Thermal Comfort Analysis

40 King Henry’s Road, Camden

March 2025

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40 King Henry's Road, Camden

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Report Outline

Contents

Executive Summary

This report presents the Thermal Comfort Analysis for the proposed development at 40 King Henry's Road, Camden, NW3 3RP.

The proposals are for renovation works on the existing residential property.

The main purpose of this report is to investigate how the proposed building performs against the criteria set out in *CIBSE TM59:2017: Design methodology for the assessment of overheating risk in homes* and the *Approved Document Part O (2021)*. Consideration has also been given to the methodology presented in *CIBSE AM11 Building Energy and Environmental Modelling*.

Dynamic thermal modelling has been undertaken and approved software IES VE 2024 was used for the purpose of the analysis.

The report demonstrates compliance with the cooling hierarchy outlined in *Policy SI 4 (Managing Heat Risk)* of the London Plan, following the Greater London Authority's *Energy Assessment Guidance* (June 2022) and includes information describing the steps and the strategies applied to mitigate the risk of overheating following the measures established in the cooling hierarchy as summarised in Table ES.1.

The analysis also considers the recommendations of the Environmental Noise Survey & Plant Assessment provided by Quantum Acoustics Ltd., which advises restricting the use of openable windows at nighttime as an overheating mitigation strategy.

As a minimum requirement to achieve compliance all occupied space need to pass the relevant CIBSE criteria under the current weather normal conditions (LWC_DSY1_2020). However, recognising the need to address a range of potential scenarios, additional assessments were conducted, as per GLA recommendations. These assessments included more extreme current weather patterns (LWC_DSY2_2020 and LWC_DSY3_2020).

Furthermore, considering the anticipated effects of climate change, future weather projections (LWC_DSY1_2050) were also tested.

Overall, the testing confirmed that comfort cooling is likely necessary for achieving compliance across all current and future weather conditions. While passive and mechanical ventilation strategies contributed to reducing overheating risks, they proved insufficient to meet the stringent CIBSE TM59 criteria.

Therefore, comfort cooling is proposed as the solution to ensure a consistently comfortable and compliant internal environment for the building's occupants.

Table ES. 1 - Measures Implemented in accordance with the London Plan Cooling Hierarchy

Cooling Hierarchy Step	Design Measure	Details	
1. Reduce solar heat gain through orientation, shading, fenestration, and insulation.	Improved building fabric U-Values and air tightness standards proposed.	U-values aligned with Table 4.3 Limiting U-values for existing elements in existing dwellings from Approved Document Part L1 (2021)	✓
2. Minimise internal heat generation through energy efficient design: efficient heat distribution infrastructure adopting pipe configurations which minimise heat loss e.g. twin pipes.	Energy efficient design of building services.	Recommendation to minimise pipe lengths, particularly in enclosed areas such as hallways, corridors, storages.	✓
3. Manage the heat within the building through exposed internal thermal mass and high ceilings: Increasing the amount of exposed thermal mass can help to absorb excess heat within the building. Efficient thermal mass should be coupled with nighttime purge ventilation	Proposed concrete floor slabs and blockwork can factor in the thermal mass effect.	The high thermal mass construction elements absorb heat, slowing its penetration into internal spaces and thereby reducing the risk of overheating. The stored heat is released during the night when the outdoor temperatures drop.	✓
4. Provide passive ventilation: For example, through the use of openable windows, shallow floorplates, dual aspect units (in line with ADO) maximising cross-ventilation or designing in the 'stack effect 'where possible.	The use of openable windows to mitigate overheating risks is not possible due to the noise restrictions during both nighttime and daytime highlighted in the Acoustic Report.	Openable sash windows to provide passive ventilation assessed with and without noise recommendations have been tested. Additionally, internal doors were modelled as open to maximise cross ventilation.	✗
5. Provide mechanical ventilation:	Under the conditions of noise restrictions requiring windows to remain closed at night, the effectiveness of implementing a mechanical ventilation system has been tested.	Mechanical ventilation system with 2 air changes per hour (2ACH) and 4 air changes per hour (4ACH) have been tested. Results suggested that mechanical ventilation is not sufficient to omit the overheating risks.	✗
6. Provide active cooling systems:	Comfort cooling system implementation.	Active cooling has been recommended as the final solution to ensure compliance.	✓

1. Introduction

Ensphere Group Ltd was commissioned by Curlew Developments London Limited to produce an energy Statement for a proposed development at 40 King Henry's Road, Camden, NW3 3RP.

Site and Surroundings

The application site (the 'Site') comprises a semi-detached residential property of approximately 3,500 sqft, distributed over four storeys, including a basement level. The surrounding area is an established urban setting, predominantly residential and characterised by similar terraced properties, with a six-storey apartment complex located opposite the Site and the North London Line Railway to the north.

The site benefits from close proximity to several green spaces. Primrose Hill Park, a 62-acre green space, is a 4-minute walk from the Site. Amenities within the park include an outdoor gym, a children's playground, and public toilets. The park is connected to Regent's Park to the south. Additionally, the Adelaide Local Nature Reserve, a locally managed nature reserve with woodland and ponds, is located just north of the Site.

The Site has a Public Transport Accessibility Level (PTAL) rating of 3, indicating moderate accessibility. Local bus routes operate along nearby roads, and Chalk Farm Underground Station is an 8-minute walk away. The station is served by the Northern Line, providing regular access to central London destinations and connections London Buses routes 1, 31, 393.

Proposed Development

The proposals are for renovation works on the existing residential property.

Report Objective

The objective of this analysis is to determine whether the proposed development can achieve appropriate thermal comfort levels and maintain a thermally comfortable environment for the building's occupants. This is assessed in accordance with CIBSE TM59:2017 (*Design Methodology for the Assessment of Overheating Risk in Homes*) and Approved Document Part O.

The report seeks to illustrate how the cooling hierarchy, as outlined in Policy SI 4 (Managing Heat Risk) of the London Plan and following the Greater London Authority's *Energy Assessment Guidance* (June 2022), has been adhered to. The aim is to evaluate and present how each design measure supports and aligns with the principles of the cooling hierarchy.

Figure 1.1 - Map Showing the Location of the Proposed Development

Dynamic Modelling Methodology

A thermal modelling exercise was undertaken using the dynamic simulation software IES VE 2024 v.0.2.0 in accordance with CIBSE AM 11. The entire residential block was assessed.

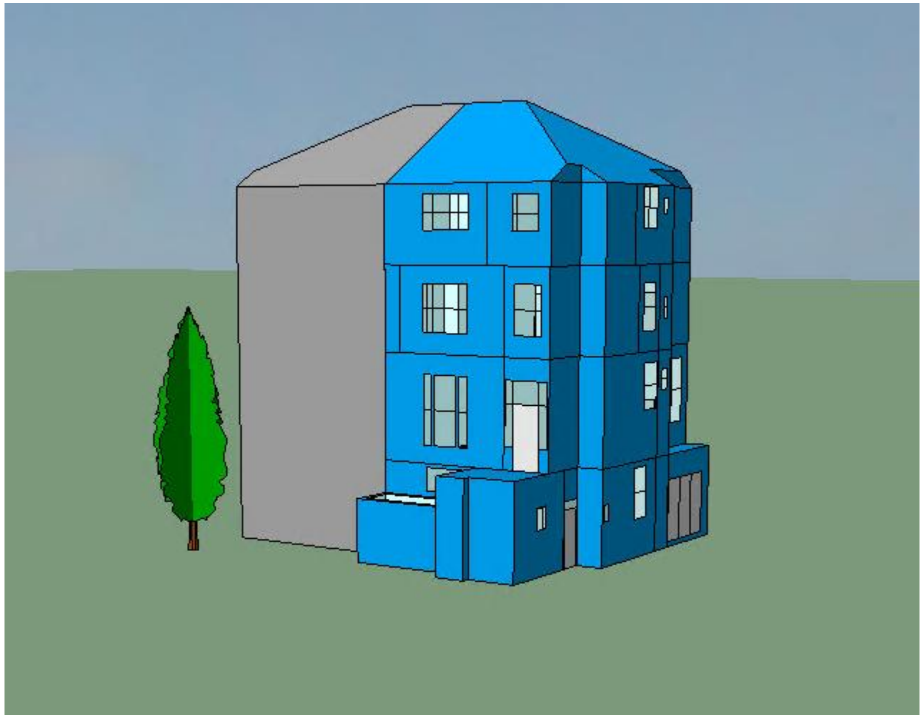


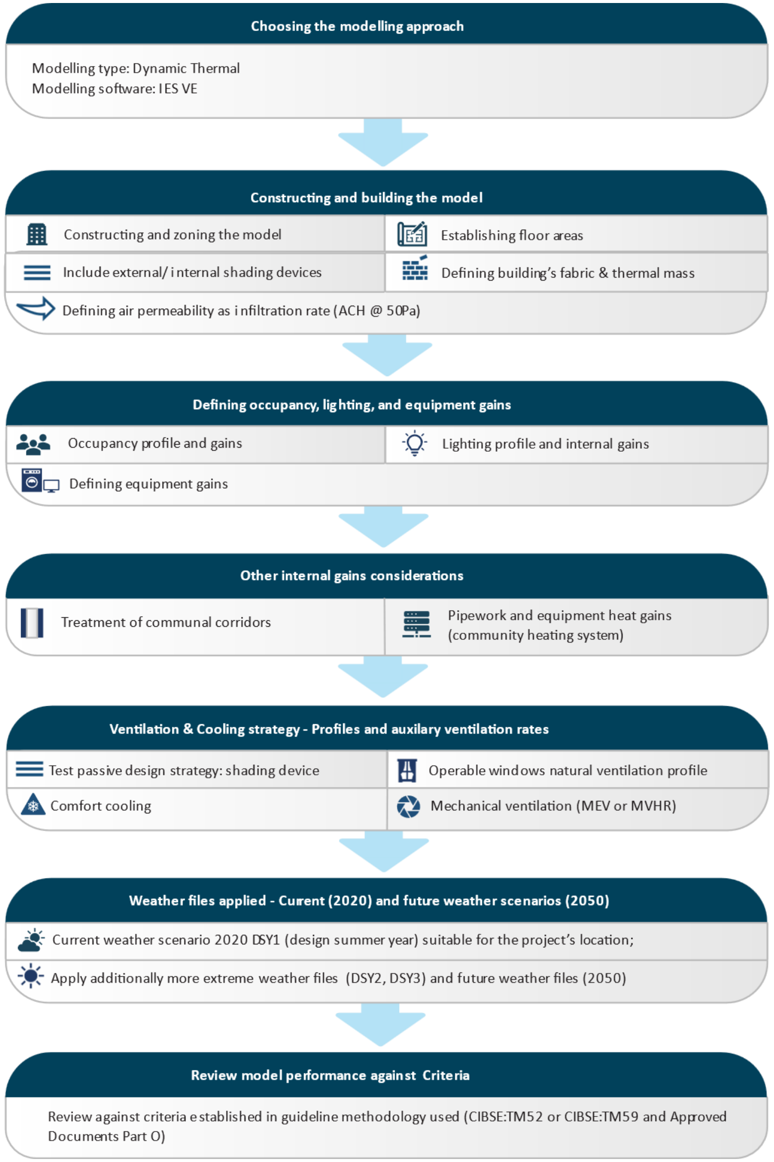
Figure1.1.2 – IES VE Indicative 3D Model of the Dwelling

The analysis follows the thermal comfort requirements set out in CIBSE Guides TM59 methodology with consideration to the CIBSE AM11 Building Energy and Environmental Modelling.

Consideration has primarily been given to the cooling hierarchy in Policy SI 4 of the London Plan to the development, as per the GLA Energy Assessment Guidance (June 2022).

The assessment criteria are described in greater detail in the sections below. The results of the analysis are presented in the appendices.

The thermal comfort methodology involves the following steps shown in the following diagram.



Clarifications

The Thermal Comfort Analysis serves as an evaluation to determine the likelihood of overheating in the building. It strictly functions as a risk assessment and should not be misconstrued as an assurance of whether the building will or will not overheat. The report is to be perceived as an application of reasonable skill and care, undertaken to assist the design team in identifying and mitigating potential risk areas.

The outcomes rely on data generated by computer modelling software and should be considered indicative of the probable final scenario. However, these conditions cannot be assured. Meeting the assessment criteria does not guarantee year-round comfort in the spaces; instead, it signifies that the risk of overheating is constrained to an acceptable level.

This report analyses the buildings with the design features provided to Ensphere at the time of writing the report. The assessment also includes anticipated building usage based on the template provided by CIBSE TM59 for the residential spaces and the NCM profiles for the amenities and communal areas.

The results will only be valid if the parameters used match those of the final building. Design assumptions therefore need to be followed all the way through procurement to installation (e.g. performance and quality of pipework insulation, façade performance, aerodynamic areas of openable windows, blind/external shading performance etc).

All assumptions and mitigations must form part of the construction contract, or the model will need to be re-run to prove compliance of any changes. Furthermore, factors such as (a) variations in the weather from the weather files selected; or (b) variations in the operation of the building; may deviate performance away from the modelled results.

Ensphere will not be liable for work undertaken by other parties and associated with the data used to populate the model (including, but not limited to, architectural design, mechanical & electrical design, construction assumptions and assumptions concerning building operation).

A thermal modelling exercise was undertaken using the dynamic simulation software IES VE 2024 v.0.2.0 in accordance with CIBSE AM 11. The entire dwelling was assessed.

2. Planning Policy

Planning policies relevant to overheating and energy are considered below:

Figure 2.1 – Tiers of Relevant Planning Policy

National Context

National Planning Policy Framework (2024)

The National Planning Policy Framework (NPPF) was updated in December 2024. Paragraph 7 of the revised NPPF includes reference to a strong emphasis on promoting sustainable development covering objectives economic, social and environmental objectives.

New developments are to prioritise prioritize minimizing climate change vulnerability, particularly in high-risk areas, by integrating adaptive measures like green infrastructure. Additionally, they should focus on reducing greenhouse gas emissions through careful planning of location, orientation, and design.

Planning Practice Guidance (2016; updated 2024)

- Climate Change – Advises how planning can identify suitable mitigation and adaption measures in plan-making and the application process to address the potential for climate change.
- Renewable and Low Carbon Energy – The guidance is intended to assist local councils in developing policies for renewable energy in local plans and identifies the planning considerations for a range of renewable sources.

London Context

London Plan (2021)

The Mayor has declared a climate emergency and has set a target for London to be net zero by 2030. This puts London at the forefront of global cities and UK action on climate change. The London Plan ensures that the planning system is playing its part in achieving this target. Policies considered related to overheating are presented below:

- Policy SI 2 (Minimising greenhouse gas emissions) – Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand.
- Policy SI 4 (Managing heat risk) – Major development proposals should demonstrate, through an energy strategy, how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:
  - Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation, and the provision of green infrastructure.
  - Minimise internal heat generation through energy efficient design.
  - Manage the heat within the building through exposed internal thermal mass and high ceilings.
  - Provide passive ventilation.
  - Provide mechanical ventilation.
  - Provide active cooling systems.

Energy Assessment Guidance (2022)

This guidance document explains how to prepare an energy assessment to accompany strategic planning applications referred to the Mayor as set out in London Plan Policy SI 2. It states that the purpose of an energy assessment is to demonstrate that the proposed climate change mitigation measures comply with London Plan energy policies, including the energy and cooling hierarchies.

Although primarily aimed at strategic planning applications, London boroughs are encouraged to apply the same structure for energy assessments related to non-referable applications and adapt it for relevant scales of development.

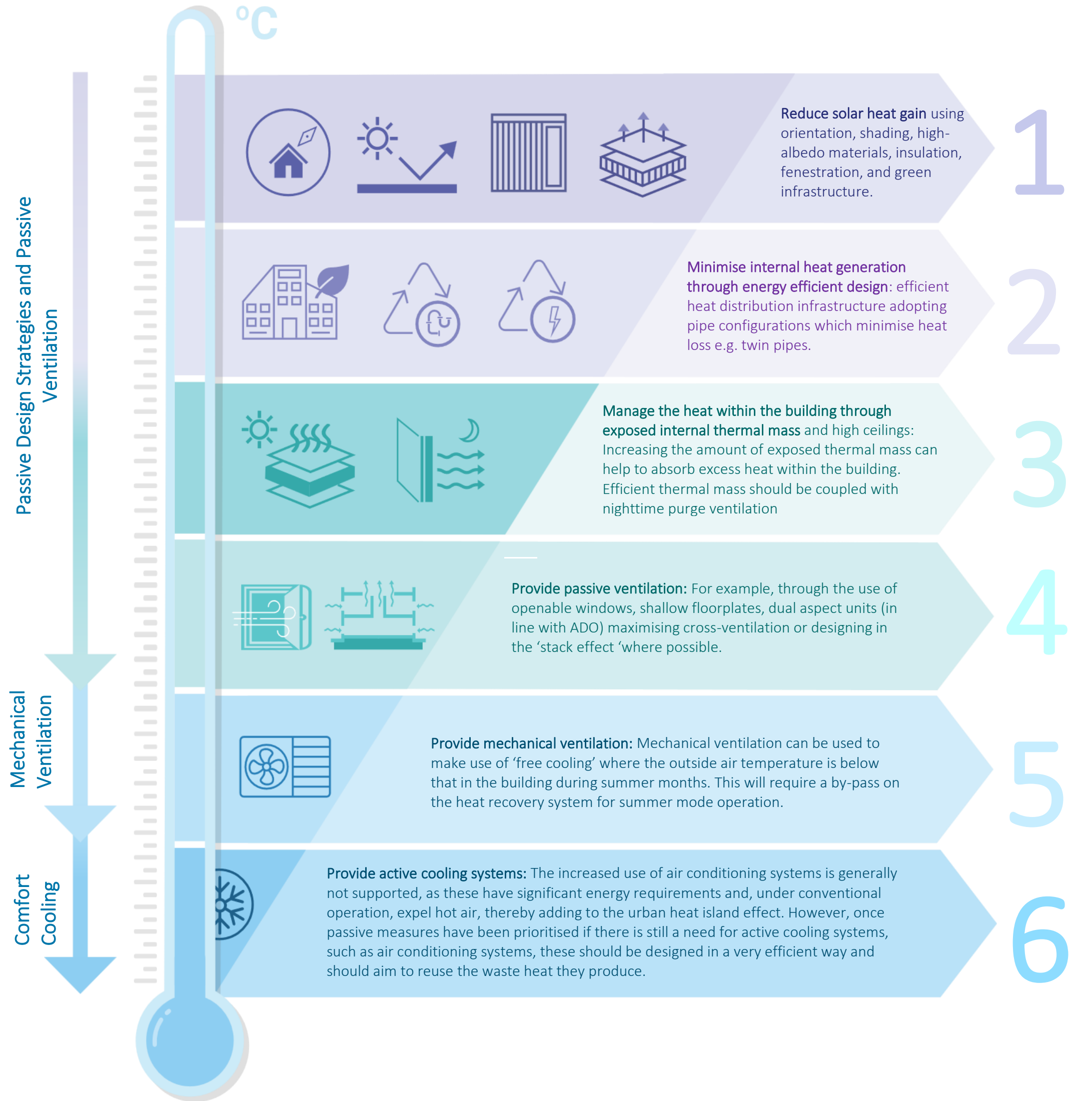


Figure 2.2 – Cooling Hierarchy as per the London Plan (2021) and GLA Energy Assessment Guidance (June 2022)

Local Context

Camden Local Plan (July 2017)

The Local Plan sets out the planning policies, site allocations and land designations Borough-wide and is the central document in the Borough's Development Plan.

The following policies are considered relevant to this report:

- Policy G1 (Delivery and Location of Growth) – promotes sustainability with regards to the efficient use of land and buildings.
- Policy D1 (Design) – includes a requirement for development to be sustainable with regards to design and construction.
- Policy CC1 (Climate Change Mitigation) – promotes zero carbon development with consideration of the Energy Hierarchy
- Policy CC2 (Adapting to Climate Change) – requires development to seek to protect existing green space, use of SUDS, incorporating biodiverse roofs, consideration of overheating risks, encourages the use of the Home Quality Mark and Passivhaus Standards along with BREEAM "excellent" for non-domestic and refurbishment developments >500sqm and/or five or more dwellings.
- Policy CC4 (Air quality) – Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution, with recommended measures adopted. In locations of poor air quality, developments that introduce sensitive receptors (i.e. housing, schools) will also need to be designed to mitigate the impact.

Camden Planning Guidance – Energy Efficiency & Adaptation (January 2021)

This document was adopted on 15 January 2021 following statutory consultation and replaces the Energy efficiency and adaptations CPG (March 2019), which replaced the CPG3 Sustainability (July 2015).

This guidance provides information on key energy and resource issues within the borough and supports Local Plan Policies CC1 Climate change mitigation and CC2 Adapting to climate change.

Where developments are likely to be at risk of overheating applicants will be required to complete dynamic thermal modelling to demonstrate that any risk to overheating has been mitigated.

Assessment tools, such as Passivhaus and Home Quality Mark are "encouraged".

3. Building Regulations – Approved Documents (2021)

On 15 June 2022, National Building Regulations were updated to enhance energy performance standards for new buildings through *Part L 2021* and ventilation requirements through *Part F 2021*. A new *Approved Document Part O (2021)* was also introduced, updating requirements to tackle overheating.

Approved Document Part L (2021)

The Approved Document Part L1 provides compliance guidelines on energy efficiency standards, detailing requirements for thermal performance, carbon emissions, and energy conservation measures. It outlines compliance strategies for buildings achieve sustainable energy use while reducing environmental impact.

Approved Document Part F (2021)

The Approved Document Part F provides regulatory guidance on ventilation provision, outlining compliant strategies, minimum airflow rates, and system-specific requirements to ensure optimal indoor comfort.

Approved Document Part O (2021)

Consideration has been given to Approved Document Part O: Overheating (2021) regulations for assessing the thermal comfort compliance for residential developments demonstrating that the building passes the CIBSE's TM59 methodology for predicting overheating risk. The following requirements are considered:

- O1 (1) Overheating mitigation – The aim of requirement O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures by limiting unwanted solar gains in summer and providing an adequate means of removing excess heat from indoor environment.

(a) Solar gains in summer should be limited by implementing fixed shading devices (louvres, recesses, overhangs etc.), glazing design consideration (size, orientation, g-value and window reveal), building design (placement of balconies), shading provided by adjacent buildings.

Internal blinds and nearby foliage are not considered

(b) Excess heat should be removed from the residential building by any of the following means:

  - Opening windows (the effectiveness of this method is improved by cross-ventilation).
  - Ventilation louvres in external walls.
  - A mechanical ventilation system.
  - A mechanical cooling system.

- O2 (2) Overheating mitigation – The aim of requirement O2 is to ensure occupant safety and implement mechanical ventilation if heat cannot be sufficiently removed by other means.

(a) This requirement is met in a new residential if account is taken for to the safety and comfort of any occupant with consideration to the following aspects:

  - Noise at night – addressed by an Acoustic Report provided by appointed consultants.
  - Pollution – addressed by an Air Quality Report conducted by appointed consultants.
  - Security – with reference to the Approved Document Part K: Protection from falling
  - Protection from entrapment

(b) Mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.

With the new Approved Document Part O (2021) the opening profiles for the openable windows are required to me modelled as per the following limitations when following the CIBSE's TM59 methodology:

Overheating Mitigation Limits on the Opening Profiles

2.6 All of the following limits on CIBSE's TM59, section 3.3, apply.

a. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following:
   (i) Start to open when the internal temperature exceeds 22°C
   (ii) Be fully open when the internal temperature exceeds 26°C
   (iii) Start to close when the internal temperature falls below 26°C
   (iv) Be fully closed when the internal temperature falls below 22°C

b. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply.
   (i) The opening is on the first floor or above and not easily accessible.
   (ii) The internal temperature exceeds 23°C at 11pm.

c. When a ground floor or easily accessible room is unoccupied, both of the following apply.

d. An entrance door should be included, which should be shut all the time.

Acoustics, Ventilation and Overheating Residential Design Guide (January 2020)

The AVO Guide aims to assist designers to adopt an integrated approach to the acoustic design within the context of the ventilation and thermal comfort requirements keeping both the noise restrictions aligned with the overheating measures.

4. CIBSE Technical Guides

CIBSE Guidance

CIBSE Guide A: Environmental Design (2015, updated 2021)

CIBSE Guide A provides a comprehensive guidance on design criteria and calculation methodologies, including fabric performance, heating and ventilation system sizing, methods for thermal comfort evaluation and energy demand.

Consideration is given to *Table 1.5 Recommended comfort criteria for specific applications* of the *Environmental criteria for design* section to define the comfort parameters such as optimum summer and winter operative temperatures and activity and clothing levels. General guidance and recommendations for suitable summer operative temperature ranges and comfort criteria for specific applications.

CIBSE Guide A: Environmental design (2015a) includes advice regarding sleep quality (that may be compromised at temperatures above 24 °C), and recommends that peak bedroom temperatures should not exceed an absolute threshold of 26 °C.

Table 4.1– Benchmark Operative Temperature Benchmarks as per Table 1.5 of CIBSE Guide A

Type of use of space	Customary winter operative temperatures	Customary summer operative temperature (in air-conditioned buildings)
Bathroom	20-22	23-25
Bedrooms	17-19	23-25
Hall/ Stairs/ Landings	19-24	21-25
Kitchen	17-19	21-25
Living Rooms	22-23	23-25
Toilets	19-21	21-25

CIBSE TM52: The Limits of Thermal Comfort Avoiding Overheating (2013)

This CIBSE Technical Memorandum focuses on predicting overheating in buildings and serves as a resource for designers, developers, and other stakeholders responsible for defining indoor environmental conditions.

The CIBSE TM52 assessment criteria apply to free-running buildings, where a room or building that fails any two of the three specified criteria is classified as overheating.

- Criterion 1: Hours of Exceedance (He) - sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature by 1ºK or more during the occupied hours of a typical non-heating season (1 May to 30 September). The exceedance shall not be more than 3 per cent of occupied hours.

$$\Delta\ \Delta T = T_{op} - T_{max}$$

- Criterion 2: Daily Weighted Exceedance (We) - deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperatures rise and its duration. This criterion sets a daily limit for acceptability, which should be less than or equal to 6 in any one day.
- Criterion 3: Upper Limit Temperature (T_{upp})- sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable. To set an absolute maximum value for the indoor operative temperature the value of ΔT, which is the difference between the actual operative temperature in the room at any time (T_{op}) and T_{max} the limiting maximum acceptable temperature, shall not exceed 4K.

The aforementioned criteria provide a robust and balanced assessment of the risk of overheating and in order for a room to be classified as compliant, it will need to meet at least two out of the three criteria.

It has been assumed that the analysed building falls under Category II of CIBSE recommendations (Table 4.2 CIBSE suggested applicability of the categories and their associated acceptable temperature range).

Additionally, the guide details on the prediction of conditions for optimal comfort defined by the predicted mean vote (PMV) predicted percentage dissatisfied (PPD) where the metabolic rates, humidity and air movements are considered.

Table 4.2 – CIBSE Suggested Applicability of the Categories and their Associated Acceptable Temperature Range

Category	Explanation	Suggested acceptable range (K)	Suggested acceptable limits PMV
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2	± 0.2
II	Normal expectation (for new buildings and renovations)	± 3	± 0.5
III	A moderate expectation	± 4	± 0.7
IV	Values outside the criteria for the above categories (only acceptable for a limited period)	> 4	> 0.7

CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes (2017)

Naturally Ventilated Buildings

CIBSE TM59 overheating methodology for predominantly naturally ventilated rooms assesses against two criteria, (a) and (b) (for Category I occupancy, T_{max} is reduced by 1K):

- Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which ΔT ($T_{op} – T_{max}$) is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance) (where Top is the operative temperature of the room and T_{max} is the limiting maximum acceptable temperature).
- Criterion (b) - 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.
- Bedrooms must pass both criteria (a) and (b).

Table 4.3 – Table Benchmarks Summer Peak Temperatures and Overheating Criteria

Table Text Bold	Benchmark Summer Peak	Overheating Criterion
Bedrooms	26°C	Maximum 1% annual occupied hours over operative temperature of 26°C
Kitchen/ Living Areas	26°C	Maximum 3% annual occupied hours over operative temperature of 26°C

Mechanically Ventilated Buildings

CIBSE TM59 overheating methodology for predominantly mechanically ventilated applies the following criteria:

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

Communal Corridors

The inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them.

CIBSE TM59 states that whilst there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for morethan 3% of annual hours, then this should be identified as a significant risk within the TM59 overheating report.

Approved Document Part O (ADO) Limits on the CIBSE TM59 Methodology

With the release of the new Approved Document Part O in June 2021 a new approach has been established for the thermal comfort analysis by imposing a series of limitation to the CIBSE TM59 methodology such as specific opening profiles restrictions associated with the safety of the users aforementioned in Chapter 2 under the ADO section.

ADO applies limits to CIBSE TM59 section 3.3 (openings); these requirements are applied by appropriate assignment of MacroFlo types / scripted profiles in the model (see Modelled Openings Section).

Additionally, the building's overheating mitigation strategy for use by occupants requires accounting for the following:

- Noise at night
- Pollution
- Security
- Protection from falling
- Protection from entrapment

Excess heat should be removed from the residential building by any of the following means as per the Approved Document Part O:

- Opening windows (the effectiveness of this method is improved by cross-ventilation).
- Ventilation louvres in external walls.
- A mechanical ventilation system.
- A mechanical cooling system.

The acceptable strategies for reducing overheating risk include the implementation of fixed shading devices, adjusting the glazing design (size, orientation, g-value, depth of the window reveal), optimising the placement of balconies, glazing, and accounting for surrounding shading.

According to Part O requirements, internal blinds and surrounding foliage are not considered overheating risk mitigation measures anymore.

5. Input Data

Background

Dynamic Thermal Modelling

An assessment of thermal comfort has been undertaken on the proposed renovation of an existing residential dwelling. The Thermal Comfort model is based upon information current at the time of the assessment.

The following table presents the key input data to the model. Other input data is presented in the appendices.

Table 5.1 – Table Summarising Key Input Data for the Model

Key Aspects	Details
Dynamic Overheating Analysis Software Used	IES VE 2024
Site Location	40 King Henry's Road, Camden, NW3 3RP
Site Orientation (from North)	-90°
Weather Files Applied	London_LWC_DSY1_2020High50 London_LWC_DSY2_2020High50 London_LWC_DSY3_2020High50 London_LWC_DSY1_2050High50
Internal Gains	In line with the CIBSE TM59 profiles for the living spaces (bedrooms, ensuites, bathrooms, kitchens, living)
Equipment Gains	
Occupancy Gains	
Fabric Thermal Performance Properties (U-Values and Air Permeability)	U-values aligned with Table 4.3 Limiting U-values for existing elements in existing dwellings from Approved Document Part L1 (2021) Air permeability estimated using SAP WORKSHEET version 10.2 (17-12-2021)
Thermal mass	Assumptions have been made as per the latest architectural drawings.
Overheating Mitigation Strategies Tested	Simulations have been run following the cooling hierarchy with the aim to identify and optimum ventilation strategy for overheating risk mitigation purposes. Natural ventilation through openable windows Infiltration rate: 0.75ACH Variations of mechanical ventilation with 2 or 4 air changes (MVHR 2ACH and 4ACH. Comfort cooling

Assessment Limitations

Noise Restrictions

An Environmental Noise Survey & Plant Assessment provided by Quantum Acoustics Ltd (Document Reference: QA25057/ENS-PNIA) recommends an overheating mitigation strategy which takes account of the likelihood that windows will be closed during sleeping hours would be appropriate.

Pollution Restrictions

Local pollution sources should be minimised by implementing an efficient design that incorporates effective ventilation, in accordance with the requirements outlined in Approved Document Part F: Volume 1.

Security Restrictions

In accordance with Approved Document Part O (ADO), openings that present security or safety concerns are generally restricted from use for passive natural ventilation during nighttime hours and are designated as operable only during daytime. Such openings typically include those situated at ground level or in easily accessible areas.

Protection from Falling

Openings intended for prolonged use to reduce overheating risks must minimise the risk of falls from height. Falling safety measures may be included such as 100mm opening restrictors.

Where openings can open wider than 100mm they can be used as overheating mitigation strategy where they meet all of the following conditions as per ADO:

- Window handles on outwards opening windows are not more than 650mm from the inside face of the wall when the window is at maximum opening angle
- Shutters or guarding provision of at least 1.1m or in line with the Approved Document Part K; Horizontal bars to be generally avoided.

Protection from Entrapment

Louvered shutters, window railings, and ventilation grilles, where installed, should be designed with health and safety considerations, ensuring gaps do not exceed 100 mm, prevent any potential entrapment risks and ensure child safety measures.

Geometry Modelling

A 3D model of the proposed indicative building was developed using IES VE 2024 software. The model was created based on information provided by the architects at the time of writing this report. The drawings used for the building model are detailed in Table 5.2.

The orientation from the true North is set in ModelIT as -90° based on the architectural drawings for the proposed site.

The geometry includes all occupied and unoccupied spaces of the dwelling.

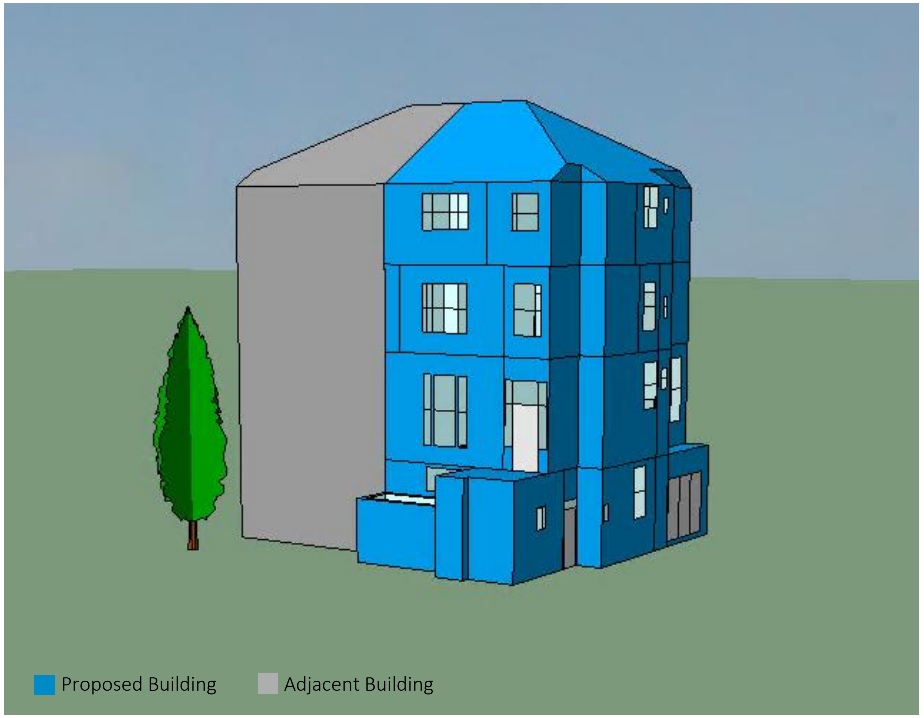


Figure 5.1 – IES VE Indicative 3D Model of the Dwelling

Table 5.2 – Architectural Drawings Considered for the Building 3D Modelling

Drawing Name	Drawing Number	Date
Proposed Lower Ground Floor Plan	1342/200	04/02/2025
Proposed Upper Ground Floor Plan	1342/201	04/02/2025

Proposed First Floor Plan	1342/202	04/02/2025
Proposed Second Floor Plan	1342/203	04/02/2025
Proposed Roof Plan	1342/204	04/02/2025
Proposed Front Elevation	1342/300	04/02/2025
Proposed Rear Elevation	1342/301	04/02/2025
Proposed Side Elevation 1 (E)	1342/302	04/02/2025
Proposed Side Elevation 2 (W)	1342/303	04/02/2025
Proposed Site Section	1342/401	04/02/2025

Weather Data

The area of the development is considered to be under the category of high-density urban areas of London, hence the most suitable weather files used for the simulations is London Weather Centre data associated with the Central Activity Zone (CAZ).

The CIBSE weather data files used for the analysis are as follows:

- Current weather scenario: Design Summer Year 1 for the 2020s, high emissions, 50% percentile scenario (London_LWC_DSY1_2020High50).
- Extreme summer year 2003 with a very intense single warm spell: Design Summer Year 2 for the 2020s, high emissions, 50% percentile scenario (London_LWC_DSY2_2020High50).
- Extreme summer year 1976, a year with a prolonged period of sustained warmth: Design Summer Year 3 for the 2020s, high emissions, 50% percentile scenario (London_LWC_DSY3_2020High50).
- Future weather scenario: Design Summer Year 1 for the 2050s, high emissions, 50% percentile scenario (London_LWC_DSY1_2050High50).

The simulations run aim to identify an overheating mitigation solution for the current weather scenario (London_LWC_DSY1_2020High50) for compliance with CIBSE TM52:2013 and CIBSE TM59: 2017 criteria.

Additional testing is conducted using the 2020 versions of the more extreme design weather years (DSY2 and DSY3). It is acknowledged that meeting the CIBSE compliance criteria is challenging for the DSY2 and DSY3 weather files, although it is expected that in the majority of cases a significant proportion of spaces will be able to achieve compliance via following the cooling hierarchy.

Solutions for the more extreme summer year scenarios (DSY2, DSY3) are reported as well as a strategy for residents to cope in extreme weather events and under future weather files in the context of climate change run under the London_LWC_DSY1_2050High50 weather file.

External Gains - Solar Radiation Analysis

To assist with the identification of areas at greatest risk of overheating an analysis was undertaken to establish the solar gains projected on the building envelope by applying the London_LWC_DSY1_2020High50 current weather data file associated with London Weather Centre area identified as the most suitable for the project's location.

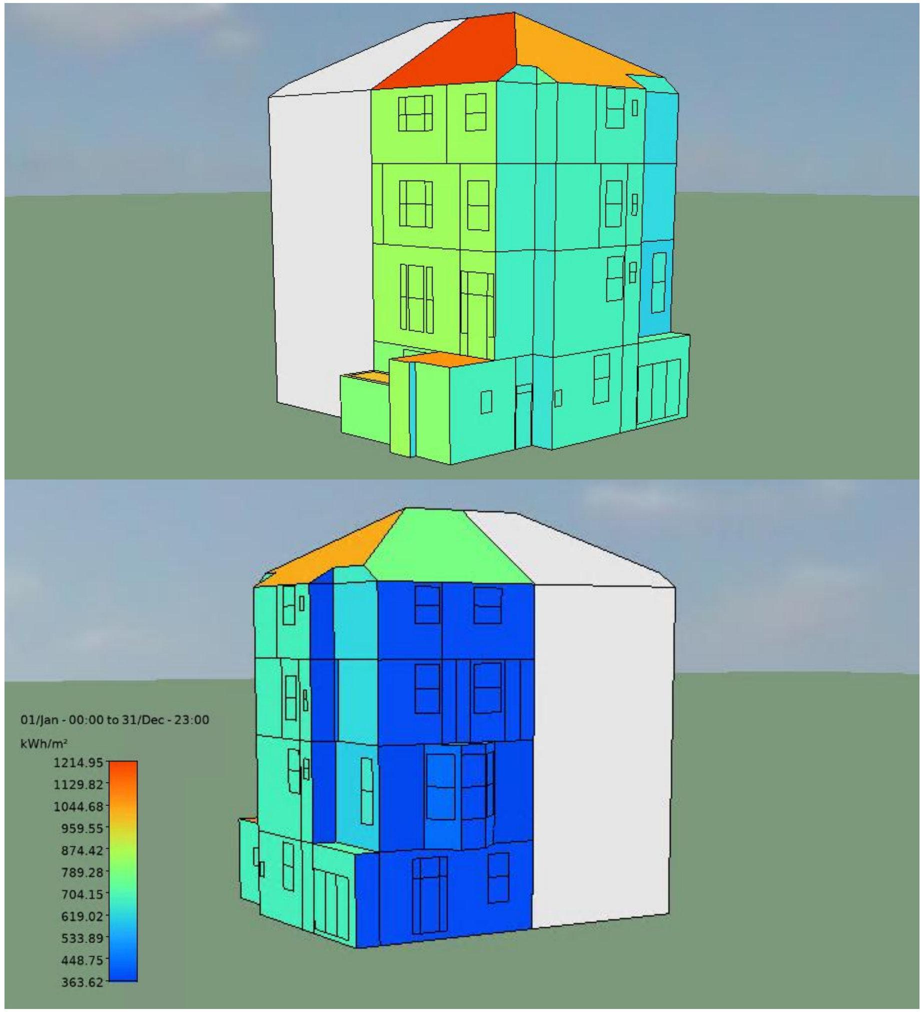


Figure 5.1 - SunCast Simulation 3D model of the Dwelling Showing Solar Gain Exposure

Building Fabric Properties

Building Fabric Thermal Performance

The building fabric is set in line with improved U-values set out in column (b) of Table 4.3 Limiting U-values for existing elements in existing dwellings from Approved Document Part L1 (2021).

The following table summarises the U-values of the building elements applied in the model in line with Table 5.3.

Table 5.3 – Building Fabric U-values

Fabric Element	Part L1 Limiting U-values for existing elements in existing dwellings (W/m²·K) (Data Input in the Model)
External Wall	0.30
Roof	0.16
Ground Floor	0.25

It is understood that the existing glazing will be replaced like-for-like throughout the dwelling. It was assumed windows will be double glazed with an approximate U-value of 1.6 (W/m2 ·K).

Good thermal properties were assumed in line with Approved Document Part L1 (2021) to minimise the heat losses through the building fabric.

Infiltration Rate

In the absence of air testing, the air permeability of was estimated at approximately 15 m³/(h·m²) @50Pa using SAP WORKSHEET version 10.2 (17-12-2021). Air permeability is input as infiltration rate in the air exchange section of the IES VE thermal template for all modelled spaces (AP = ~ 0.75ACH).

Thermal Mass

Thermal mass refers to the capacity of a building material to absorb, store, and subsequently release heat, providing a buffer against temperature fluctuations within a building. Thermal lag is the rate at which a material releases stored heat. Typically, for most building materials, an increase in thermal mass results in a longer thermal lag, meaning materials with higher thermal mass take longer to change temperature, thereby stabilising the indoor climate by reducing the impact of external temperature changes. Using thermal mass appropriately can improve the thermal performance of the building reducing cooling demands and hence the overheating risk.

Given that the proposals are for renovation of the existing building, the scope to increase the thermal mass of the building is somewhat limited. Nevertheless, this should be a consideration when selecting building materials. For modelling purposes, the construction was defined based on reasonable assumptions in line with the architectural design as well as the existing building.

Window Type Details

The indicative model for the overheating assessment was produced following the elevations provided by Thomas Alexander architects at the time of writing the report showing openable timber sash windows. The proposed windows for the indicative model have been set as double-glazed windows with a U-Value of 1.6 W/m²K, and a G- Value of circa 0.4. A low G-Value minimises the solar heat gain but impacts CO_2 emissions, fabric energy efficiency, and internal daylight levels. Consequently, it has been carefully optimised to achieve a balanced performance across these aspects.

Consideration has been given to the Approved Document Part O (ADO) opening profiles limitations from section 2.6 for the simulations with openable windows under the passive measure scenarios. The efficiency of natural ventilation was assessed with consideration of the Part O limits for residential spaces. Accordingly, the openable window profiles were configured in the MacroFlo tool of the IES VE software, following the guidelines outlined in Section 2.6 of ADO noted in Chapter 2 under the Approved Document Part O (2021) overview.

To understand the impacts of the recommended noise restrictions, initial simulations were run with no restrictions allowing for openable windows during daytime and nighttime hours. Subsequent simulations were then conducted in line with recommendations set out in the Environmental Noise Survey & Plant Assessment provided by Quantum Acoustics Ltd, with windows closed during nighttime hours (11pm to 7am) representing the proposed strategy for the dwelling.

Table 5.4 –Tested Opening Profiles

Noise Restrictions Applied	Window Type Applied	Opening Profile
None	Openable sash windows	Opening profile as per ADO section 2.6.a + b. definition (windows modelled as open during both daytime when the ambient temperature exceeds 22°C and nighttime The internal temperature exceeds 23°C at 11pm)
Noise restrictions applied during the nighttime (in line with acoustic report)	Openable sash windows	Opening profile as per ADO section 2.6.a. definition (windows modelled as open only during the daytime between 7am and 11pm when the ambient temperature exceeds 22°C; windows shut during the nighttime between 11pm and 7am)

The following figures show the proposed strategy for the opening types of the consistent with the proposed architectural design and the noise restrictions outlined in the acoustic report

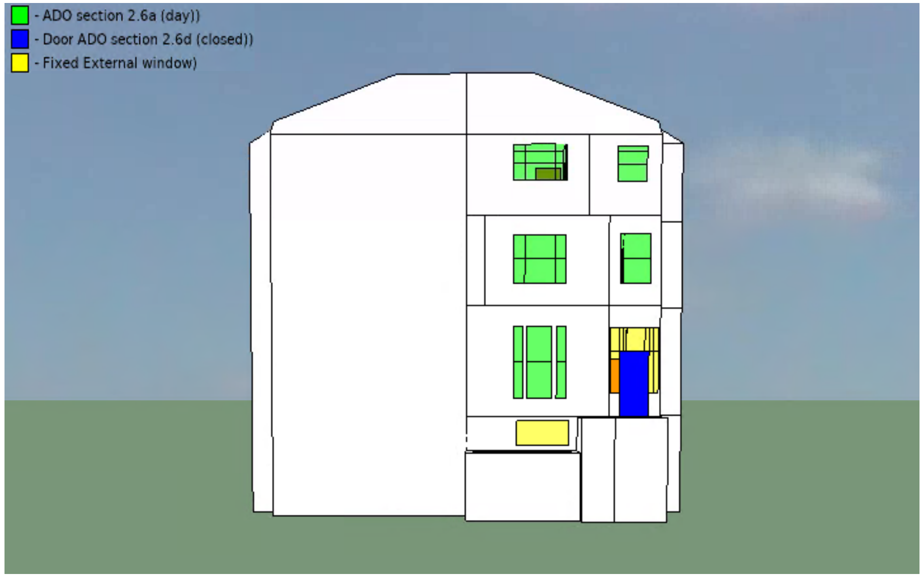


Figure 5.2 – Front Elevation Opening Types

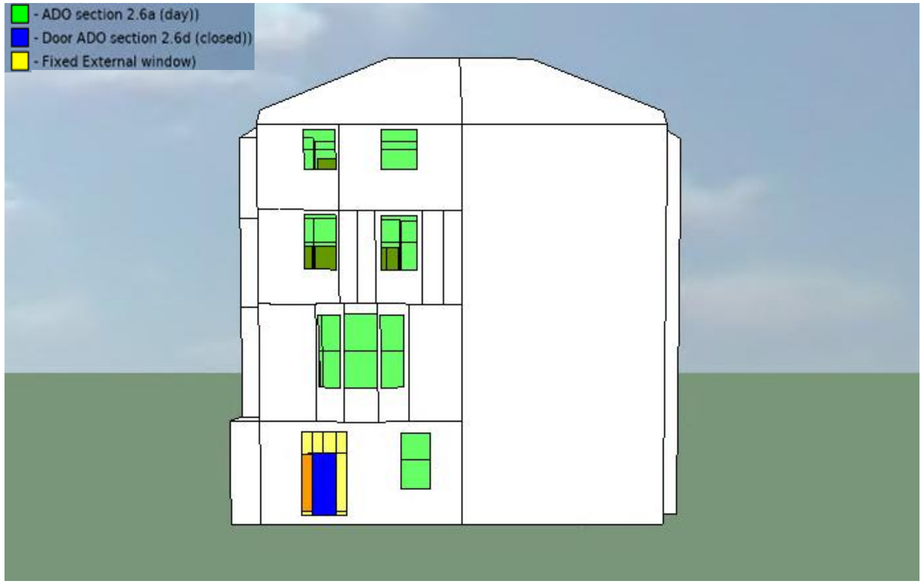


Figure 5.3 – Rear Elevation Opening Types

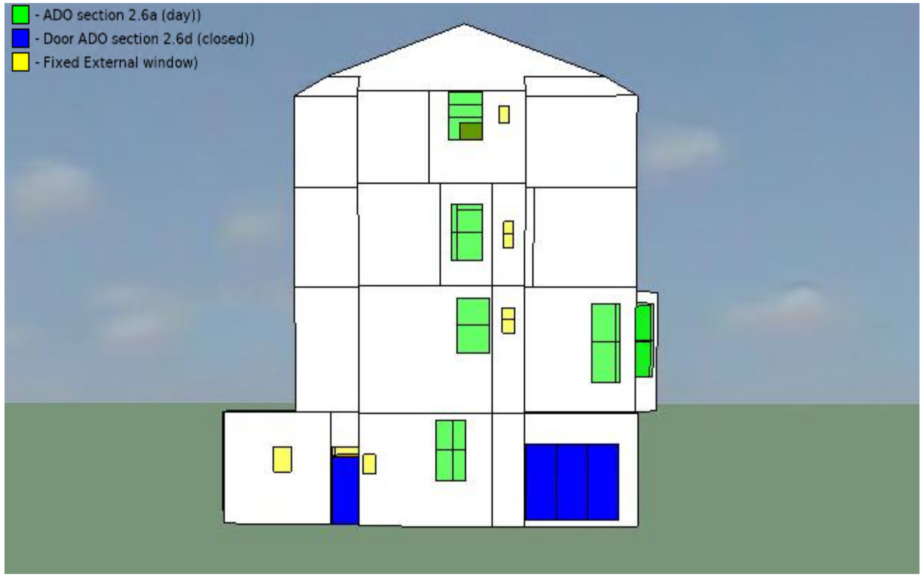


Figure 5.4 - Rear Elevation Opening Types

Thermal Templates

The thermal templates were defined based on activity type, in accordance with the CIBSE TM59 methodology.

Internal Gains

Internal heat gains are generated by the activity of occupants as metabolic heat, by utilisation of electrical devices, or by thermal emission of artificial lighting.

The thermal templates used, and any assumptions made were based on the guidelines provided by CIBSE TM59:2017.

The internal gains were input into the model by defining thermal templates specific to each type of space and associated activity.

The dynamic overheating analysis adheres to the additional requirements highlighted in section 8.10 of the GLA Energy Assessment Guidance (June 2022) which consists in the inclusion of the following considerations:

- Communal corridors are included in the overheating analysis assuming heating pipework will run through them as per Paragraph 3.9 of the CIBSE TM59 guidance.

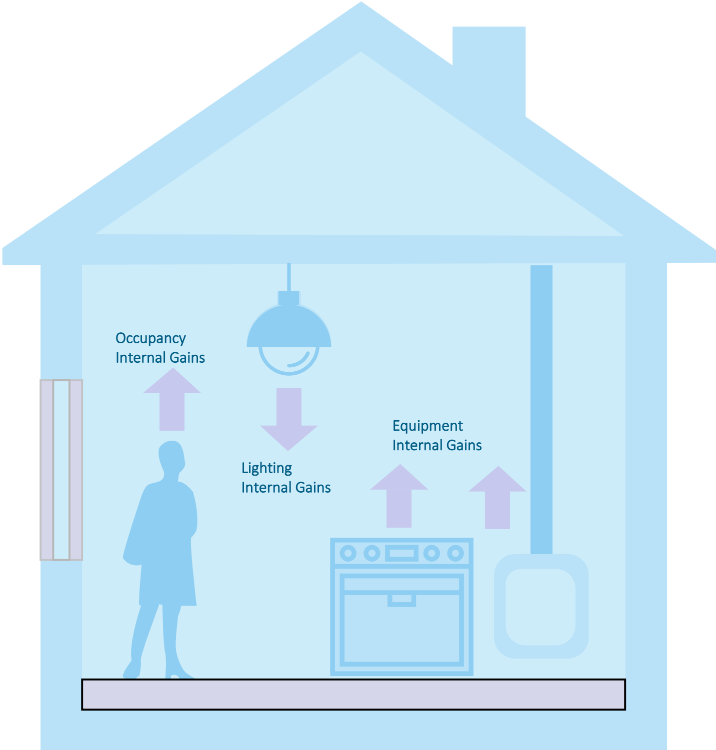


Figure 5.5 – Figure Showing a Breakdown for the Internal Gains Sources

Occupancy Gains

The modelled studios have an occupancy profile defined based on a 24-hour schedule in line with the CIBSE TM59 profiles. Full details can be found in the appendices. For the bedrooms, this is 2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gain in the bedroom from 9 am to 10 pm.

Kitchens and living spaces are set as unoccupied during the sleeping hours and occupied during the rest of the day. This is the worst-case scenario since the room is modelled as occupied only during the hottest hours of the day.

The communal corridors and the bathrooms are assumed as unoccupied in line with the CIBSE TM59 methodology.

Lighting Gains

In the context of this assessment, it is presumed that the energy consumption for lighting is directly related to the floor area, with the energy demand for lighting being quantified in watts per square meter (W/m^2). For an efficient new-build residence, a default value of 2 W/m^2 is to be assumed for the time period from 6 pm to 11 pm.

This presupposes the availability of adequate daylight, and it is important to note that the assessment period covered by CIBSE TM59 is limited to the months from May to September.

Equipment Gains

Equipment gains in a building refer to the heat generated by electrical or mechanical equipment during operation, including devices such as computers, mechanical systems, and appliances. This heat contributes to the internal temperature of the building and influences its overall cooling or heating requirements. These gains are an important factor in designing HVAC systems, as they impact on the cooling and heating demands required to maintain thermal comfort and energy efficiency, particularly during peak operational hours.

Heating systems can contribute to overheating risks through a range of factors. The heat is often released 24/7 and, when emitted into poorly ventilated internal spaces, such as corridors, it can accumulate and significantly contribute to overheating in these areas as well as in adjacent occupied spaces. The heat gains associated with the distribution pipework were incorporated into the model.

Comfort Parameters

The comfort parameters are addressed in CIBSE's Guide A: Environmental Design (2015, updated 2021) in Table 1.5 Recommended Comfort Criteria for specific applications, which provides standards and recommendations for creating comfortable and sustainable indoor environments.

The comfort parameters defined in the model as per the CIBSE Guide A are summarised in Table 4 of Appendix E.

6. Overheating Mitigation Strategies and Results

The cooling hierarchy is followed in testing, identifying, and defining the proposed overheating risk mitigation strategy in compliance with CIBSE TM59.

Passive Measures

Reduce External Heat Gains

The amount of heat entering the building can be reduced by consideration given to factors such as orientation on site, shading elements, good insulation levels and air tightness. As the proposals comprise refurbishment of an existing building, the opportunities to reduce solar heat gains through these measures are limited, as the site's orientation and external appearance will be largely unchanged.

Nevertheless, for the purposes of this assessment, it has been assumed that the building fabric will be improved as far as possible.

Minimise Internal Heat Generation through Energy Efficient Design

Internal heat generation can be minimised through energy-efficient building services design. While the plant selections have not yet been made at the time of writing this report, the development should incorporate efficient infrastructure with reduced pipe lengths and configurations that minimise heat loss, particularly in enclosed areas such as corridors and storage spaces.

Manage Heat using Thermal Mass

The thermal mass, defined as the capacity of materials to absorb, store, and release heat, acts as a buffer against temperature fluctuations. High thermal mass elements increase thermal lag, thereby reducing the impact of excessive solar gains.

This concept was included into the simulations and the overheating strategy, through reasonable assumptions aligned with the architectural design. The model includes concrete slabs and solid blockwork for external walls.

Passive Ventilation Testing

The potential for natural ventilation through openable windows is restricted at nighttime by noise regulations at the site, as outlined in Environmental Noise Survey & Plant Assessment provided by Quantum Acoustics Ltd (Document Reference: QA25057/ENS-PNIA). The report recommends an overheating mitigation strategy which takes account of the likelihood that windows will be closed during sleeping hours.

To fully assess the impact of these restrictions, two distinct scenario analyses were conducted within the model simulations. One scenario, representing unrestricted use of openable windows, was purely undertaken to fully assess the impacts of the noise restrictions and cannot be proposed in reality for a compliant dwelling. The other reflected the proposed strategy of closed windows during nighttime hours.

Furthermore, the simulations for openable windows under passive ventilation scenarios considered the opening profile limitations outlined in Section 2.6 of the Approved Document Part O (ADO). The efficiency of natural ventilation was assessed in line with these limits for residential spaces, with window profiles configured in the MacroFlo tool of the IES VE software.

To maximise the effect of cross-ventilation, the internal doors that do not pose security or safety concerns were modelled as open as part of the natural ventilation simulations.

The results of the passive ventilation simulations are shown in Table 6.1 as follows.

Table 6.1 – Passive Ventilation Test Results Summary

	Weather File	Number of Spaces Failing Criterion (a)	Number of Spaces Failing Criterion (b)
Theoretical Scenario: Unrestricted use of Openable Windows			
Test 1	LWC_2020_DSY1	0 / 9	1 / 4
Test 2	LWC_2050_DSY1	0 / 9	4 / 4
Compliant Scenario: Closed Windows at Nighttime due to Noise Recommendations			
Test 3	LWC_2020_DSY1	0 / 9	4 / 4
Test 4	LWC_2020_DSY2	4 / 9	4 / 4
Test 5	LWC_2020_DSY3	5 / 9	4 / 4

Testing indicates that, even under the hypothetical scenario of unrestricted openable windows, the results demonstrate that passive ventilation alone would not be sufficient to fully mitigate overheating. Specifically, one out of nine occupied spaces failed the CIBSE TM59 criteria when assessed using the LWC_2020_DSY1 weather file, representing current weather conditions. Under the LWC_2050_DSY1 weather file, representing future weather conditions, four out of nine spaces would not meet the criteria. This shows that the final overheating mitigation strategy is unchanged by the noise restrictions.

Furthermore, the proposed scenario, which accounts for nighttime window closures due to noise requirements, revealed significant challenges. Notably, all four bedrooms failed Criterion (b) across all three tests, exceeding 26°C for more than 1% of annual sleeping hours. This is likely attributable to the enforced nighttime window closures.

Additionally, while all nine occupied spaces passed Criterion (a) when assessed using the LWC_2020_DSY1 weather file, the rooms began to fail when assessed using the more intense current weather files, LWC_2020_DSY2 and LWC_2020_DSY3.

Passive ventilation simulation results are shown in more detail alongside other testing in in Table 1, Appendix F. Tests 1 and 2 represent unrestricted windows, while Tests 3, 4, and 5 reflect nighttime closure due to noise restrictions.

Overall, the results indicate that passive ventilation alone is insufficient to mitigate overheating in line with TM59 criteria. Therefore, further mitigation measures, as outlined in the cooling hierarchy, must be explored

Mechanical Ventilation

Where passive measures are not sufficient to mitigate the overheating risks, the next step of the Cooling Hierarchy is to explore is the implementation of mechanical ventilation.

Mechanical Ventilation Testing

To determine whether mechanical ventilation with heat recovery provided a sufficient strategy for mitigating overheating risk in accordance with CIBSE TM59 criteria, a series of simulations were conducted. These simulations assessed the effectiveness of mechanical ventilation by testing incremental air change rates of two air changes per hour (2 ACH) and four air changes per hour (4 ACH).

CIBSE TM59 overheating methodology for predominantly mechanically ventilated rooms states that the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours. To assess compliance, all nine occupied spaces within the dwelling were analysed.

As a minimum requirement to achieve compliance, all occupied spaces need to pass the relevant CIBSE criteria under the current weather conditions. Therefore, mechanical ventilation scenarios were assessed using the London_LWC_DSY1_2020High50 weather file. The testing revealed the following results:

- Test 6 (2 ACH): Five out of nine occupied rooms passed.
- Test 7 (4 ACH): Six out of nine occupied rooms passed.

Therefore, while the mechanical ventilation strategy demonstrably helped reduce the risk of overheating, it did not fully meet the required CIBSE TM59 criteria across all occupied spaces.

Further details of the mechanical ventilation test results, conducted as Test 6 and Test 7, are detailed in Table 1 of Appendix F. This outcome necessitated the exploration of the next stage of the Cooling Hierarchy, namely comfort cooling.

Comfort Cooling

Once passive measures were explored and maximised, as well as the mechanical ventilation system options, if the results suggest that there is still a need for additional measures, comfort cooling may be implemented.

Comfort Cooling Testing

Given that passive and mechanical ventilation strategies are deemed insufficient to meet CIBSE TM59 criteria for the proposed development, comfort cooling is proposed in accordance with the Cooling Hierarchy. The air conditioning systems implemented are to be designed in an efficient way and ideally with waste heat recovery incorporated. Tests 8 and 9, conducted under both current and future (2050) weather scenarios, demonstrate that comfort cooling will adequately mitigate overheating risks.

Proposed Strategy

Following the analysis of overheating mitigation strategies, conducted in accordance with the Cooling Hierarchy and CIBSE TM59 criteria, the simulation results revealed that both passive and mechanical ventilation measures may be insufficient to adequately mitigate overheating risks within the proposed dwelling. Full details of all testing results can be found in Appendix F.

Comfort cooling is therefore proposed as the most effective strategy for ensuring compliance with CIBSE TM59 and maintaining a comfortable internal environment for occupants.

7. Summary

This report presents the Thermal Comfort Analysis for the proposed development at 40 King Henry's Road, Camden, NW3 3RP.

The proposals are for renovation works on the existing residential property.

The main purpose of this report is to investigate how the proposed building performs against the criteria set out in *CIBSE TM59:2017: Design methodology for the assessment of overheating risk in homes* and the *Approved Document Part O (2021)*. Consideration has also been given to the methodology presented in *CIBSE AM11 Building Energy and Environmental Modelling*. Dynamic thermal modelling has been undertaken and approved software IES VE 2024 was used for the purpose of the assessment. The analysis includes all occupied spaces within the building, such as bedrooms, kitchens and other living areas.

The report shows that the cooling hierarchy outlined in Policy SI 4 (Managing Heat Risk) of the London Plan, as per the Greater London Authority’s Energy Assessment Guidance (June 2022), has been followed.

The analysis also considers the recommendations of the Environmental Noise Survey & Plant Assessment provided by Quantum Acoustics Ltd., which advises restricting the use of openable windows at nighttime as an overheating mitigation strategy.

To ensure compliance, an overheating mitigation strategy was identified and applied, showing that all occupied spaces meet the relevant CIBSE criteria under current standard weather conditions (LWC_DSY1_2020). Additional weather scenarios, including more intense current weather patterns and future climate projections, were also assessed, as recommended by the GLA.

To achieve compliance, various mitigation strategies were investigated, following the cooling hierarchy and CIBSE TM59. These strategies included passive measures, mechanical ventilation, and comfort cooling.

The testing shows that, to achieve compliance under both current and future weather conditions, comfort cooling is required. While passive and mechanical ventilation strategies helped to reduce overheating risks, they were not sufficient to meet the CIBSE TM59 criteria. Therefore, comfort cooling is proposed to ensure a comfortable and compliant internal environment for the occupants of the dwelling.

Appendices

A. General Information

Table Appendix A.1 – Key Terms

Policy Reference	Details
Thermal Comfort and Operative Temperatures	The provision of thermal comfort for building occupants involves designing the internal conditions so that the heat loss and heat gain from occupants lie within the bounds that are generally accepted as comfortable. Thermal comfort is defined in the ISO 7730 as "That condition of mind which expresses satisfaction with the thermal environment". This is a definition most people can agree on but also a definition that is not easily converted into physical parameters. The human body can be crudely regarded as a heat engine that converts fuel (food) into energy for its function and creates waste heat that must be dissipated by the body to ensure proper "thermoregulation". The greater the amount of activity, the greater the amount of heat to be dissipated. Typical office work generates up to 110-130W of heat. Heat dissipation from the body takes place by several modes of heat transfer — radiation and convection from the outer surface, evaporation from both the surface and inner parts of the body and respiration involving both sensible and latent heat transfer. To maintain thermal equilibrium, the amount of heat produced or absorbed must equal the heat dissipated. The perception of thermal comfort is based on a range of variables:
Dry bulb air temperature	Is the most commonly quoted factor in relation to thermal comfort. In a 'traditional" building, if the air temperature is within reasonable limits, it is likely that there is a reasonable degree of thermal comfort. This simple relationship between air temperature and comfort is less reliable in lighter weight modern buildings
Moisture content	Humans will experience discomfort if the moisture content of the air in the room is either too dry, causing drying of the respiratory tract and eyes or too moist so that the body is unable to lose heat through evaporation (sweating) from the skin.
Air movement	The movement of air across the surface of the body affects the convective heat transfer from both the bare and clothed parts; over the exposed skin surfaces the flow of air is a factor in determining the transmission rate of moisture from the surface. If the combined effect of temperature and movement is too great, then too much heat is removed and a subjective feeling of chill or draught results. Conversely, a high air temperature with little air movement will produce a subjective sensation of warmth that, although acceptable locally near a heating unit, is not tolerable throughout the general area of a room.
Operative Temperatures	The CIBSE standard adopted in the UK for the assessment of comfort in an internal space is known as operative temperature (formerly known as dry resultant temperature); $T_{operative} = (0.5xTair) + (0.5x\ T_{radiant})$ This is in effect a simple average and so an increasing air temperature requires a corresponding reduction in radiant temperature if comfort is to be maintained. This can be achieved through reduced areas of glass, external shading, exposed concrete soffits and radiant cooling systems.
Sensible heat	When an object is heated, its temperature arises as heat is added. The increase in heat is called sensible heat. Similarly, when heat is removed from an object and its temperature falls, the heat removed is also called sensible heat. Heat that causes a change in temperature in an object is called sensible heat.
Latent heat	All pure substances in nature are able to change their state. Solids can become liquids and liquids can become gases but changes such as these require the addition of removal of heat. The heat that causes these changes is called latent heat.

B. Proposed Site Layout

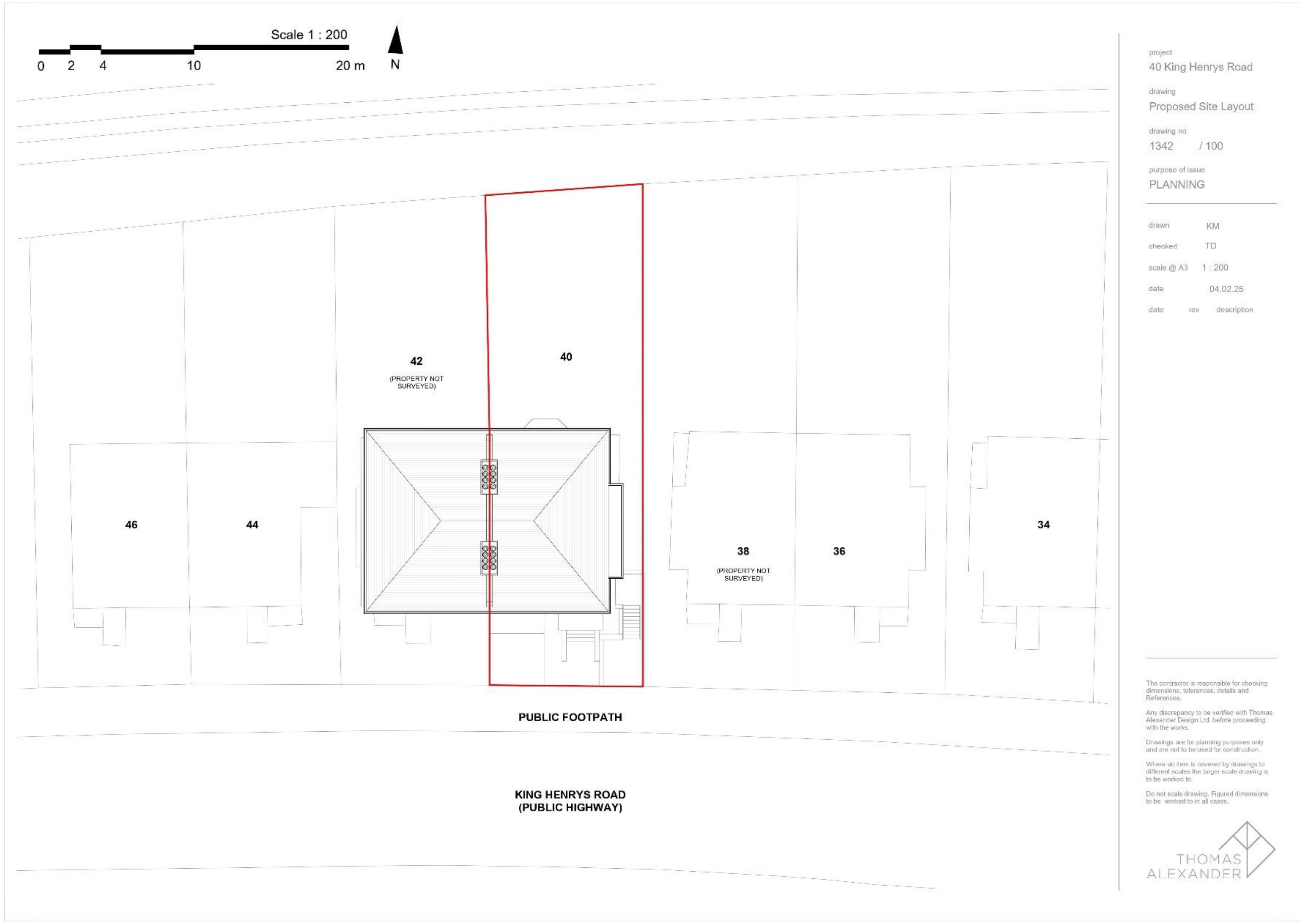


Figure Appendix B.1 – Site Plan (produced by Thomas Alexander)

C. Key Local Planning Policy Requirements

London Planning Policy Framework

Table Appendix C.1 – London Plan (2021)

Policy Reference	Details
Policy SI 1 Improving air quality [extract]	[…] B. To tackle poor air quality, protect health and meet legal obligations the following criteria should be addressed: 1) Development proposals should not: a) lead to further deterioration of existing poor air quality b) create any new areas that exceed air quality limits, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits c) create unacceptable risk of high levels of exposure to poor air quality. 2) In order to meet the requirements in Part 1, as a minimum: a) development proposals must be at least Air Quality Neutral b) development proposals should use design solutions to prevent or minimise increased exposure to existing air pollution and make provision to address local problems of air quality in preference to post-design or retro-fitted mitigation measures c) major development proposals must be submitted with an Air Quality Assessment. Air quality assessments should show how the development will meet the requirements of B1 d) development proposals in Air Quality Focus Areas or that are likely to be used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure. […]
Policy SI 2 Minimising greenhouse gas emissions	A. Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy: 1) be lean: use less energy and manage demand during operation 2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly 3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site 4) be seen: monitor, verify and report on energy performance. B. Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy. C. A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either: 1) through a cash in lieu contribution to the borough's carbon offset fund, or 2) off-site provided that an alternative proposal is identified and delivery is certain. D. Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually. E. Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions. F. Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions.
Policy SI 4 Managing heat risk	A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure. B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy: 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure 2) minimise internal heat generation through energy efficient design 3) manage the heat within the building through exposed internal thermal mass and high ceilings 4) provide passive ventilation 5) provide mechanical ventilation 6) provide active cooling systems.

Local Policy

Table Appendix C.2 – Camden Local Plan (July 2017)

Policy Reference	Details
Policy G1 Delivery and Location of Growth [extract]	The Council will create the conditions for growth to deliver the homes, jobs, infrastructure and facilities to meet Camden's identified needs and harness the benefits for those who live and work in the borough. Delivery of Growth The Council will deliver growth by securing high quality development and promoting the most efficient use of land and buildings in Camden by: a. Supporting development that makes best use of its site, taking into account quality of design, its surroundings, sustainability, amenity, heritage, transport accessibility and any other considerations relevant to the site; […]
Policy D1 Design [extract]	The Council will seek to secure high quality design in development. The Council will require that development: […] a. respects local context and character; b. preserves or enhances the historic environment and heritage assets in accordance with Policy D2 Heritage; c. is sustainable in design and construction, incorporating best practice in resource management and climate change mitigation and adaptation; d. is of sustainable and durable construction and adaptable to different activities and land uses; e. comprises details and materials that are of high quality and complement the local character; f. integrates well with the surrounding streets and open spaces, improving movement through the site and wider area with direct, accessible and easily recognisable routes and contributes positively to the street frontage; g. is inclusive and accessible for all; h. promotes health; i. is secure and designed to minimise crime and antisocial behaviour; j. responds to natural features and preserves gardens and other open space; k. incorporates high quality landscape design (including public art, where appropriate) and maximises opportunities for greening for example through planting of trees and other soft landscaping, l. incorporates outdoor amenity space; m. preserves strategic and local views; n. for housing, provides a high standard of accommodation; and o. carefully integrates building services equipment.is of sustainable and durable construction and adaptable to different activities and land uses; […]
Policy CC1 Climate Change Mitigation	The Council will require all development to minimise the effects of climate change and encourage all developments to meet the highest feasible environmental standards that are financially viable during construction and occupation. We will: a. Promote zero carbon development and require all development to reduce carbon dioxide emissions through following the steps in the energy hierarchy; b. Require all major development to demonstrate how London Plan targets for carbon dioxide have been met; c. Ensure that the location of the development and mix of land uses minimise the need to travel by car and help to support decentralised energy networks; d. Support and encourage sensitive energy efficiency improvements to existing buildings; e. Require all proposals that involve substantial demolition to demonstrate that it is not possible to retain and improve the existing building; and f. Expect all developments to optimise resource efficiency. For decentralised energy networks, we will promote decentralised energy by: g. Working with local organisations and developers to implement decentralised energy networks in the parts of Camden most likely to support them; h. Protecting existing decentralised energy networks (e.g. at Gower Street Bloomsbury, Kings Cross, Gospel Oak, and Somers Town) and safeguarding potential network routes; and i. Requiring all major developments to assess the feasibility of connecting to an existing decentralised energy network, or where this is not possible establishing a new network. To ensure that the Council can monitor the effectiveness of renewable and low carbon technologies, major developments will be required to install appropriate monitoring equipment.
Policy CC2 Adapting to Climate Change	The Council will require development to be resilient to climate change. All development should adopt appropriate climate change adaptation measures such as:

	a. The protection of existing green spaces and promoting new appropriate green infrastructure; b. Not increasing, and wherever possible reducing, surface water run-off through increasing permeable surfaces and use of Sustainable Drainage Systems; c. Incorporating bio-diverse roofs, combination green and blue roofs and green walls where appropriate; and d. Measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy. Any development involving 5 or more residential units of 500sqm or more of any additional floorspace is required to demonstrate the above in a Sustainability Statement. Sustainable Design and Construction Measures The Council will promote and measure sustainable design and construction by: e. Ensuring development schemes demonstrate how adaptation measures and sustainable development principles have been incorporated into the design and proposed implementation; f. Encourage new build residential development to use the Home Quality Mark and Passivhaus design standards; g. Encouraging conversions and extensions of 500 sqm of residential floorspace or above or five or more dwellings to achieve "excellent" in BREEAM domestic refurbishment; and h. Expecting non-domestic developments of 500sqm of floorspace or above to achieve "excellent" in BREEAM assessments and encouraging zero carbon in new developments from 2019.
Policy CC4 Air quality	The Council will ensure that the impact of development on air quality is mitigated and ensure that exposure to poor air quality is reduced in the borough. The Council will take into account the impact of air quality when assessing development proposals, through the consideration of both the exposure of occupants to air pollution and the effect of the development on air quality. Consideration must be taken to the actions identified in the Council's Air Quality Action Plan. Air Quality Assessments (AQAs) are required where development is likely to expose residents to high levels of air pollution. Where the AQA shows that a development would cause harm to air quality, the Council will not grant planning permission unless measures are adopted to mitigate the impact. Similarly, developments that introduce sensitive receptors (i.e. housing, schools) in locations of poor air quality will not be acceptable unless designed to mitigate the impact. Development that involves significant demolition, construction or earthworks will also be required to assess the risk of dust and emissions impacts in an AQA and include appropriate mitigation measures to be secured in a Construction Management Plan.

D. Key Building Regulations Requirements

Approved Documents 2021

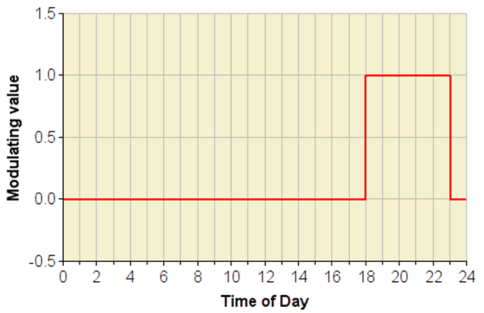
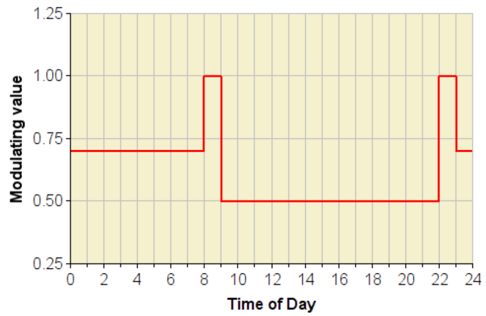
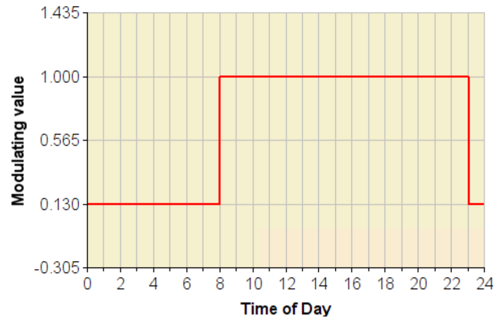
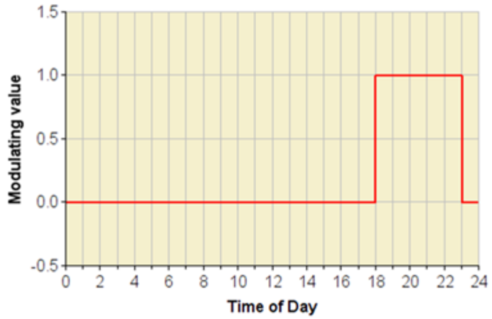
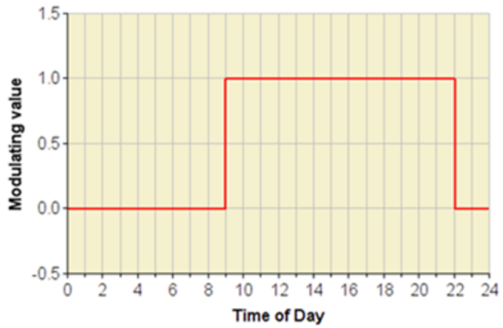
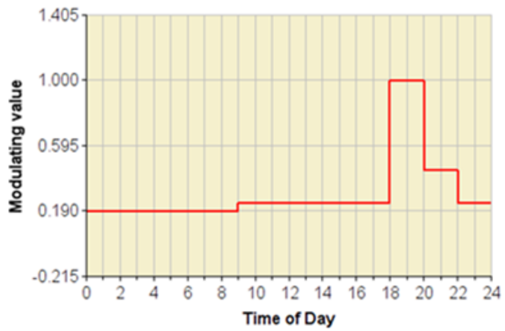
Table Appendix D.1 – Approved Document Part O (2021)

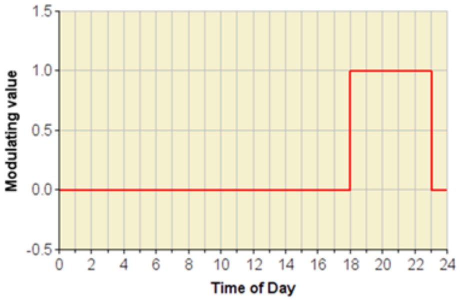
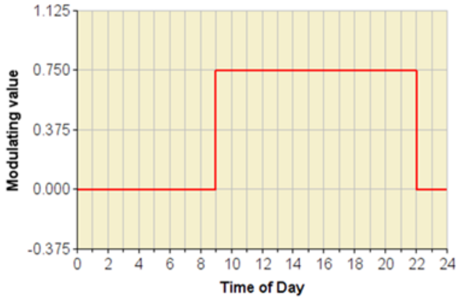
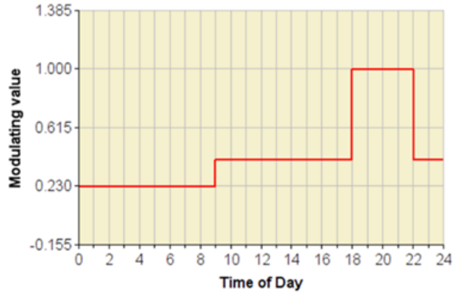
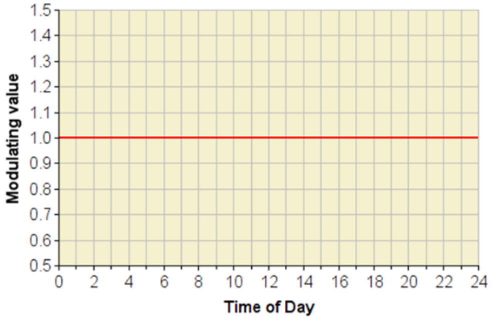
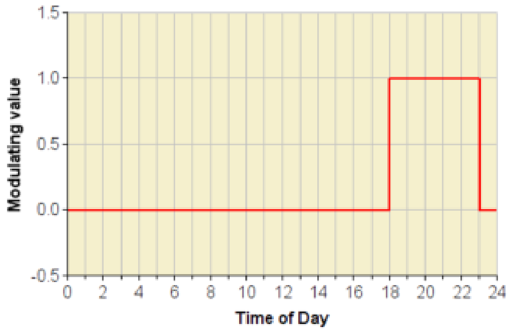
Document Reference	Details
Requirement O1 Overheating mitigation	(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to: (a) limit unwanted solar gains in summer (b) provide an adequate means to remove heat from the indoor environment. (2) In meeting the obligations in paragraph (1): (a) limit unwanted solar gains in summer (b) provide an adequate means to remove heat from the indoor environment.
Requirement O1(2) (a) Overheating mitigation	(1) Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to: (a) limit unwanted solar gains in summer (b) provide an adequate means to remove heat from the indoor environment. (2) In meeting the obligations in paragraph (1): (a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and (b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.
O1 Section 2: Dynamic thermal modelling	2.3 To demonstrate compliance using the dynamic thermal modelling method, all of the following guidance should be followed. (a) CIBSE's TM59 methodology for predicting overheating risk
	(b) The limits on the use of CIBSE's TM59 methodology set out in paragraphs 2.5 and 2.6 (c) The acceptable strategies for reducing overheating risk in paragraphs 2.7 to 2.11 2.4 The building control body should be provided with a report that demonstrates that the residential building passes CIBSE's TM59 assessment of overheating. This report should contain the details in CIBSE's TM59, section 2.3. 2.5 CIBSE's TM59 method requires the modeller to make choices. The dynamic thermal modelling method in this section applies limits to these choices, which are detailed in paragraph 2.6. These limits should be applied when following the guidance in CIBSE's TM59. 2.6 All of the following limits on CIBSE's TM59, section 3.3, apply. (a) When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following: i. Start to open when the internal temperature exceeds 22°C ii. Be fully open when the internal temperature exceeds 26°C iii. Start to close when the internal temperature falls below 26°C iv. Be fully closed when the internal temperature falls below 22°C (b) At night (11pm to 8am), openings should be modelled as fully open if both of the following apply. i. The opening is on the first floor or above and not easily accessible. ii. The internal temperature exceeds 23°C at 11pm. (c) When a ground floor or easily accessible room is unoccupied, both of the following apply. (d) An entrance door should be included, which should be shut all the time.

E. Input Data

Internal Gains

Table Appendix E.1 - IES Lighting, Occupancy and Equipment Profiles Operational Schedules

Thermal Template	Lighting Weekly Profile	Occupancy Weekly Profile	Equipment Weekly Profile
Double Bedroom			
4-Bedroom Apartment: Kitchen			

4-Bedroom Apartment: Living Room			
Corridors		N/A	N/A
Bathrooms			

Internal Gains

Table Appendix E.2 - IES Occupancy Internal Gains as per CIBSE TM59 Methodology

Thermal Template Space Type	Maximum Sensible Gain (W/person)	Maximum Latent Gain (W/person)	Occupancy Density
Double Bedroom	75	55	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gain in the bedroom from 9 am to 10 pm
4-Bedroom Apartment: Living Room	75	55	4 people at 5% gains from 9 am to 10 pm; room is unoccupied for the rest of the day
4-Bedroom Apartment: Kitchen	75	55	4 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day
Corridors	Assumed to be zero		Pipework heat gains and lighting heat gains only

Table Appendix E. 3 - IES Equipment Internal Gains as per CIBSE TM59 Methodology

Thermal Template Space Type	Maximum Sensible Gain (Watts)	Maximum Power Consumption (Watts)
Double Bedroom	80	80
4-Bedroom Apartment: Living Room	150	150
4-Bedroom Apartment: Kitchen	300	300

Comfort Parameters

Table Appendix E. 4 - Comfort Parameters Input as per CIBSE Guide A

Thermal Template Space Type	Metabolic Rate (MET) Description	Metabolic Rate Value (MET) Winter	Metabolic Rate Value (MET) Summer	Minimum Clothing Winter (Min. CLO)	Maximum Clothing Summer (Max. CLO)	Nominal Air Supply Rate
Bedroom	Sleeping/ Seated at rest	0.9	0.9	2.5	1.2	0.4-1 ACH
Living Room	Seated/ at rest	1.1	1.1	1	0.6	0.4-1 ACH
Kitchen	Very light work	1.6	1.5	1	0.5	60 L/s
Circulation Area	Very light movement	1.4	1.3	1	0.6	10 L/s
Office	Seated/ at rest	1.2	1.2	0.9	0.7	10 L/s
Laundry	Very light movement	1.6	1.4	1.2	0.6-	10 L/s

F. Results

CIBSE TM59 Assessment Results

CIBSE TM59 overheating methodology for predominantly naturally ventilated rooms assesses against two criteria, (a) and (b) (for Category I occupancy, T_{max} is reduced by 1K):

- Criterion (a) states that for living rooms, kitchens and bedrooms, the number of hours during which DT is greater than or equal to 1K from May to September (or November to March for southern hemisphere locations) shall not exceed 3% of occupied hours
- Criterion (b) states that the operative temperature of the bedrooms from 22:00-07:00 shall not exceed 26°C for more than 1% of annual hours (33 hours is therefore recorded as a). Approved document O applies limits to CIBSE TM59 section 3.3 (openings); these requirements are applied by appropriate assignment of MacroFlo types / scripted profiles in the model (see Modelled Openings Section).

CIBSE TM59 overheating methodology for predominantly mechanically ventilated rooms states the operative temperature of all rooms shall not exceed 26°C for more than 3% of annual occupied hours.

CIBSE TM59 also states that the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. While there is no mandatory target for communal corridors, if an operative temperature of 28°C is exceeded for more than 3% of the total annual hours this should be identified as a significant risk.

Table Appendix F.1 – Results

Test	Ventilation Strategy	Weather File	Natural Ventilation Criteria		No. of Rooms Failing Mechanical Ventilation Criteria	Total Bedrooms and Living Spaces Analysed = 9		Total Corridors Analysed = 4
			No. of Rooms Failing Criterion (a)	No. of Rooms Failing Criterion (b)		Total Spaces (FAIL)	Total Spaces (PASS)	Corridors (PASS)
No Noise Restrictions at Any Time								
Test 1	Passive ventilation via sash windows. Windows open during only during daytime (7am-11pm) when the operative temperature exceeds 22°C and open during nighttime (11pm-7am) when the internal temperature exceeds 23°C at 11pm	LWC_2020_DSY1	0 / 9	1 / 4	N/A	1 / 9	8 / 9	4 / 4
Test 2	Passive ventilation via sash windows. Windows open during only during daytime (7am-11pm) when the operative temperature exceeds 22°C and open during nighttime (11pm-7am) when the internal temperature exceeds 23°C at 11pm	LWC_2050_DSY1	0 / 9	4 / 4	N/A	4/ 9	5/9	3 / 4

Noise Restrictions Applied During Nighttime (Between 11PM and 7AM) in line with Acoustic Report								
Test 3	Passive ventilation via sash windows. Windows open during only during daytime (7am-11pm) when the operative temperature exceeds 22°C and shut during nighttime (11pm-7am)	LWC_2020_DSY1	0 / 9	4 / 4	N/A	4/ 9	5/9	3 / 4
Test 4	Passive ventilation via sash windows. Windows open during only during daytime (7am-11pm) when the operative temperature exceeds 22°C and shut during nighttime (11pm-7am)	LWC_2020_DSY2	4 / 9	4 / 4	N/A	8 / 9	1 / 9	4 / 4
Test 5	Passive ventilation via sash windows. Windows open during only during daytime (7am-11pm) when the operative temperature exceeds 22°C and shut during nighttime (11pm-7am)	LWC_2020_DSY3	5 / 9	4 / 4	N/A	8 / 9	1 / 9	0 / 4
Test 6	Mechanical ventilation system to two air changes per hour (MVHR 2ACH)	LWC_2020_DSY1	N/A	N/A	4 / 9	4 / 9	5 / 9	4 / 4
Test 7	Mechanical ventilation system to four air changes per hour (MVHR 4ACH)	LWC_2020_DSY1	N/A	N/A	3 / 9	3 / 9	6 / 9	4 / 4
Test 8	Comfort cooling applied to occupied areas in line with summer operative temperatures CIBSE Guide A	LWC_2020_DSY1	0 / 9	0 / 4	N/A	0 / 9	9 / 9	4 / 4
Test 9	Comfort cooling applied to occupied areas in line with summer operative temperatures CIBSE Guide A	LWC_2050_DSY1	0 / 9	0 / 4	N/A	0 / 9	9 / 9	4 / 4

G. General Notes

The report is based on information available at the time of the writing and discussions with the client during any project meetings. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by Ensphere Group Ltd for inaccuracies in the data supplied by any other party.

The review of planning policy and other requirements does not constitute a detailed review. Its purpose is as a guide to provide the context for the development and to determine the likely requirements of the Local Authority.

No site visits have been carried out, unless otherwise specified.

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