1	37	FAIL
B-05-02 2B4P DB2	36	FAIL
A-05-02 2B4P DB2	36	FAIL
A-05-02 2B4P DB1	38	FAIL
A-05-01 1B2P DB	61	FAIL
A-05-08 1B2P DB	51	FAIL
B-05-03 2B4P DB2	64	FAIL
B-05-03 2B4P DB1	67	FAIL
A-05-03 2B4P DB1	67	FAIL
A-05-03 2B4P DB2	64	FAIL
B-05-04 2B3P SB	50	FAIL
B-05-04 2B3P DB	71	FAIL
B-05-05 2B3P DB	66	FAIL
B-05-05 2B3P SB	58	FAIL
B-05-06 STUDIO	64	FAIL
A-05-04 2B3P DB	67	FAIL
A-05-05 2B3P SB	69	FAIL
A-05-05 2B3P DB	67	FAIL
A-05-06 STUDIO	63	FAIL
A-05-04 2B3P SB	46	FAIL
A-07-07 2B4P DB1	49	FAIL
A-07-07 2B4P DB2	46	FAIL
B-07-07 1B2P DB	51	FAIL
B-07-08 1B2P DB	48	FAIL
B-07-01 1B2P DB	59	FAIL
B-07-02 2B4P DB1	38	FAIL
B-07-02 2B4P DB2	36	FAIL
A-07-02 2B4P DB2	36	FAIL
A-07-02 2B4P DB1	38	FAIL
A-07-01 1B2P DB	61	FAIL
A-07-08 1B2P DB	51	FAIL
B-07-03 2B4P DB2	46	FAIL
B-07-03 2B4P DB1	47	FAIL

A-07-03 2B4P DB1	47	FAIL
A-07-03 2B4P DB2	46	FAIL
B-07-04 2B3P SB	40	FAIL
B-07-04 2B3P DB	52	FAIL
B-07-05 2B3P DB	66	FAIL
B-07-05 2B3P SB	58	FAIL
B-07-06 STUDIO	64	FAIL
A-07-05 2B3P SB	68	FAIL
A-07-05 2B3P DB	66	FAIL
A-07-06 STUDIO	63	FAIL
A-07-04 2B4P DB2	46	FAIL
A-07-04 2B4P DB1	44	FAIL

RESULTS FOR CRITERIA FOR THE NINE ROOMS IDENTIFIED AS HIGH RISK FOR NOISE IN THE ENVIRONMENTAL & INTRUSIVE NOISE STUDY AND WILL BE MECHANICALLY VENTILATED – OUT OF A TOTAL OF 9 ROOMS, ALL ARE MARGINALLY FAILING. PLEASE NOTE AS THE 9 ROOMS ARE ONLY MARGINALLY FAILING, IT IS EXPECTED THAT THIS WOULD BE EASILY RESOLVED BY ADDITIONAL VENTILATION OR A MINIMAL LEVEL OF COMFORT COOLING.

Room Name	TM59 Analysis for mechanically ventilated rooms identified as high risk for noise in the Environmental & Intrusive Noise Study	
	Percentage of Occupied Hours Annually Where Operative Temperature > 26°C (Target Criteria is not more than 3%)	Pass/Fail
A-01-01 2B4P DB2	13.1	FAIL
A-01-01 2B4P LDK	10.9	FAIL
C-00-05 3B5P M DB2	14.4	FAIL
C-00-05 3B5P M DB1	13.3	FAIL
C-00-05 3B5P M SB	14.5	FAIL
B-02-04 3B5P DB1	12.6	FAIL
A-02-04 3B5P DB1	12.9	FAIL
B-03-04 3B5P DB1	10.9	FAIL
A-03-04 3B5P DB1	11	FAIL

RESULTS FOR COMMUNAL CORRIDORS – ALL CORRIDORS ARE PASSING CRITERIA

Room Name	TM59 Analysis	
	Percentage of Hours Annually Where Operative Temperature > 28°C	Pass/Fail
CORRIDOR	0.6	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0.1	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	1.7	PASS
CORRIDOR	0	PASS
CORRIDOR	0.1	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS
CORRIDOR	0	PASS
CORRIDOR	0.2	PASS

APPENDIX E

THERMAL MODELLING RESULTS FOR ANALYSIS TO ASSESS OVERHEATING RISK WITHOUT SOLAR CONTROL INTERNAL BLINDS

As solar control internal blinds are part of the overheating prevention strategy for summertime, please see results below for the analysis without blinds which must be reported for reference in accordance with CIBSE guide TM59:2017 “Design methodology for the assessment of overheating risk in homes” guidelines.

RESULTS FOR CRITERIA 1 FOR LIVING/KITCHENS/BEDROOMS – OUT OF 352 TOTAL HABITABLE ROOMS, ALL 352 ROOMS ARE PASSING CRITERIA 1

Room Name	TM59 Analysis	
	Criteria 1: Hours of exceedance (He)	Pass/Fail
C-00-04 3B5P M DB1	0	PASS
C-00-03 3B5P M DB1	0	PASS
C-00-02 3B5P M DB1	0	PASS
C-00-01 3B5P M DB1	0	PASS
C-00-05 3B5P M LDK	0	PASS
C-00-06 3B5P M LDK	0.6	PASS
C-00-07 3B5P M SB	0	PASS
C-00-08 3B5P M DB1	0	PASS
C-00-09 3B5P M DB1	0	PASS
A-01-04 2B3P DB	0.8	PASS
A-01-04 2B3P SB	0.8	PASS
A-01-04 2B3P LDK	0.7	PASS
A-01-03 2B4P LDK	0.9	PASS
A-01-03 2B4P DB1	0.5	PASS
A-01-03 2B4P DB2	0.7	PASS
A-01-02 3B5P DB2	0.5	PASS
A-01-02 3B5P SB	0.7	PASS
A-01-02 3B5P DB1	0.2	PASS
A-01-02 3B5P LDK	0.6	PASS
A-01-01 2B4P DB1	0.5	PASS
C-00-01 3B5P M SB	0	PASS
C-00-01 3B5P M LDK	0	PASS
C-00-01 3B5P M DB2	0	PASS
C-00-02 3B5P M DB2	0	PASS
C-00-02 3B5P M LDK	0	PASS
C-00-02 3B5P M SB	0	PASS
C-00-03 3B5P M DB2	0	PASS
C-00-03 3B5P M LDK	0	PASS
C-00-03 3B5P M SB	0	PASS
C-00-04 3B5P M DB2	0	PASS
C-00-04 3B5P M SB	0	PASS

C-00-04 3B5P M LDK	0	PASS
C-00-06 3B5P M DB1	1	PASS
C-00-06 3B5P M DB2	1	PASS
C-00-06 3B5P M SB	1.4	PASS
C-00-07 3B5P M LDK	0.2	PASS
C-00-07 3B5P M DB2	0.3	PASS
C-00-07 3B5P M DB1	0.2	PASS
C-00-08 3B5P M SB	0.1	PASS
C-00-08 3B5P M DB2	0.2	PASS
C-00-08 3B5P M LDK	0	PASS
C-00-09 3B5P M SB	0.6	PASS
C-00-09 3B5P M DB2	1	PASS
C-00-09 3B5P M LDK	0.6	PASS
A-02-06 2B4P LDK	0.8	PASS
A-02-06 2B4P DB1	0.4	PASS
A-02-06 2B4P DB2	0.6	PASS
A-02-05 3B5P DB2	0.5	PASS
A-02-05 3B5P SB	0.7	PASS
A-02-05 3B5P DB1	0.2	PASS
A-02-05 3B5P LDK	0.6	PASS
A-02-01 1B2P LDK	0	PASS
B-02-04 3B5P DB2	1.4	PASS
B-02-04 3B5P SB	2.3	PASS
B-02-04 3B5P LDK	2	PASS
B-02-05 3B5P LDK	0.7	PASS
B-02-05 3B5P SB	1.3	PASS
B-02-05 3B5P DB2	1	PASS
B-02-05 3B5P DB1	0.4	PASS
B-02-06 1B2P DB	0.7	PASS
B-02-06 1B2P LDK	1	PASS
B-02-07 1B2P DB	0.1	PASS
B-02-07 1B2P LDK	0.1	PASS
B-02-01 1B2P DB	0	PASS
B-02-03 1B2P DB	0	PASS
B-02-03 1B2P LDK	0.2	PASS
B-02-02 3B6P LDK	0	PASS
B-02-02 3B6P DB1	0	PASS
B-02-02 3B6P DB2	0	PASS
B-02-02 3B6P DB3	0	PASS
A-02-02 3B6P DB2	0	PASS
A-02-02 3B6P DB1	0	PASS
A-02-02 3B6P LDK	0	PASS
A-02-02 3B6P DB3	0	PASS
A-02-03 1B2P DB	0	PASS
A-02-04 3B5P SB	2	PASS

A-02-04 3B5P DB2	1.3	PASS
A-02-04 3B5P LDK	2.2	PASS
A-02-01 1B2P DB	0	PASS
A-02-07 1B2P DB	0.4	PASS
B-02-01 1B2P LDK	0	PASS
A-02-07 1B2P LDK	0.2	PASS
A-02-03 1B2P LDK	0.1	PASS
A-04-07 2B4P LDK	0.7	PASS
A-04-07 2B4P DB1	0.4	PASS
A-04-07 2B4P DB2	0.6	PASS
A-04-01 1B2P LDK	0	PASS
B-04-07 1B2P DB	0.8	PASS
B-04-07 1B2P LDK	1	PASS
B-04-08 1B2P DB	0.2	PASS
B-04-08 1B2P LDK	0.1	PASS
B-04-01 1B2P DB	0	PASS
B-04-02 2B4P LDK	0	PASS
B-04-02 2B4P DB1	0	PASS
B-04-02 2B4P DB2	0	PASS
A-04-02 2B4P DB2	0	PASS
A-04-02 2B4P DB1	0	PASS
A-04-01 1B2P DB	0	PASS
A-04-08 1B2P DB	0.4	PASS
B-04-01 1B2P LDK	0	PASS
A-04-08 1B2P LDK	0.1	PASS
B-04-03 2B4P DB2	0.4	PASS
B-04-03 2B4P LDK	0	PASS
B-04-03 2B4P DB1	0.2	PASS
A-04-03 2B4P DB1	0.2	PASS
A-04-03 2B4P DB2	0.4	PASS
A-04-03 2B4P LDK	0	PASS
B-04-04 2B3P SB	0.5	PASS
B-04-04 2B3P LDK	0.6	PASS
B-04-04 2B3P DB	0.7	PASS
B-04-05 2B3P DB	0.9	PASS
B-04-05 2B3P SB	1.4	PASS
B-04-05 2B3P LDK	1.4	PASS
B-04-06 STUDIO	0.7	PASS
A-04-04 2B3P DB	0.3	PASS
A-04-05 2B3P LDK	0.9	PASS
A-04-05 2B3P SB	0.7	PASS
A-04-05 2B3P DB	0.5	PASS
A-04-06 STUDIO	0.3	PASS
A-04-02 2B4P LDK	0	PASS
A-04-04 2B3P SB	0.5	PASS

A-04-04 2B3P LDK	0.5	PASS
A-06-07 2B4P DB1	0.4	PASS
A-06-07 2B4P DB2	0.6	PASS
A-06-01 1B2P LDK	0	PASS
B-06-07 1B2P DB	0.8	PASS
B-06-07 1B2P LDK	1	PASS
B-06-08 1B2P DB	0.4	PASS
B-06-08 1B2P LDK	0.3	PASS
B-06-01 1B2P DB	0	PASS
B-06-02 2B4P DB1	0	PASS
B-06-02 2B4P DB2	0	PASS
A-06-02 2B4P DB2	0	PASS
A-06-02 2B4P DB1	0	PASS
A-06-02 2B4P LDK	0	PASS
A-06-01 1B2P DB	0	PASS
A-06-08 1B2P DB	0.4	PASS
B-06-01 1B2P LDK	0	PASS
A-06-08 1B2P LDK	0.1	PASS
B-06-03 2B4P DB2	0.2	PASS
B-06-03 2B4P LDK	0	PASS
B-06-03 2B4P DB1	0.1	PASS
A-06-03 2B4P DB1	0.1	PASS
A-06-03 2B4P DB2	0.3	PASS
A-06-03 2B4P LDK	0	PASS
B-06-04 2B3P SB	0.4	PASS
B-06-04 2B3P LDK	0.4	PASS
B-06-04 2B3P DB	0.5	PASS
B-06-05 2B3P DB	0.9	PASS
B-06-05 2B3P SB	1.4	PASS
B-06-05 2B3P LDK	1.5	PASS
B-06-06 STUDIO	0.7	PASS
A-06-05 2B3P LDK	0.8	PASS
A-06-05 2B3P SB	0.7	PASS
A-06-05 2B3P DB	0.5	PASS
A-06-06 STUDIO	0.3	PASS
A-06-07 2B4P LDK	0.8	PASS
A-06-04 2B4P DB2	0.4	PASS
A-06-04 2B4P DB1	0.2	PASS
A-06-04 2B4P LDK	0.4	PASS
A-08-07 2B4P DB1	0.4	PASS
A-08-07 2B4P DB2	0.6	PASS
A-08-01 1B2P LDK	0	PASS
B-08-07 1B2P DB	1.1	PASS
B-08-07 1B2P LDK	2.4	PASS
B-08-08 1B2P DB	0.7	PASS

B-08-08 1B2P LDK	1.8	PASS
B-08-01 1B2P DB	0	PASS
B-08-02 2B4P LDK	0	PASS
B-08-02 2B4P DB1	0	PASS
B-08-02 2B4P DB2	0	PASS
A-08-02 2B4P DB2	0	PASS
A-08-02 2B4P DB1	0	PASS
A-08-02 2B4P LDK	0	PASS
A-08-01 1B2P DB	0	PASS
A-08-08 1B2P DB	0.6	PASS
B-08-01 1B2P LDK	0	PASS
A-08-08 1B2P LDK	0.3	PASS
B-08-03 2B4P DB2	0.2	PASS
B-08-03 2B4P LDK	0	PASS
B-08-03 2B4P DB1	0.1	PASS
A-08-03 2B4P DB1	0.1	PASS
A-08-03 2B4P DB2	0.3	PASS
A-08-03 2B4P LDK	0	PASS
B-08-05 2B3P DB	1.7	PASS
B-08-05 2B3P SB	2.6	PASS
B-08-05 2B3P LDK	2.6	PASS
B-08-06 STUDIO	1.5	PASS
A-08-05 2B3P LDK	0.8	PASS
A-08-05 2B3P SB	0.7	PASS
A-08-05 2B3P DB	0.5	PASS
A-08-06 STUDIO	0.4	PASS
A-08-07 2B4P LDK	0.8	PASS
A-08-04 2B4P DB2	0.4	PASS
A-08-04 2B4P DB1	0.1	PASS
A-08-04 2B4P LDK	0.4	PASS
B-08-04 2B4P B1	0.9	PASS
B-08-04 2B4P LDK	0.9	PASS
B-08-04 2B4P B2	0.4	PASS
B-06-02 2B4P LDK	0	PASS
A-09-07 2B4P DB1	0.5	PASS
A-09-07 2B4P DB2	0.8	PASS
A-09-01 1B2P LDK	0.2	PASS
A-09-02 2B4P DB2	1.1	PASS
A-09-02 2B4P DB1	0.9	PASS
A-09-02 2B4P LDK	0.2	PASS
A-09-01 1B2P DB	0.4	PASS
A-09-08 1B2P DB	1	PASS
A-09-08 1B2P LDK	1.2	PASS
A-09-03 2B4P DB1	0.3	PASS
A-09-03 2B4P DB2	0.4	PASS

A-09-03 2B4P LDK	0	PASS
A-09-05 2B3P LDK	0.9	PASS
A-09-05 2B3P SB	0.7	PASS
A-09-05 2B3P DB	0.6	PASS
A-09-06 STUDIO	0.8	PASS
A-09-07 2B4P LDK	1.8	PASS
A-09-04 2B4P DB2	0.4	PASS
A-09-04 2B4P DB1	0.2	PASS
A-09-04 2B4P LDK	0.4	PASS
B-09-01 3B5P LDK	2.2	PASS
B-09-01 3B5P SB	0.4	PASS
B-09-01 3B5P DB1	0.2	PASS
B-09-01 3B5P DB2	0.3	PASS
B-09-02 3B6P DB3	1.3	PASS
B-09-02 3B6P DB1	0.3	PASS
B-09-02 3B6P LDK	0.5	PASS
B-09-02 3B6P DB2	1.6	PASS
A-10-03 2B3P LDK	1.2	PASS
A-10-03 2B3P SB	0.9	PASS
A-10-03 2B3P DB	0.8	PASS
A-10-01 1B2P DB	1.5	PASS
A-10-01 1B2P LDK	1.4	PASS
A-10-02 1B2P DB	0.5	PASS
A-10-02 1B2P LDK	0.6	PASS
A-03-06 2B4P LDK	0.9	PASS
A-03-06 2B4P DB1	0.5	PASS
A-03-06 2B4P DB2	0.6	PASS
A-03-05 3B5P DB2	0.6	PASS
A-03-05 3B5P SB	0.8	PASS
A-03-05 3B5P DB1	0.4	PASS
A-03-05 3B5P LDK	0.9	PASS
A-03-01 1B2P LDK	0	PASS
B-03-04 3B5P DB2	1.3	PASS
B-03-04 3B5P SB	2	PASS
B-03-04 3B5P LDK	1.9	PASS
B-03-05 3B5P LDK	1.8	PASS
B-03-05 3B5P SB	1.7	PASS
B-03-05 3B5P DB2	1.2	PASS
B-03-05 3B5P DB1	0.8	PASS
B-03-06 1B2P DB	1	PASS
B-03-06 1B2P LDK	1.3	PASS
B-03-07 1B2P DB	0.3	PASS
B-03-07 1B2P LDK	0.4	PASS
B-03-01 1B2P DB	0.1	PASS
B-03-03 1B2P DB	0.1	PASS

B-03-03 1B2P LDK	0.4	PASS
B-03-02 3B6P LDK	0	PASS
B-03-02 3B6P DB1	0	PASS
B-03-02 3B6P DB2	0	PASS
B-03-02 3B6P DB3	0	PASS
A-03-02 3B6P DB2	0	PASS
A-03-02 3B6P DB1	0	PASS
A-03-02 3B6P LDK	0	PASS
A-03-02 3B6P DB3	0	PASS
A-03-03 1B2P DB	0.1	PASS
A-03-04 3B5P SB	1.2	PASS
A-03-04 3B5P DB2	1	PASS
A-03-04 3B5P LDK	1.5	PASS
A-03-01 1B2P DB	0	PASS
A-03-07 1B2P DB	0.5	PASS
B-03-01 1B2P LDK	0	PASS
A-03-07 1B2P LDK	0.4	PASS
A-03-03 1B2P LDK	0.4	PASS
A-05-07 2B4P LDK	0.8	PASS
A-05-07 2B4P DB1	0.5	PASS
A-05-07 2B4P DB2	0.6	PASS
A-05-01 1B2P LDK	0	PASS
B-05-07 1B2P DB	1	PASS
B-05-07 1B2P LDK	1.3	PASS
B-05-08 1B2P DB	0.4	PASS
B-05-08 1B2P LDK	0.4	PASS
B-05-01 1B2P DB	0.1	PASS
B-05-02 2B4P LDK	0	PASS
B-05-02 2B4P DB1	0	PASS
B-05-02 2B4P DB2	0	PASS
A-05-02 2B4P DB2	0	PASS
A-05-02 2B4P DB1	0	PASS
A-05-01 1B2P DB	0	PASS
A-05-08 1B2P DB	0.5	PASS
B-05-01 1B2P LDK	0	PASS
A-05-08 1B2P LDK	0.4	PASS
B-05-03 2B4P DB2	0.3	PASS
B-05-03 2B4P LDK	0.3	PASS
B-05-03 2B4P DB1	0.1	PASS
A-05-03 2B4P DB1	0.1	PASS
A-05-03 2B4P DB2	0.4	PASS
A-05-03 2B4P LDK	0.1	PASS
B-05-04 2B3P SB	0.4	PASS
B-05-04 2B3P LDK	0.6	PASS
B-05-04 2B3P DB	0.8	PASS

B-05-05 2B3P DB	1.1	PASS
B-05-05 2B3P SB	1.7	PASS
B-05-05 2B3P LDK	2.2	PASS
B-05-06 STUDIO	1	PASS
A-05-04 2B3P DB	0.4	PASS
A-05-05 2B3P LDK	1.1	PASS
A-05-05 2B3P SB	0.8	PASS
A-05-05 2B3P DB	0.6	PASS
A-05-06 STUDIO	0.4	PASS
A-05-02 2B4P LDK	0	PASS
A-05-04 2B3P SB	0.4	PASS
A-05-04 2B3P LDK	0.5	PASS
A-07-07 2B4P DB1	0.5	PASS
A-07-07 2B4P DB2	0.6	PASS
A-07-01 1B2P LDK	0	PASS
B-07-07 1B2P DB	1.1	PASS
B-07-07 1B2P LDK	1.4	PASS
B-07-08 1B2P DB	0.6	PASS
B-07-08 1B2P LDK	0.6	PASS
B-07-01 1B2P DB	0.1	PASS
B-07-02 2B4P DB1	0	PASS
B-07-02 2B4P DB2	0	PASS
A-07-02 2B4P DB2	0	PASS
A-07-02 2B4P DB1	0	PASS
A-07-02 2B4P LDK	0	PASS
A-07-01 1B2P DB	0.1	PASS
A-07-08 1B2P DB	0.6	PASS
B-07-01 1B2P LDK	0	PASS
A-07-08 1B2P LDK	0.4	PASS
B-07-03 2B4P DB2	0.2	PASS
B-07-03 2B4P LDK	0.2	PASS
B-07-03 2B4P DB1	0	PASS
A-07-03 2B4P DB1	0.1	PASS
A-07-03 2B4P DB2	0.2	PASS
A-07-03 2B4P LDK	0	PASS
B-07-04 2B3P SB	0.4	PASS
B-07-04 2B3P LDK	0.6	PASS
B-07-04 2B3P DB	0.7	PASS
B-07-05 2B3P DB	1.2	PASS
B-07-05 2B3P SB	1.8	PASS
B-07-05 2B3P LDK	2.3	PASS
B-07-06 STUDIO	1.1	PASS
A-07-05 2B3P LDK	1.1	PASS
A-07-05 2B3P SB	0.7	PASS
A-07-05 2B3P DB	0.6	PASS

A-07-06 STUDIO	0.4	PASS
A-07-07 2B4P LDK	0.9	PASS
A-07-04 2B4P DB2	0.4	PASS
A-07-04 2B4P DB1	0.3	PASS
A-07-04 2B4P LDK	0.5	PASS
B-07-02 2B4P LDK	0	PASS

RESULTS FOR CRITERIA FOR BEDROOMS – OUT OF 230 BEDROOMS, 197 BEDROOMS PASSING WITH 33 MARGINALLY FAILING. PLEASE NOTE AS THE 33 BEDROOMS ARE ONLY MARGINALLY FAILING, IT IS EXPECTED THAT THIS WOULD BE EASILY RESOLVED BY ADDITIONAL VENTILATION. FOR EXAMPLE, OCCUPANTS COULD TEMPORARILY REMOVE THE 100MM RESTRICTORS ON THE DOORS/WINDOWS TO ALLOW ADDITIONAL AIRFLOW INTO THE ROOM.

Room Name		TM59 Analysis
	Criteria 2: Operative Temperature Hours >26°C between 10pm to 7am daily must not exceed 32 hours	Pass/Fail
C-00-04 3B5P M DB1	27	PASS
C-00-03 3B5P M DB1	28	PASS
C-00-02 3B5P M DB1	27	PASS
C-00-01 3B5P M DB1	26	PASS
C-00-07 3B5P M SB	22	PASS
C-00-08 3B5P M DB1	22	PASS
C-00-09 3B5P M DB1	14	PASS
A-01-04 2B3P DB	32	PASS
A-01-04 2B3P SB	18	PASS
A-01-03 2B4P DB1	27	PASS
A-01-03 2B4P DB2	25	PASS
A-01-02 3B5P DB2	32	PASS
A-01-02 3B5P SB	26	PASS
A-01-02 3B5P DB1	30	PASS
A-01-01 2B4P DB1	52	FAIL
C-00-01 3B5P M SB	20	PASS
C-00-01 3B5P M DB2	18	PASS
C-00-02 3B5P M DB2	19	PASS
C-00-02 3B5P M SB	14	PASS
C-00-03 3B5P M DB2	19	PASS
C-00-03 3B5P M SB	14	PASS
C-00-04 3B5P M DB2	18	PASS
C-00-04 3B5P M SB	20	PASS
C-00-06 3B5P M DB1	51	FAIL
C-00-06 3B5P M DB2	42	FAIL
C-00-06 3B5P M SB	40	FAIL
C-00-07 3B5P M DB2	25	PASS
C-00-07 3B5P M DB1	27	PASS

C-00-08 3B5P M SB	23	PASS
C-00-08 3B5P M DB2	29	PASS
C-00-09 3B5P M SB	21	PASS
C-00-09 3B5P M DB2	11	PASS
A-02-06 2B4P DB1	24	PASS
A-02-06 2B4P DB2	22	PASS
A-02-05 3B5P DB2	29	PASS
A-02-05 3B5P SB	26	PASS
A-02-05 3B5P DB1	27	PASS
B-02-04 3B5P DB2	45	FAIL
B-02-04 3B5P SB	44	FAIL
B-02-05 3B5P SB	27	PASS
B-02-05 3B5P DB2	32	PASS
B-02-05 3B5P DB1	31	PASS
B-02-06 1B2P DB	30	PASS
B-02-07 1B2P DB	20	PASS
B-02-01 1B2P DB	19	PASS
B-02-03 1B2P DB	27	PASS
B-02-02 3B6P DB1	13	PASS
B-02-02 3B6P DB2	13	PASS
B-02-02 3B6P DB3	21	PASS
A-02-02 3B6P DB2	13	PASS
A-02-02 3B6P DB1	13	PASS
A-02-02 3B6P DB3	21	PASS
A-02-03 1B2P DB	24	PASS
A-02-04 3B5P SB	48	FAIL
A-02-04 3B5P DB2	51	FAIL
A-02-01 1B2P DB	23	PASS
A-02-07 1B2P DB	22	PASS
A-04-07 2B4P DB1	24	PASS
A-04-07 2B4P DB2	22	PASS
B-04-07 1B2P DB	30	PASS
B-04-08 1B2P DB	23	PASS
B-04-01 1B2P DB	19	PASS
B-04-02 2B4P DB1	13	PASS
B-04-02 2B4P DB2	13	PASS
A-04-02 2B4P DB2	13	PASS
A-04-02 2B4P DB1	13	PASS
A-04-01 1B2P DB	21	PASS
A-04-08 1B2P DB	22	PASS
B-04-03 2B4P DB2	32	PASS
B-04-03 2B4P DB1	30	PASS
A-04-03 2B4P DB1	31	PASS
A-04-03 2B4P DB2	32	PASS
B-04-04 2B3P SB	27	PASS
B-04-04 2B3P DB	46	FAIL

B-04-05 2B3P DB	35	PASS
B-04-05 2B3P SB	29	PASS
B-04-06 STUDIO	32	PASS
A-04-04 2B3P DB	41	FAIL
A-04-05 2B3P SB	40	FAIL
A-04-05 2B3P DB	31	PASS
A-04-06 STUDIO	28	PASS
A-04-04 2B3P SB	30	PASS
A-06-07 2B4P DB1	24	PASS
A-06-07 2B4P DB2	22	PASS
B-06-07 1B2P DB	30	PASS
B-06-08 1B2P DB	23	PASS
B-06-01 1B2P DB	19	PASS
B-06-02 2B4P DB1	13	PASS
B-06-02 2B4P DB2	13	PASS
A-06-02 2B4P DB2	13	PASS
A-06-02 2B4P DB1	13	PASS
A-06-01 1B2P DB	21	PASS
A-06-08 1B2P DB	22	PASS
B-06-03 2B4P DB2	23	PASS
B-06-03 2B4P DB1	21	PASS
A-06-03 2B4P DB1	21	PASS
A-06-03 2B4P DB2	22	PASS
B-06-04 2B3P SB	18	PASS
B-06-04 2B3P DB	29	PASS
B-06-05 2B3P DB	35	FAIL
B-06-05 2B3P SB	30	PASS
B-06-06 STUDIO	33	FAIL
A-06-05 2B3P SB	40	FAIL
A-06-05 2B3P DB	31	PASS
A-06-06 STUDIO	28	PASS
A-06-04 2B4P DB2	23	PASS
A-06-04 2B4P DB1	22	PASS
A-08-07 2B4P DB1	25	PASS
A-08-07 2B4P DB2	22	PASS
B-08-07 1B2P DB	30	PASS
B-08-08 1B2P DB	29	PASS
B-08-01 1B2P DB	19	PASS
B-08-02 2B4P DB1	15	PASS
B-08-02 2B4P DB2	15	PASS
A-08-02 2B4P DB2	15	PASS
A-08-02 2B4P DB1	15	PASS
A-08-01 1B2P DB	23	PASS
A-08-08 1B2P DB	26	PASS
B-08-03 2B4P DB2	22	PASS
B-08-03 2B4P DB1	21	PASS

A-08-03 2B4P DB1	21	PASS
A-08-03 2B4P DB2	22	PASS
B-08-05 2B3P DB	39	FAIL
B-08-05 2B3P SB	34	FAIL
B-08-06 STUDIO	36	FAIL
A-08-05 2B3P SB	40	FAIL
A-08-05 2B3P DB	31	PASS
A-08-06 STUDIO	31	PASS
A-08-04 2B4P DB2	22	PASS
A-08-04 2B4P DB1	22	PASS
B-08-04 2B4P B1	25	PASS
B-08-04 2B4P B2	20	PASS
A-09-07 2B4P DB1	25	PASS
A-09-07 2B4P DB2	24	PASS
A-09-02 2B4P DB2	19	PASS
A-09-02 2B4P DB1	20	PASS
A-09-01 1B2P DB	27	PASS
A-09-08 1B2P DB	29	PASS
A-09-03 2B4P DB1	20	PASS
A-09-03 2B4P DB2	22	PASS
A-09-05 2B3P SB	42	FAIL
A-09-05 2B3P DB	32	PASS
A-09-06 STUDIO	33	FAIL
A-09-04 2B4P DB2	22	PASS
A-09-04 2B4P DB1	22	PASS
B-09-01 3B5P SB	15	PASS
B-09-01 3B5P DB1	19	PASS
B-09-01 3B5P DB2	20	PASS
B-09-02 3B6P DB3	21	PASS
B-09-02 3B6P DB1	18	PASS
B-09-02 3B6P DB2	20	PASS
A-10-03 2B3P SB	41	FAIL
A-10-03 2B3P DB	33	FAIL
A-10-01 1B2P DB	26	PASS
A-10-02 1B2P DB	19	PASS
A-03-06 2B4P DB1	21	PASS
A-03-06 2B4P DB2	20	PASS
A-03-05 3B5P DB2	28	PASS
A-03-05 3B5P SB	24	PASS
A-03-05 3B5P DB1	27	PASS
B-03-04 3B5P DB2	42	FAIL
B-03-04 3B5P SB	41	FAIL
B-03-05 3B5P SB	27	PASS
B-03-05 3B5P DB2	32	PASS
B-03-05 3B5P DB1	29	PASS
B-03-06 1B2P DB	24	PASS

B-03-07 1B2P DB	20	PASS
B-03-01 1B2P DB	23	PASS
B-03-03 1B2P DB	28	PASS
B-03-02 3B6P DB1	12	PASS
B-03-02 3B6P DB2	12	PASS
B-03-02 3B6P DB3	23	PASS
A-03-02 3B6P DB2	12	PASS
A-03-02 3B6P DB1	12	PASS
A-03-02 3B6P DB3	22	PASS
A-03-03 1B2P DB	25	PASS
A-03-04 3B5P SB	37	FAIL
A-03-04 3B5P DB2	36	FAIL
A-03-01 1B2P DB	23	PASS
A-03-07 1B2P DB	20	PASS
A-05-07 2B4P DB1	22	PASS
A-05-07 2B4P DB2	20	PASS
B-05-07 1B2P DB	24	PASS
B-05-08 1B2P DB	21	PASS
B-05-01 1B2P DB	23	PASS
B-05-02 2B4P DB1	13	PASS
B-05-02 2B4P DB2	13	PASS
A-05-02 2B4P DB2	13	PASS
A-05-02 2B4P DB1	13	PASS
A-05-01 1B2P DB	23	PASS
A-05-08 1B2P DB	20	PASS
B-05-03 2B4P DB2	29	PASS
B-05-03 2B4P DB1	28	PASS
A-05-03 2B4P DB1	28	PASS
A-05-03 2B4P DB2	29	PASS
B-05-04 2B3P SB	21	PASS
B-05-04 2B3P DB	36	FAIL
B-05-05 2B3P DB	34	FAIL
B-05-05 2B3P SB	29	PASS
B-05-06 STUDIO	30	PASS
A-05-04 2B3P DB	34	FAIL
A-05-05 2B3P SB	35	FAIL
A-05-05 2B3P DB	31	PASS
A-05-06 STUDIO	27	PASS
A-05-04 2B3P SB	22	PASS
A-07-07 2B4P DB1	21	PASS
A-07-07 2B4P DB2	20	PASS
B-07-07 1B2P DB	24	PASS
B-07-08 1B2P DB	23	PASS
B-07-01 1B2P DB	24	PASS
B-07-02 2B4P DB1	13	PASS
B-07-02 2B4P DB2	13	PASS

A-07-02 2B4P DB2	13	PASS
A-07-02 2B4P DB1	13	PASS
A-07-01 1B2P DB	24	PASS
A-07-08 1B2P DB	23	PASS
B-07-03 2B4P DB2	21	PASS
B-07-03 2B4P DB1	20	PASS
A-07-03 2B4P DB1	20	PASS
A-07-03 2B4P DB2	21	PASS
B-07-04 2B3P SB	15	PASS
B-07-04 2B3P DB	24	PASS
B-07-05 2B3P DB	35	FAIL
B-07-05 2B3P SB	30	PASS
B-07-06 STUDIO	33	FAIL
A-07-05 2B3P SB	34	FAIL
A-07-05 2B3P DB	31	PASS
A-07-06 STUDIO	27	PASS
A-07-04 2B4P DB2	22	PASS
A-07-04 2B4P DB1	19	PASS

RESULTS FOR CRITERIA FOR THE NINE ROOMS IDENTIFIED AS HIGH RISK FOR NOISE IN THE ENVIRONMENTAL & INTRUSIVE NOISE STUDY AND WILL BE MECHANICALLY VENTILATED – OUT OF A TOTAL OF 9 ROOMS, ALL ARE MARGINALLY FAILING.

PLEASE NOTE AS THE 9 ROOMS ARE ONLY MARGINALLY FAILING, IT IS EXPECTED THAT THIS WOULD BE EASILY RESOLVED BY ADDITIONAL VENTILATION OR A MINIMAL LEVEL OF COMFORT COOLING.

Room Name	TM59 Analysis for mechanically ventilated rooms identified as high risk for noise in the Environmental & Intrusive Noise Study	
	Percentage of Occupied Hours Annually Where Operative Temperature > 26°C (Target Criteria is not more than 3%)	Pass/Fail
A-01-01 2B4P DB2	6.4	FAIL
A-01-01 2B4P LDK	4.4	FAIL
C-00-05 3B5P M DB2	8	FAIL
C-00-05 3B5P M DB1	7.2	FAIL
C-00-05 3B5P M SB	8.2	FAIL
B-02-04 3B5P DB1	7.5	FAIL
A-02-04 3B5P DB1	7.7	FAIL
B-03-04 3B5P DB1	6.2	FAIL
A-03-04 3B5P DB1	6.1	FAIL

RESULTS FOR COMMUNAL CORRIDORS – ALL CORRIDORS ARE PASSING CRITERIA.

Room Name	TM59 Analysis	
	Percentage of Hours Annually Where Operative Temperature > 28°C	Pass/Fail
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	1	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS
CORRIDOR	0	PASS

Appendix H

MTT Report (Master planning)

...sustainable building services solutions

old vinyl factory

section 106 schedule 13, energy centre delivery

ace
consultancy engineering business environment

...sustainable building services solutions

EXECUTIVE SUMMARY

This report has been compiled to address the requirements set out within the Section 106 agreement (dated 31st July 2014) in Section 13 'Energy Centre Delivery'. This requires a review of the Old Vinyl Factory's energy performance, prior to the occupation of 300 dwellings or 31st December 2018, whichever is earlier. According to Section 13, this review should include an update to the energy strategy confirming that the overall scheme will deliver a carbon saving of a minimum of 394 tonnes per annum.

This report has therefore been provided to meet the 31st December deadline. Accordingly, it is demonstrated herein that the energy strategy has remained as confirmed in the outline planning report 'Old Vinyl Factory Site: Outline Sustainable Energy Assessment' Ref: 5293.003.006, Issue 3, 14 November 2012.

It is also confirmed, in line with Criterion 1, that the carbon savings are currently on course to exceed the required threshold of 394 tonnes per annum.

Criterion 2 of S106 Section 13 requires the energy strategy to support each Phase of the development in achieving the necessary BREEAM and Code for Sustainable Homes Rating. Each Phase is currently on course to achieve these ratings.

Criterion 3 of S106 Section 13 requires the Energy Strategy to utilise Combined Heat and Power. The CHP unit has been installed in the energy centre and is operational.

Criterion 4 of S106 Section 13 requires all measures necessary to meet the threshold of a 394 tonne carbon emissions saving per annum to be completed and operational prior to the commencement of Phase 6. The CHP unit has been installed in the energy centre, it is currently estimated to be able to provide a carbon saving of 438 tonnes per annum once all Phases of the development are operational.

Criterion 5 of S106 Section 13 requires any shortfall in the saving of 394 tonnes carbon per annum to be offset with a financial contribution. This report confirms that the carbon saving is currently on course to exceed this threshold.

In addition to the utilisation of CHP within a single energy centre supplying a significant proportion of the site's heat demand, in line with the Be Clean Stage of the London Plan Energy Hierarchy, the requirement to achieve Part L compliant buildings through energy efficiency ('Be Lean') measures alone has been met. The energy efficiency measures include: improved fabric insulation; improved air tightness; improved glazing performance; high efficiency mechanical ventilation with heat recovery; energy efficient lighting and controls. The site wide system incorporates gas fired CHP plant designed to meet the domestic hot water demand and a portion of the space heating demand in the dwellings and commercial areas, with high efficiency gas fired boilers meeting the peaks in demand.

The tables below show the Carbon emissions figures in the format required by the GLA in their 'Guidance on Preparing Energy Assessments, April 2014' document.

Old Vinyl Factory Site	Carbon Dioxide Emissions (Tonnes CO_2 per annum) Regulated	Unregulated
Baseline: Building Regulations Compliant	1,509	2,436
After energy demand reduction 'Lean'	1,452	2,436
After CHP 'Clean'	1,104	2,073
After Renewable Energy 'Green'	982	2,073

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

Old Vinyl Factory Site	Regulated Carbon Dioxide Savings (Tonnes CO_2 per annum)	(%)
Savings from energy demand reduction	57	3.8%
Savings from CHP	438	30.1%
Savings from renewable energy	33	3.2%
Total cumulative savings	527	34.9%

GLA Table 2: Carbon Dioxide Emissions savings from each stage of the Energy Hierarchy

DATE OF ISSUE	DETAILS OF CHANGE	AUTHOR	CHECKED
12th December 2018	Draft	CLL	JW
18th December 2018	Issue 1	CLL	JW

CONTENTS

1.0 INTRODUCTION

The Old Vinyl Factory in Hayes is a mixed-use development close to Hayes and Harlington Station, situated in between the railway line and Blyth Road.

The Old Vinyl Factory Masterplan includes the provision of a site wide heating scheme, as described in the Outline Energy Strategy, conveyed in the Outline Sustainable Energy Assessment, dated 23rd July 2012. This approved Strategy details the phased implementation of a site wide scheme and sets individual targets for the energy performance of each building.

The planning consent includes energy-and-sustainability-related conditions, as well as Section 106 requirements. Each phase of the masterplan is required to submit a reserved matters planning application addressing energy and sustainability; the latest of these to be submitted has been for the Assembly Buildings in phase 3B. The Section 106 Agreement requires the Energy Strategy to be reviewed either prior to occupation of more than 300 dwellings or prior to 31st December 2018, whichever is earlier.

This report is therefore an update to the masterplan Outline Sustainable Energy Assessment. It includes more detailed calculations for the London Plan Energy Hierarchy 'Be Lean', 'Be Clean' and 'Be Green' stages for the submitted reserved matters applications, up to the Assembly Buildings. This report summarises the results from the latest detailed calculations and/or operational consumption figures for each building except the Veneer Building, which is yet to be designed. Carbon emissions estimates equivalent to those used in the original Outline Sustainable Energy Assessment are therefore used for the Veneer Building.

The Boiler House, Power House, Material Store, UTC, Music Box, Machine Store & Pressing Plant and Assembly Buildings will be represented by the latest known figures. The Shipping Building, Cabinet Building and Record Store do not form part of this assessment, in line with the 2012 Energy Strategy.

The communal heating system demand profile, capacity and phasing arrangement is assessed using the latest known values for each phase of the development and the site wide strategy is reviewed, taking into account the new modelling values.

SECTION 106 SCHEDULE 13

Outline planning permission has been granted for a Masterplan for the re-development of The Old Vinyl Factory Site at Hayes, which was amended through the approval of a Minor Material Amendment, application reference 59872/APP/2013/3375. Permission was granted with a number of conditions and other requirements set out in the Section 106 agreement. This report is intended to Address Schedule 13 'Energy Centre Delivery'.

Schedule 13 states:

"1. *Prior to occupation of more than 300 dwellings or prior to 31st December 2018, (whichever is earliest) the Owner shall carry out a review of the 'Old Vinyl Factory Outline Sustainable Energy Assessment' reference 5319.003.006, Issue 3, 14th November 2012 and shall produce an energy strategy for the Development ("The Energy Strategy"). The Energy Strategy shall demonstrate how savings of a minimum of 394 tonnes per annum (unless some other figure is agreed in writing having regard to the savings which need actually to be made compared with the assumptions made as part of the Planning Application) can be achieved for the lifetime of the Development. The Energy Strategy shall be submitted to the Council for approval. The Owner shall make such amendments to the Energy Strategy as is reasonably required by the council.*

2. The Energy Strategy shall help ensure that all phases of the Development (completed or future) can achieve the relevant BREEAM and Code for Sustainable Homes credits for energy sections of said code.

3. The Energy Strategy shall prioritise the use of Combine Heat & Power Systems ("CHP") to achieve 394 tonnes per year in CO2 reduction in accordance with the 'Old Vinyl Factory Outline Sustainable Energy Assessment' reference 5319.003.006, Issue 3, 14th November 2012. The energy strategy shall ensure that any complete phases retrospectively reach the 2011 London Plan energy requirements. The Energy Strategy shall also ensure that any future phases will achieve the 2011 London Plan requirements as a minimum.

4. The Energy Strategy shall propose all necessary measures required to be installed to comply with the energy savings of a minimum of 394 tonnes per year. All measures necessary to achieve the energy savings of 394 tonnes per year shall be carried out and completed and made operational prior to the commencement of Phase 6.

5. In the event that the Owner fails to deliver the energy saving of 394 tonnes per year by the year ending 31 December 2018 then the Owner shall pay the Council a carbon offset payment at a cost of £46/carbon tonne per year until such a time as the energy saving is delivered or of the lifetime of the development (10 years residential, 60 years non-residential)".

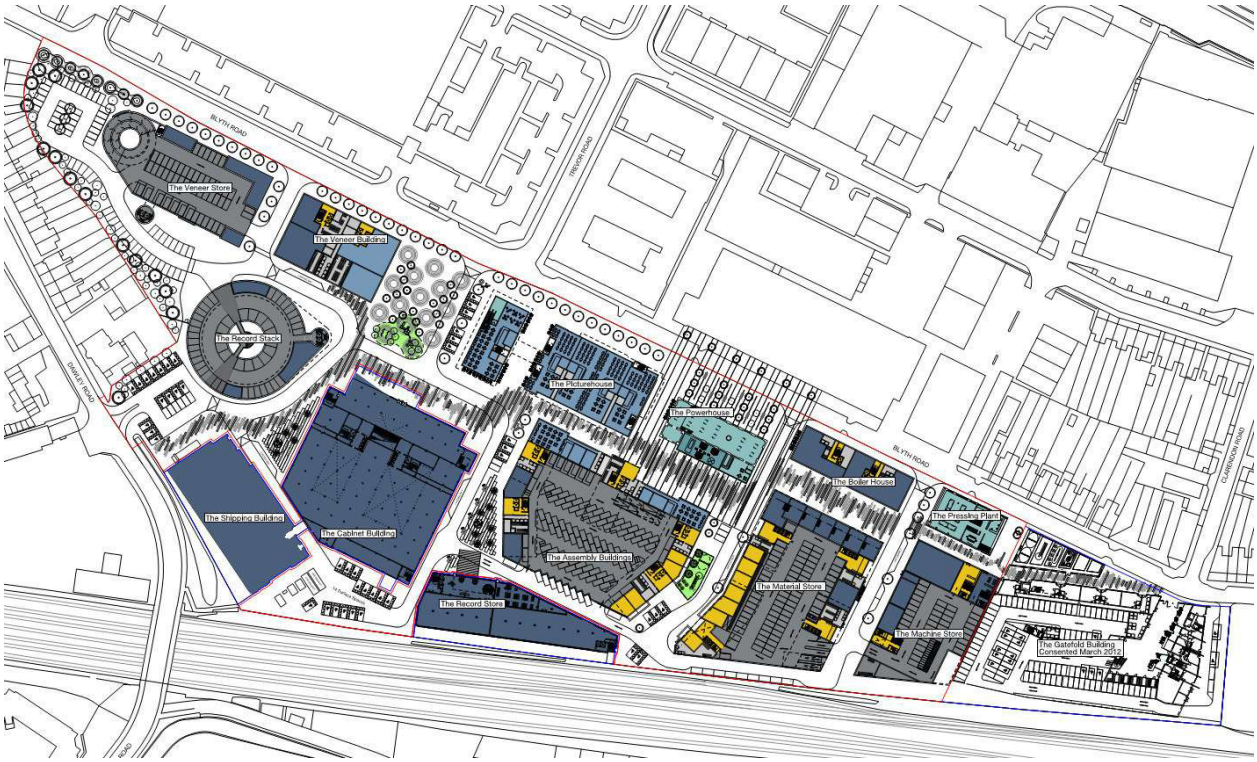
…sustainable building services solutions

OLD VINYL FACTORY MASTERPLAN SITE DESCRIPTION

The Outline Sustainable Energy Assessment is based on the approved Masterplan phasing and usage mix.

The Masterplan consists of:

- Refurbished office buildings, some locally listed
- New employment spaces at a variety of scales
- Up to 510 residential units
- Cafés, bars, leisure and arts spaces along the pedestrian route and Blyth Road to encourage integration with the wider Hayes community
- Re-provided car parking (including surface, multi storey and integral to new buildings)
- An active new pedestrian route (The Groove) connecting through the site and towards the town centre
- A sequence of planned landscaped spaces (squares, groves and playgrounds) linked by the new pedestrian route (The Groove).



Outline Masterplan (2012)

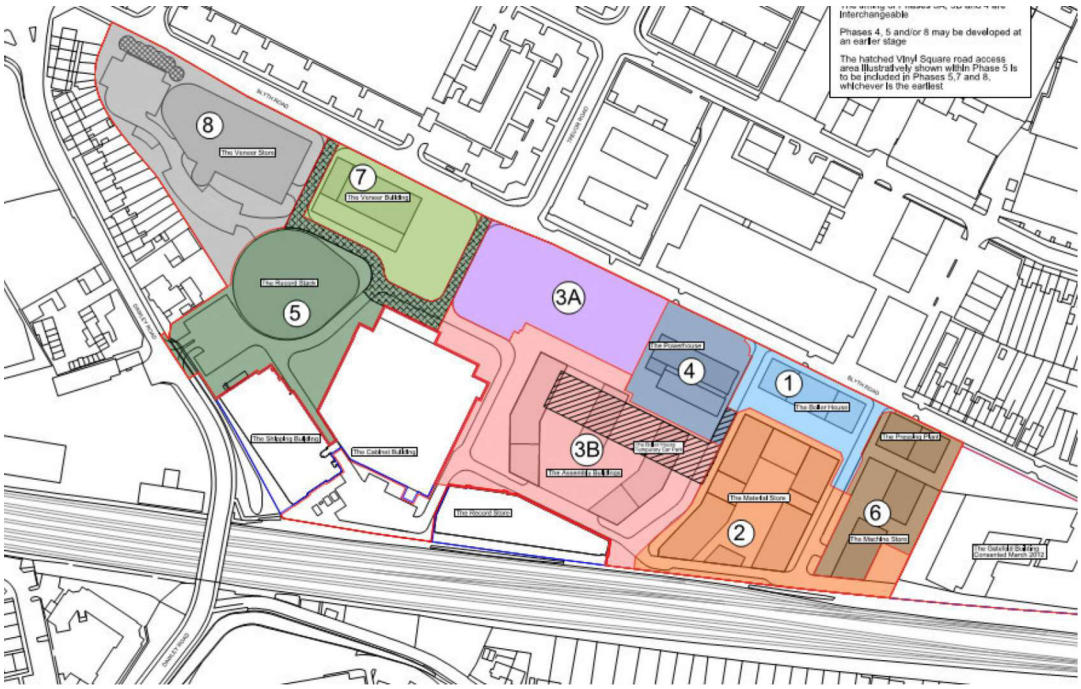
Schedule of Buildings

BUILDING NAME	BUILDING TYPE (PREDOMINANTLY)	APPROX. TREATED FLOOR AREA, M²		ANTICIPATED YEAR OF OCCUPATION
		DWELLINGS	COMMERCIAL	
Shipping Building	Existing commercial (to remain as is)		8,250	Occupied
Gatefold (not part of this application)	Predominantly Dwellings	9,250		Occupied
Pressing Plant	New Cinema (existing building façade retained)		625	2020
Material Store	Dwellings (with some commercial)	11,150	825	Occupied
Machine Store	Dwellings (with some commercial)	4,100	2,350	2020
Boiler House	Dwellings	3,044		Occupied
Powerhouse	Existing commercial (to be refurbished)		574	2020
University Technical College	New commercial/education		4,483	Occupied
Veneer Building	Dwellings (with some commercial)	6,200		2022
Cabinet Building	Existing commercial (to be refurbished)		20,300	2023
Assembly Buildings	Dwellings (with some commercial)	10,719		2022
The Record Store	Existing commercial (to be refurbished)		8,700	Occupied
The Veneer Store Carpark	New car park with new commercial		314	2023
The Music Box Carpark	New car park (with new commercial)		150	Complete (comm. 2019)

N.B. the floor area stated is the 'treated floor area' not the gross area based on the masterplan, i.e. the area of the building that is provided with space heating and is subject to Part L of the Building Regulations.

PHASING

APPROVED PHASING PLAN



The Gatefold Building, Shipping Building, Cabinet Building and Record Store are existing buildings and do not form part of the permitted development. However, for the purposes of the assessment of the site wide energy scheme it is assumed that, with the exception of the Cabinet Building, these buildings will be connected to the site wide system when feasible. As such, it has been possible to provide connection to the Record Store. Approval for the Veneer Store car park has also been granted by the council on the basis that the Veneer Store will not connect to the energy centre.

The Shipping Building is currently occupied and fully serviced by existing plant and equipment.

STRUCTURE OF ENERGY REPORTING

The structure of this report is based on the approved Outline Sustainable Energy Assessment. The energy consumption and carbon emissions from the buildings on the site are based on the latest energy calculations or consumption data where possible, otherwise the same benchmark data as used in the Outline Sustainable Energy Assessment is maintained.

Preliminary modelling to provide energy calculations for the designed/constructed residential units has been undertaken using SAP compliant software for a representative sample of units. Modelling for the non-residential spaces has been undertaken using the NCM compliant software package Tas, with an assumed 'worst case' fit out.

The report includes the following sections:

- Baseline energy consumption.
- Be Lean carbon emissions, including the carbon savings through passive design and energy efficiency measures.
- Be Clean assessment for the site, including the impact of phasing.
- Be Green assessment for the site.

2.0 BASELINE ENERGY CONSUMPTION AND CARBON EMISSIONS

The baseline energy consumption and carbon emissions from the completed thermal modelling to date is combined amongst the performance of designed buildings on the site, based on their latest energy calculations or consumption data where possible; otherwise, the same benchmark data as used in the Outline Sustainable Energy Assessment is maintained.

The baseline case against which carbon savings are assessed is the proposed dwellings designed to conform to Part L1A of the Building Regulations and proposed non-residential spaces designed to meet Part L1B of the Building Regulations. This baseline case is derived from the Target Emissions Rate (TER) and represents a building with the same form, function and geometry, but with standard 'notional' parameters for building fabric performance and building services configurations/efficiencies.

The following 'regulated' energy uses are considered in the baseline energy analysis:

- Space Heating/Cooling (where relevant)
- Water Heating
- Ventilation
- Fans, Pumps and Controls
- Lighting (internal)

The Outline Energy Strategy confirmed that benchmarks stated within in the London Renewables Toolkit are out of date, therefore the more up to date values stated in CIBSE Guide F were used. The CIBSE benchmarks do not differentiate between regulated and non-regulated energy use.

The design and construction for some of the buildings on the site has progressed such that it is possible to use updated figures which provide a more robust indication of the site-wide energy performance. This includes Boiler House, Power House, Material Store, UTC, Music Box and Machine Store & Pressing Plant. The Veneer Building is yet to be designed, so benchmark figures are used; the Shipping Building, Cabinet Building and Record Store do not form part of this assessment.

The carbon emissions from the existing commercial buildings that are not part of the Masterplan are not included in the calculation of the regulated emissions. However, the following table shows the baseline carbon emissions for the entire development including the non-regulated emissions of the new build elements and the existing buildings.

REGULATED EMISSIONS

Summary of Baseline Regulated Carbon Emissions (New Build Only)

Building Use	Area m^2	Regulated Baseline Carbon Emission Rate $kgCO_2/m^2$	Baseline Regulated Carbon Emissions $kgCO_2$
Boiler House	3,044	17.9	54,488
Material Store	12,038	16	192,608
Music Box	150	19	2,850
Machine Store	1,727	16	27,632
Assembly Buildings	10,719	16	171,504
Veneer Store	6,200	16	99,200
Power House	574	157	90,378
Pressing Plant	2,690	80	215,179
Restaurants	1,793	120	215,179
New Commercial	6,171	25	154,275
Veneer Car Park	314	19	5,966
Total	**62,923**		**1,509,300**

N.B. the floor area stated is the 'treated floor area', i.e. the area of the building that is provided with space heating and is subject to Part L of the Building Regulations.

Depending on the level of design/information available, the energy consumption for the various buildings on the site is taken from the latest energy model, performance data or Table 20.1 of CIBSE Guide F, 3rd Edition, May 2012.

SUMMARY OF CARBON EMISSIONS - BASELINE

OLD VINYL FACTORY SITE

The majority of the carbon emissions result from the non-regulated emissions associated with the new build elements and from all sources in the existing occupied and refurbished commercial buildings.

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

TOVF Development	Carbon dioxide emissions (tonnes CO_2 per annum) Regulated	Unregulated
Part L Compliant	1,509	2,436

3.0 BE LEAN – REDUCE ENERGY DEMAND

The first step in pursuing an energy efficient and low-carbon design under the Energy Hierarchy is to minimise the development's energy demand. This is achieved both by passive measures and the introduction of more energy efficient plant and services. Any measures achieved at this stage will reduce the extent of measures or size of plant needed to address the subsequent 'Be Clean' and 'Be Green' stages. In establishing the proposed energy strategy and services strategy for the development, the requirement to minimise energy consumption through available building fabric and building services measures has been considered a priority.

The following is a summary of the measures implemented at the 'Be Lean' stage is given for dwellings and other commercial spaces.

DWELLINGS

The dwellings will be constructed to be energy efficient and achieve compliance with Building Regulations Part L without the need for low or zero carbon technologies. The detailed energy and sustainability approach for all buildings, except the Veneer Building which is yet to be progressed, has been approved by the council. As a summary, this level of performance has been/will be achieved through the use of energy efficient design, including:

- Better U-values, exceeding the requirements of Part L
- Air permeability of <5m³/h/m²
- Best practice system efficiencies for heating
- Best practice system efficiencies for ventilation system(s), including mechanical ventilation with heat recovery where appropriate
- Highly efficient light fittings, including LED and efficient control technology where appropriate
- Enhanced control of services and lighting
- The mechanical ventilation units, where provided, will incorporate the following design features:
  - Heat recovery of at least 91% for the residential units.
  - Specific Fan Powers of no greater than 0.42 W/l/s.
  - Summer bypass to assist with summertime cooling
  - Variable speed controls with summertime cooling function

NON-RESIDENTIAL

New commercial buildings have been/will be constructed to exceed the limiting requirements of the Building Regulations. Ventilation systems will incorporate heat recovery devices with an efficiency of 75% or greater. Cooling, where provided, will use high efficiency chillers or packaged refrigeration systems.

The latest in lighting technology will be used with the best practice luminaires, lamps, and controls. Daylight linked controls will be provided where appropriate.

The existing commercial buildings will be refurbished to a standard that meets or exceeds the limiting requirements of the building regulations as and when it is commercially viable to do so.

The Shipping Building is currently occupied, and has recently undergone some refurbishment, so any further work will be planned around tenancy agreements.

For the purpose of the outline energy strategy, benchmark energy consumption figures from CIBSE Guide F were used for any existing or shell spaces, such as the Cabinet Building. This is because the nature of the businesses that will occupy the buildings are unknown, therefore this is considered an appropriate approach.

CARBON EMISSIONS REDUCTIONS - BE LEAN

This section of the Energy Statement encompasses the first stage of the Energy Hierarchy, identifying measures to reduce the 'baseline' energy demand for the development by passive and active means.

In establishing the proposed energy strategy and servicing strategy for the development, opportunities to minimise energy consumption through available building fabric and building services measures has been considered a priority. Any measures implemented at this stage will reduce the extent of measures or size of plant needed to address the subsequent 'be clean' and 'be green' stages.

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

TOVF Development	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Building Regulations Part L Compliant	1,509	2,436
After energy demand reduction 'Lean'	1,452	2,436

GLA Table 2: Carbon Dioxide Emissions savings from each stage of the Energy Hierarchy

TOVF Development	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Energy demand reduction savings 'Lean'	57	3.8%

4.0 BE CLEAN – SUPPLY ENERGY EFFICIENTLY

The Outline Sustainable Energy Assessment included a review of the feasibility of connection into district energy schemes and the provision of a communal heating system to serve the Old Vinyl Factory site. These assessments are repeated in this report, with updates as necessary to reflect the detail of the design of progressed buildings and any other changes, including those external to the site, which may have an impact on the strategy.

EXISTING DISTRICT ENERGY SCHEMES

A review of the London Heat Map has shown that there is a future planned district heating network adjacent to the site in Blyth Road. The Hillingdon-Hayes network is proposed to run from the junction of Blyth Road and Trevor Road to Hayes Swimming Pool at the northern end of the town via Station Road and Hayes Town centre. The proposed route passes to the north of the Power House.

In addition to this, the area to the south of the railway line has been identified as being an 'opportunity' for the provision of a district heating scheme.

Future Connections

Should an opportunity for connection into a future Hillingdon-Hayes network arise, the feasibility of such connections will need to be explored in full. In the event of connection to the system being viable, either the site (via the Powerhouse) will become a supplier (exporter) of energy to the network, or if it is importing energy, some of the existing plant could be removed to create space for the district energy system interface plant. The current provider of the energy centre within the Power House is aware of the previous discussions relating to the wider heat network and would be receptive to other opportunities.

The incoming pipework to the site boundary would need to be of sufficient capacity to allow the new network to connect directly into this system, if that is the preferred method at the time of connection.

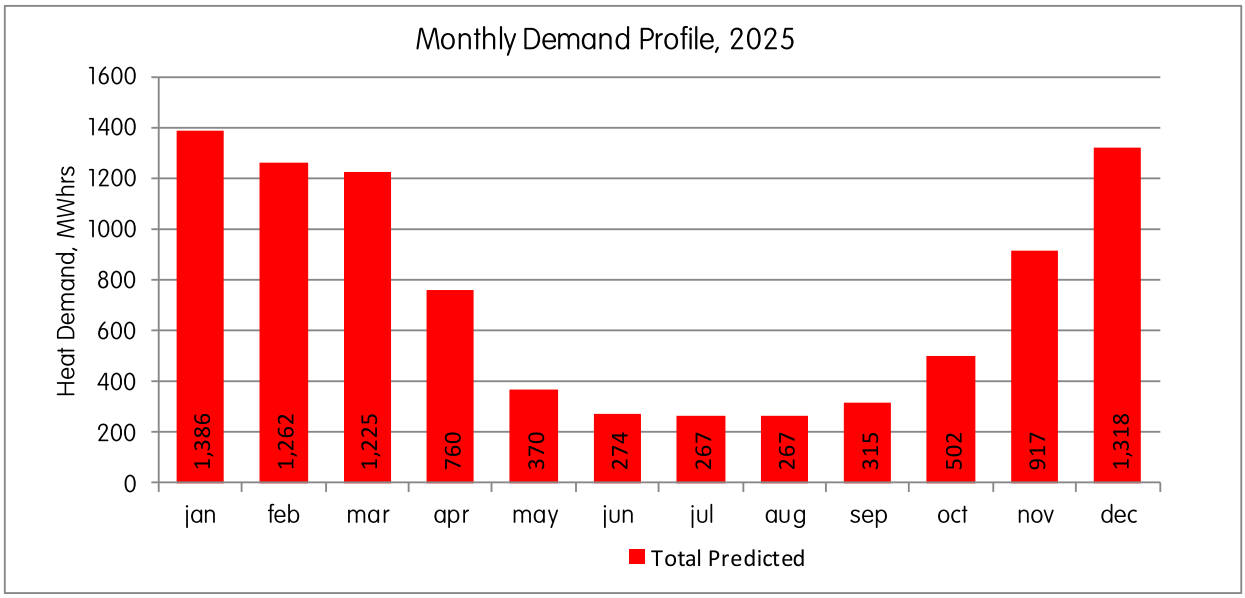
COMMUNAL HEATING

ENERGY DEMAND PROFILE

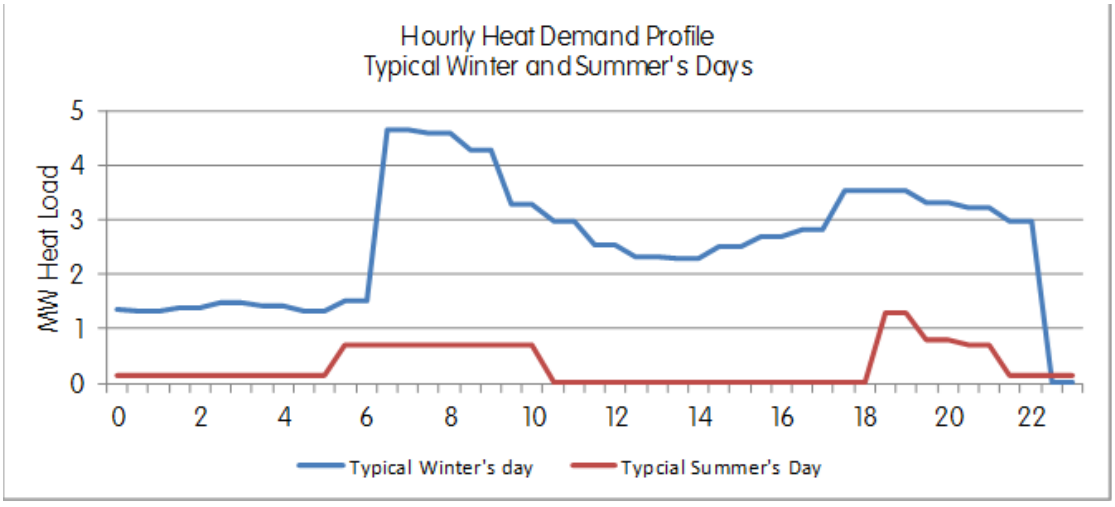
The domestic hot water demand for the proposed residential buildings will provide a year-round background demand for heat. This is supplemented during the winter by the space heating demand from the proposed dwellings and the various new and existing commercial buildings.

Due to the relative size of the commercial buildings, and the fact that existing buildings such as the Shipping Building, are not constructed to modern standards the space heating demand is approximately treble the domestic hot water demand. Whilst the summer to winter load variation is greater than would be preferred for a communal heating system with a CHP lead, the differing daily heat use profile for the dwellings and commercial areas helps to mitigate the annual imbalance.

The predicted energy demand profile does not include the Shipping Building and has been amended to include for the omission of the Veneer Store and the Cabinet Building, in line with the approach previously agreed with the council.



Typical monthly heat demand profile, when complete.



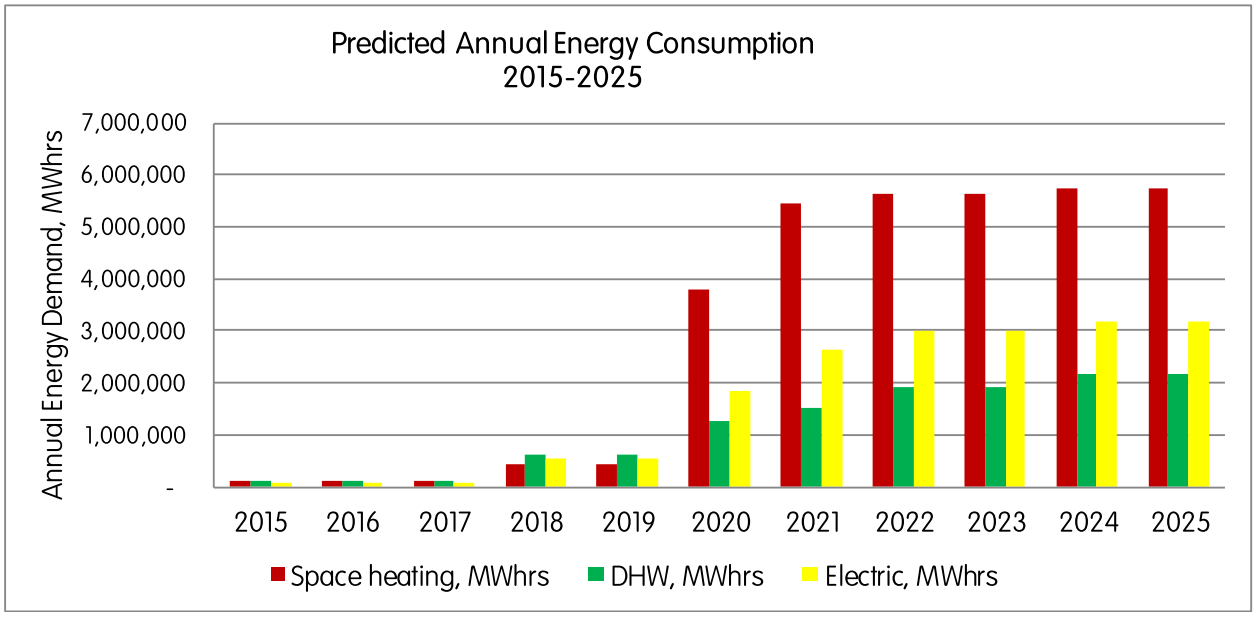
Typical daily heat demand profiles for whole site when complete.

PROPOSED PLANT DESCRIPTION

Please refer to Vital Energi's information, summary included in Appendix A.

PHASING

The phased addition of the buildings and their energy demands results in a stepped growth of energy demand during the construction period.



Predicted annual delivered energy demand to 2025

The heat demand of the development is predicted to be introduced gradually over a period of 7 years; the initial demand is predicted to increase by a factor of 38 by the time that the final phase is connected to the site wide system. Of key importance to the viability of the CHP is the domestic hot water demand, which increases by a factor of 11 from installation beyond 2020.

The phasing plan shows that initially the connected demand could be approximately 109MWhrs of domestic hot water and approaching 95MWhrs of heat demand. After 2020 the connected demand is predicted to increase beyond approximately 1,257MWhrs of domestic hot water and 3,726MWhrs of space heating.

The central energy centre will provide the heat demand now that the plant is up and running and the district heating mains will be progressively installed to allow connection to the buildings as they are completed or occupied.

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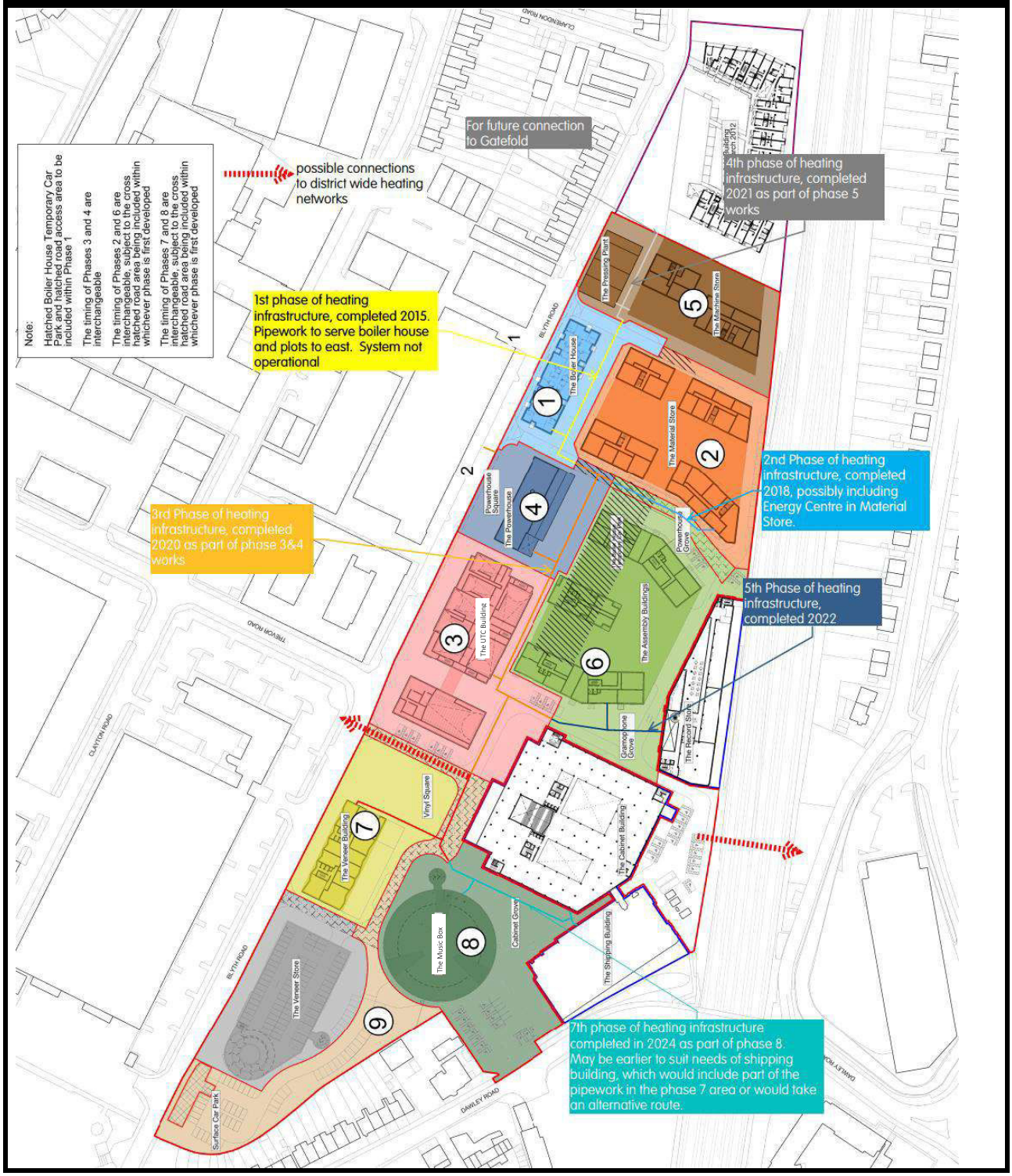
PROPOSED NETWORK AND PHASING



CARBON EMISSIONS REDUCTIONS - BE CLEAN

Vital Energi's information has been used to provide an indication of plant and equipment capacities and the associated carbon savings. For a site wide system serving all buildings, the CHP was predicted by Vital Energi to provide a total carbon saving (regulated and non-regulated emissions) of at least 630 tonnes CO_2 a year in comparison to a traditional gas fired boiler solution. This assumes that the CHP unit is capable of meeting at least 30% of the annual heat demand.

This carbon saving is attributable to each building in different quantities, for this assessment it has been assumed that the carbon savings are proportional to the total energy demand of each element of the development. However, a more detailed analysis of energy use available for much of the site shows that the proportion of heat consumed by the proposed dwellings is greater than calculated using the simplistic assessment as most of the CHP heat output during the summer is delivered to the dwellings only for the domestic hot water generation. This is a predicted operational figure and does not align entirely with the results of this, which is based on a more theoretical design appraisal using standardised software. However, it is within a similar range.

The residential buildings will connect to the site-wide energy system, with the space heating and hot water demands of all residential units provided from the central energy centre in the Power House. A plate heat exchanger, with associated pumps and controls will be provided to ensure a physical separation exists between the district heating system and the relevant buildings.

The shell only retail units will be provided with capped connections to the site-wide energy system, as well as other utilities.

The tables below indicate the site wide Carbon emissions reductions at the 'Be Clean' stage for TOVF Masterplan. The results in these tables include updated modelling results for those phases which have achieved reserved matters consent, whilst the assumptions made within the original outline consent have been maintained for phases which have not.

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

TOVF Development	Carbon dioxide emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Building Regulations Part L Compliant	1,509	2,436
After energy demand reduction 'Lean'	1,452	2,436
After CHP 'Clean'	1,014	2,073

GLA Table 2: Carbon Dioxide Emissions savings from each stage of the Energy Hierarchy

TOVF Development	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Energy demand reduction savings 'Lean'	57	3.8%
Savings from CHP 'Clean'	438	30.1%

5.0 BE GREEN – RENEWABLE ENERGY FROM PHOTOVOLTAIC PANELS

The outline Energy Strategy concluded that photovoltaic (PV) panels would be a suitable technology for the site. PV is compatible with a CHP and communal energy system.

Consideration has been given to installing PV panels on each building. The Outline Sustainable Energy Assessment stated that an assumed area equivalent to 20% of the available roof area would be usable for PV. This accounts for overshading, access and obstructions.

Some of the phases that have gone through the reserved matters planning process and have been granted full planning consent have done so without the need for PV. This is because it has been possible to meet or exceed the relevant energy performance and CO_2 emissions targets already, by implementing the Energy Hierarchy up to the Be Clean stage. The approach for all buildings has been approved by the council for all buildings, except for the Veneer Building which has yet to be progressed.

The requirement within Schedule 13 of the S106 for the site to achieve a CO_2 reduction of 394 tonnes has been exceeded at the Be Clean stage of the Energy Hierarchy, by implementing passive and active demand-reducing measures (Be Lean) and with the CHP-led energy centre. The results in the tables below reflect this whilst including an allowance for the PV proposed in the Outline Sustainable Energy Assessment.

THE OLD VINYL FACTORY SITE

GLA Table 1: Carbon Dioxide Emissions after each stage of the Energy Hierarchy

TOVF Development	Carbon Dioxide Emissions (Tonnes CO_2 per annum)	
	Regulated	Unregulated
Building Regulations Part L Compliant	1,509	2,436
After energy demand reduction 'Lean'	1,452	2,436
After CHP 'Clean'	1,014	2,073
After Renewable Energy 'Green'	982	2,073

GLA Table 2: Carbon Dioxide Emissions savings from each stage of the Energy Hierarchy

TOVF Development	Regulated Carbon Dioxide Savings	
	(Tonnes CO_2 per annum)	(%)
Energy demand reduction savings 'Lean'	57	3.8%
Savings from CHP 'Clean'	438	30.1%
Renewable energy savings 'Green'	33	3.2%
Total cumulative savings	527	34.9%

The above tables indicate that with further detail applied to the proposals, the originally consented scheme target values for improvement in annual Carbon emissions is being exceeded.

6.0 CONCLUSION

The updated CO_2 emissions reduction calculations and the results presented in this report demonstrate that Schedule 13 of the Section 106 Agreement has been met.

This has been achieved by following the London Plan Energy Hierarchy. Firstly, the Be Lean measures achieve a reduction of 57 tCO_2 per annum. The energy efficiency measures include: improved fabric insulation; improved air tightness; improved glazing performance; high efficiency mechanical ventilation with heat recovery; energy efficient lighting and controls.

Connecting the relevant buildings to the site wide CHP-led energy centre, including all residential units and capped connections for the majority of non-residential spaces, has resulted in a reduction of 438 tCO_2 per annum.

As shown on page 6 of this document, there are 5 parts to Schedule 13. Parts 1, 3 and 4 each require the development to achieve a CO_2 emissions reduction of 394 tonnes per annum. As shown in this document, the scheme achieves a CO_2 emissions reduction of 495 tonnes per annum from Be Lean and Be Clean measures alone (57 tCO_2 + 438 tCO_2). Furthermore, when the reductions from PV are included, the total saving increases to 527 tCO_2 per annum.

Part 2 of Schedule 13 requires the Energy Strategy to enable all phases of the development to meet the relevant ratings within BREEAM and the Code for Sustainable Homes. As confirmed in the reserved matters applications for each phase, the required BREEAM and Code for Sustainable Homes ratings have been targeted, with the relevant Credits for Energy Performance and low and zero carbon technologies sought.

Part 5 of Schedule 13 includes the requirement for a carbon offset payment to be made in the event of the carbon saving of 394 tCO_2 per annum not being met. As confirmed in this document, the carbon saving will be exceeded over the lifetime of the development, therefore, the requirement has been achieved and a carbon offset payment is not required.

It is noted that the carbon savings have been significantly exceeded regardless of whether or not the retail unit within the Music Box car park building is connected to the district heating system. The potential saving from connecting to the district system is estimated to be less than 1 tonne CO_2 per annum and, as such, it is considered that the benefit of connection will minimal. The practical and cost implications are therefore being explored by the developer and once fully considered, this connection will be discussed separately with the Council.