72 MARESFIELD GARDENS

OVERHEATING ANALYSIS FOR PLANNING WITH TM 59 ANALYSIS – REV01

Allwood Design

15/04/24 Rev 01
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EXECUTIVE SUMMARY

72 Maresfield Gardens, located within the Fitzjohns Netherhall Conservation Area, was recently refurbished and extended. As part of the work, an active cooling system was installed. Following the installation, a retrospective planning application was made for the system (2021/0467/P) and refused on two accounts:

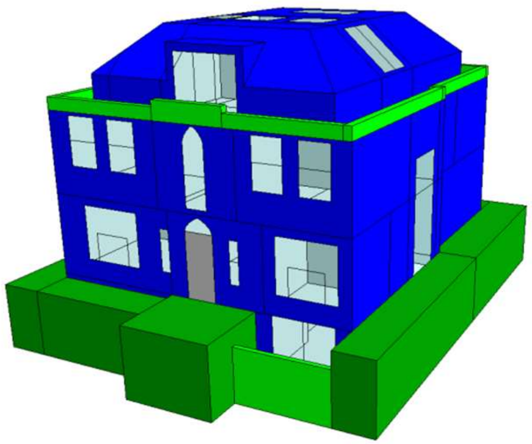
1. Harm to the character and appearance of the street scene
2. Failure to justify the need for active cooling through the application of the cooling hierarchy

This report examines the second point of refusal and demonstrates how the cooling hierarchy was applied while working within the constraints of the existing building. It also shows how the refurbishment significantly improved the fabric's thermal performance, reducing associated carbon emissions.

An analysis was completed to assess the overheating risk. The analysis complies with the Chartered Institute of Building Services Engineer's (CIBSE) guidance for domestic properties; TM 59. It also follows the requirements of the Camden Local Plan and the London Plan.

The analysis has demonstrated that, after following the requirements of the Cooling Hierarchy, the building is failing TM 59 and will overheat unless active cooling is introduced. The results are summarised in the tables opposite, and the full report is included as an appendix.

This justifies the requirement for active cooling to maintain comfortable internal temperatures throughout the year and mitigate the risk of future climate change.



Sustainable Construction Services

4. RESULTS

4.1 TM59 COMPLIANCE

4.1.1 Results – DSY1 2020 High Weather Data – MVHR/Mech Ven

In line with the GLA guidance, the model has been assessed using the CIBSE DSY1 2020 High weather year. The results are reported in Table 3,4 & 5.

	TM52	Bedrooms Only	TM59
	Criterion 1 (%Hrs Top-Tmax>=1K)	No hours > 26°C	PASS / FAIL
Basement - Bedroom	16.1	551	FAIL
1F - Master Bedroom	3.2	113	FAIL
1F - Childrens Bedroom 01	10	385	FAIL
1F - Childrens Bedroom 02	12	433	FAIL
1F - Guest Bedroom	4	225	FAIL
2F - Bedroom	6.7	209	FAIL
GF - Kitchen/Living/Dining	2.8	N/A	PASS

Table 2: *TM59 Results Using DSY1 2020 Weather Data.*

	TM52			
	Criterion 1 (%Hrs Top-Tmax>=1K)	Criteria 2: (Max. Daily Deg.Hrs)	Criterion 3 (Max.DeltaT)	Criteria Failed
Basement - Gym	10.5	9	4	1 & 2
GF - Playroom	21.2	18	5	1 & 2 & 3
2F - Office	18.2	37	7	1 & 2 & 3

Table 3: *TM52 Results Using DSY1 2020 Weather Data.*

Corridors	Percentage hours>28°C	Risk of Overheating?
Basement - Circ	1.6	NO
Basement - Stairway Hall	1.7	NO
GF - Stairway	3.6	YES
GF - Entrance Hall	1.7	NO
1F - Master Circ	10.4	YES
2F - Stairway Hall	9.7	YES
1F - Stairway Hall	6.4	YES

Table 4: *TM59 Results Using DSY1 2020 Weather Data for Circulation Spaces.*

INTRODUCTION

Allwood Design Ltd was appointed to conduct an overheating analysis at 72 Maresfield Gardens, Camden. The study aims to demonstrate that, even though the principles of the Cooling Hierarchy were followed, the property overheats and does not provide a comfortable environment to live in. This will only be amplified in future hotter weather years. Active cooling has been installed, and this report retrospectively justifies its inclusion in accordance with the planning requirements of the Camden Local Plan and the London Plan.

A Dynamic Thermal Model of the property has been completed. The model has been assessed against the Chartered Institution of Building Services Engineers (CIBSE) guidance on overheating risk, TM59 and TM52. The modelling results are appended to this report and show that the property fails to pass the criteria in almost all spaces.

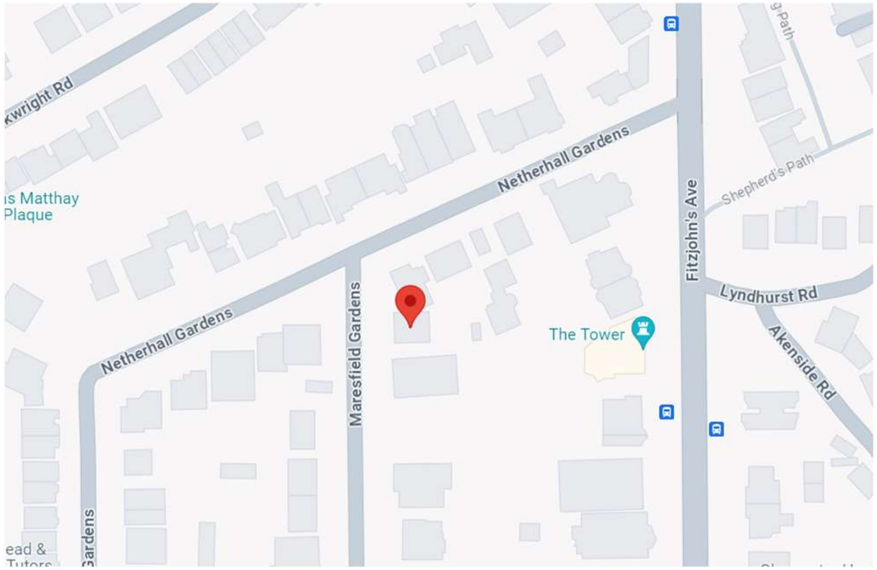
The property is not listed. It is located within the Fitzjohns Netherhall Conservation Area.

The completed refurbishment and extension significantly improved the fabric of the building, with the installation of internal wall insulation, a new upgraded roof, and replacement windows. The facades are characteristic of the local Conservation area, and the property is not highly glazed. The overall level of glazing falls within the LETI Climate Emergency Design Guide recommendations.

Part of the property's top floor is used as office space, where acoustic separation from external noise is fundamental. Whilst windows have been modelled as opening, this is not always possible during sensitive video calls, making the space impossibly hot without active cooling.

dB Consulting Ltd. conducted an acoustic assessment for the installed external cooling unit, which was issued to the planners in May 2022. The noise level of the AC units was deemed compliant with policy and of minimal impact. Therefore this is not covered in this submission.

A refusal was made based on the external condenser unit's visual impact on the local area, which is being addressed separately by a proposal to shield the external unit from view.



PLANNING POLICY

The following planning policies from the Camden Local Plan and the London Plan apply to the overheating analysis:

Camden Local Plan, Policy CC2 Adapting to Climate Change, Clause d, 8.41-8.43

Cooling

8.41 All new developments will be expected to submit a statement demonstrating how the London Plan's 'cooling hierarchy' has informed the building design. Any development that is likely to be at risk of overheating (for example due to large expanses of south or south west facing glazing) will be required to complete dynamic thermal modelling to demonstrate that any risk of overheating has been mitigated.

8.42 Active cooling (air conditioning) will only be permitted where dynamic thermal modelling demonstrates there is a clear need for it after all of the preferred measures are incorporated in line with the cooling hierarchy.

8.43 The cooling hierarchy includes:

- Minimise internal heat generation through energy efficient design;
- Reduce the amount of heat entering a building in summer through orientation, shading, albedo, fenestration, insulation and green roofs and walls;
- Manage the heat within the building through exposed internal thermal mass and high ceilings;
- Passive ventilation;
- Mechanical ventilation; and
- Active cooling.

London Plan, Policy SI 4 Managing heat risk, B, adherence to the 'Cooling Hierarchy'

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.

9.4.1 Climate change means London is already experiencing higher than historic average temperatures and more severe hot weather events. This, combined with a growing population, urbanisation and the urban heat island effect, means that **London must manage heat risk** in new developments, using the cooling hierarchy set out above. Whilst the cooling hierarchy applies to major developments, the principles can also be applied to minor development.

9.4.2 In managing heat risk, new developments in London face two challenges – the need to ensure London does not overheat (the urban heat island effect) and the need to ensure that individual buildings do not overheat. **The urban heat island effect** is caused by the extensive built up area absorbing and retaining heat during the day and night leading to parts of London being several degrees warmer than the surrounding area. This can become problematic on the hottest days of the year as daytime temperatures can reach well over 30°C and not drop below 18°C at night. These circumstances can lead many people to feel too hot or not be able to sleep, but for those with certain health conditions, and 'at risk' groups such as some young or elderly Londoners, the effects can be serious and worsen health conditions. Green infrastructure can provide some mitigation of this effect by shading roof surfaces and through evapotranspiration. Development proposals should incorporate green infrastructure in line with Policy G1 Green infrastructure and Policy G5 Urban greening.

9.4.3 Many aspects of building design can lead to increases in overheating risk, including high proportions of glazing and an increase in the air tightness of buildings. Single-aspect dwellings are more difficult to ventilate naturally and are more likely to overheat, and should normally be avoided in line with Policy D6 Housing quality and standards. There are a number of low-energy measures that can **mitigate overheating risk**. These include solar shading, building orientation and solar-controlled glazing. Occupant behaviour will also have an impact on overheating risk. The Mayor's London Environment Strategy sets out further detail on actions being taken to address this.

9.4.4 Passive ventilation should be prioritised, taking into account external noise and air quality in determining the most appropriate solution. The increased use of **air conditioning systems** is not desirable as these have significant energy requirements and, under conventional operation, expel hot air, thereby adding to the urban heat island effect. If active cooling systems, such as air conditioning systems, are unavoidable, these should be designed to reuse the waste heat they produce. Future district heating networks are expected to be supplied with heat from waste heat sources such as building cooling systems.

9.4.5 The Chartered Institution of Building Services Engineers (CIBSE) has produced **guidance on assessing and mitigating overheating risk in new developments**, which can also be applied to refurbishment projects. TM 59 should be used for domestic developments and TM 52 should be used for non-domestic developments. In addition, TM 49 guidance and datasets should also be used to ensure that all new development is designed for the climate it will experience over its design life. Further information will be provided in guidance on how these documents and datasets should be used.

COMPLIANCE WITH PLANNING POLICY - 1

In accordance with the planning policy, the principles of the cooling hierarchy have been applied to the refurbishment and extension:

1) Minimise external heat entering

As an extension and retrofit of an existing building, the orientation and mass could not be affected.

Generally, the existing fenestrations were retained and replaced with high-performance double-glazed units sensitive to the requirements of the conservation area. New glazed units were provided to the rear and side of the property, as well as on the new dormers and roof lights on the top floor.

Following the refurbishment, 17% of the external elevation area is glazed. LETI guidance in their Climate Emergency Design Guide[1] for Small Scale Housing suggests 10-25% across each orientation. The property has a reasonable level of glazing that does not disproportionately contribute to excess heat gain.

Significant effort and cost went into insulating the existing walls and bringing them up to current standards by adding internal wall insulation. The existing poor-performing roof was replaced with a highly insulated and airtight roof. These measures have helped to reduce heat entering the building, significantly reducing heat demand and the associated carbon emissions .

Following the initial works, external blinds were added to the roof lights on the top floor to minimise heat entering the building.

The material selection, and therefore albedo, is in keeping with the local conservation area.

The only flat roof on the property is at the top of the main pitch. This would not have been suitable for a green roof as it would be at odds with the pitched roof and general character of the conservation area, the access requirements, additional loading, and the additional depth it would create in the build-up.

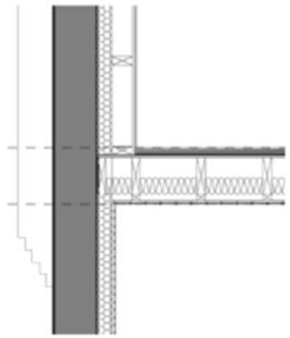
The selection of low g-values for the new glazing has minimised heat entering the building. The report models the replacement of existing glazing with a g-value of 0.55 and new modern glazing with a g-value of 0.4.

2) Minimise Internal Heating Gain

Energy-efficient appliances have been used, high-efficiency LED lighting has been installed, and pipework is insulated throughout. These measures have been installed to minimise internal heat gains.

1. LETI Climate Emergency Design Guide – Page 26 – Small scale housing

The percentage glazing across each façade is approximately 17% of wall area



Internal Wall Insulation – Calsitherm insulation board added to existing walls to greatly improve thermal performance whilst maintaining moisture permeability, protecting the fabric.

COMPLIANCE WITH PLANNING POLICY - 2

3) Exposed Thermal Mass and Ceiling Heights

The original building sets the existing floor-to-ceiling heights and could not be altered.

The external brick cavity walls have been internally insulated with Calsitherm board throughout. This significantly reduces the building heat load and meets the requirement of Building Regulation Part L. The internal high thermal mass structural walls have been retained to provide thermal mass in the property.

4) Passive Ventilation

The existing fenestrations have generally been retained, with new higher performance double glazed units. The new windows are fully operable and maximise the available opening area compared to the original sashes, which could not be entirely operated.

Where new openings have been installed, generally on the rear and side of the property, as well as at roof level, these provide large openable areas, which increase the overall level of ventilation. The roof opening also increases the stack ventilation up through the house.

5) Mechanical Ventilation

Mechanical ventilation with heat recovery has been installed at the basement level.

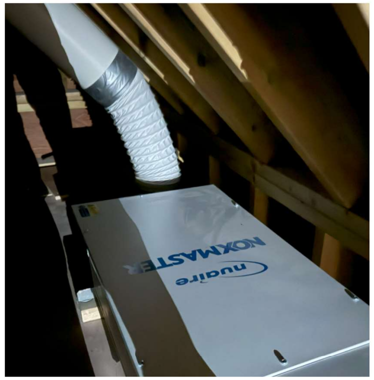
Positive input ventilation has been installed on the ground and second floors to increase air movement and passive cooling.

Mechanical extracts are provided to all WCs, Bathrooms, Utility rooms, and Kitchens as required by Building Regulation Part F.

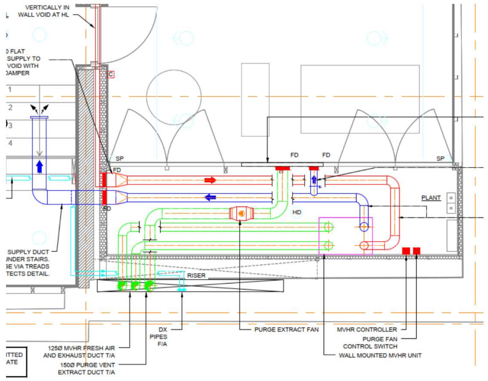
6) Active Cooling

The overheating analysis has modelled measures 1-5 above. Even after these improvements are made, the building is shown to be failing TM 59 (domestic) and TM 52 (non-domestic type spaces) and overheating. This is demonstrated in detail in the overheating thermal model carried out by Sustainable Construction Design.

The results demonstrate that, after following the Energy Hierarchy, Active cooling is required for the property to ensure a comfortable environment now and, increasingly, for the hotter climate anticipated.



External blinds on rooflights and positive input ventilation to increase free cooling



Mechanical Ventilation with Heat Recovery Unit in basement

MINIMISING CARBON DIOXIDE EMISSIONS

Whilst the TM59 analysis shows that cooling is required to provide sufficient comfort, the development also minimised the associated operational carbon emissions, following the principles of the Energy Hierarchy set in the Camden Plan CC1.

Be Lean

Extensive passive measures were taken to ensure a high thermal efficiency exceeding the requirement of Part L. Internal wall insulation was provided to the existing building. New high-performance double glazing replaced the existing poorly performing glazing. The roof was replaced to current standards, and property air-tightness was greatly improved.

These measures are not just for the present but investments for the future. They guarantee a low-energy building for the entire property lifespan, ensuring long-term energy savings and environmental sustainability.

Low-energy LED lighting was installed throughout, along with higher-efficiency appliances, minimising the electrical load.

Mechanical ventilation with heat recovery was installed in the basement, allowing energy to be recovered from the extracted air. It is planned to extend the MVHR system to the top floors.

Be Clean

A new high-efficiency condensing boiler was installed as part of the work.

Heating and hot water pipework was fully insulated to the requirements of Part L.

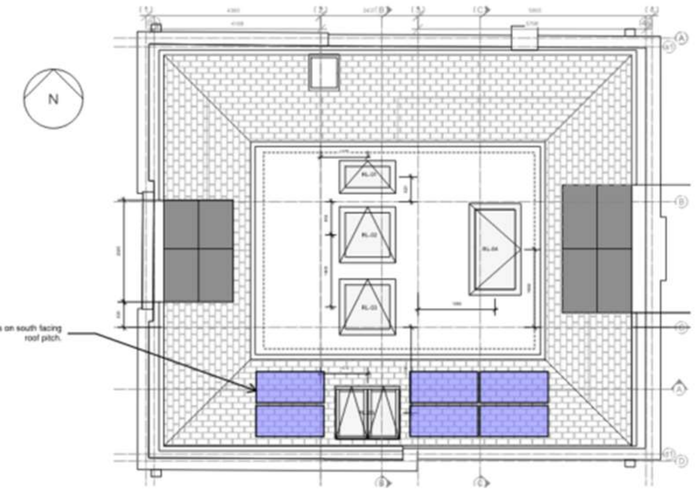
The installed VRF system with an external heat pump goes some way to electrifying the heat at the property at high seasonal efficiencies (+300%), though it is not the primary heat source. The system also allows heat/cooling to be moved around the house if there is a concurrent heating and cooling demand; this aligns with the London Plan requirement.

Be Green

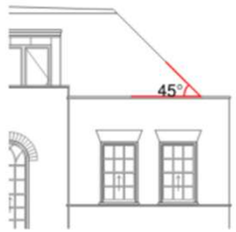
Whilst no renewable energy was installed as part of the completed refurbishment, a submission is being made as part of this planning submission to install photovoltaic panels on the south-facing pitched roof. Energy production on hot sunny days coincides with cooling demand and offsets the associated carbon emissions.

It is anticipated that the PV array will produce 2,400kWh of electricity per year, offsetting 330 Kg of carbon emissions.

A battery will be installed with the PVs to store and even out the usage of the electricity generated.



Standard Solar Panel Module
Approx size 1700mm Wide, 1100mm High
Eg. Longi, Perlight
Mounted on top of roof tiles with roof fixing.
Efficiency around 21%



APPENDIX – OVERHEATING ANALYSIS

Sustainable Construction Design has carried out the following overheating analysis. It is carried out to TM59, as the London Plan requires for domestic properties. Non-domestic spaces are modelled using TM52. It demonstrates that the property requires active cooling to comply with the guidance.

72 Maresfield Gardens

Thermal Comfort Report

SCS Ref: 32548

For:

Allwood Design

Prepared by:

Ben Mead

Sustainable Construction Services

Revision record

Description	Version	Date	By	Reviewed
Thermal Comfort Report	V1	9th April 2024	Ben Mead	CR
Thermal Comfort Report	V2	12th April 2024	Ben Mead	CR

EXECUTIVE SUMMARY

The purpose of this report is to convey the results from the analysis of the environmental performance of 72 Maresfield Gardens located in London. Specifically, this report summarises the work undertaken to review the level of overheating that may occur in spaces that are regularly occupied for significant periods of time. In addition, this report analyses if the cooling hierarchy, set out by the GLA, has been followed.

The proposed development comprises a medium sized, four-storey dwelling that has a west facing front façade. A mixed ventilation strategy is present with natural ventilation coming from a combination of traditional style sash windows, modern style glazed panels and sliding doors.

MVHR is present and provides background extract ventilation in bathrooms, utility and storage rooms whilst supplying fresh air to the gym, kitchen/living area and basement hall.

The temperature conditions occurring in these spaces have been compared against the standards described in the CIBSE TM59 document 'methodology for the assessment of overheating risk in homes'. The gym, playroom and office are assessed using the methodology described in TM52 'The Limits of Thermal Comfort' as they are not classed as a 'domestic' room type.

In summary, based on the details modelled in this report, and a typical summer scenario, compliance with TM59/ Part O targets have not been met for all of the relevant spaces when assessed against the DSY1 2020 50% high emissions weather file.

This is likely due to the reduced opening areas of the glazed panels due to restrictions, along with many fabric elements of the retained building having a relatively high u-value, resulting in a combination of higher heat gains with reduced capacity of purging through natural ventilation.

It should be noted that the current assessment does not include for internal blinds or curtains since these can vary considerably in performance and are normally installed by the occupant. Additionally, these are to be excluded as per Part O guidance.

This analysis has been undertaken using the detailed dynamic thermal simulation program ApacheSIM (IESVE, 2023) to predict the building's environmental performance.

There are a number of assumptions made in this report that should be carefully reviewed when using these results to determine design strategies for the proposed building going forward. Details relating to façade openings, internal gains, occupancies and building fabric details are all critical in determining the thermal comfort conditions occurring in each space so should be scrutinised appropriately to ensure any simulation of the building is an accurate reflection of the conditions likely to occur in each space when the building is in use.

There are a number of limitations in the modelling associated with the outputs in this report. In some cases, window openings have been set to open at a given temperature, where in reality, their ability to open is solely reliant upon the occupants in the room. It is highly likely that some windows will be opened sooner, and some will be opened later. Computer modelling cannot truly represent the actions (or inaction) of people.

Finally, it is important to consider that benchmarks set out in the legislation referred to in analysis cannot truly measure whether an individual will be "comfortable". The analysis can only ever be read as guidance and should never be seen as an absolute guarantee of either performance or comfort. At best is should be seen as an indicator of what many people might think, most of the time.

Therefore, it is recommended that the client for this project should try to understand this report, seek advice from the design team and review their own thoughts on comfort levels. Only once this has occurred will the client be in a position to decide on whether the level of comfort indicated in this report is likely to be acceptable once the building is in operation.

TABLE OF CONTENTS

1. INTRODUCTION

The purpose of this report is to convey the results from the analysis of the environmental performance of 72 Maresfield Gardens. Specifically, this report summarises the work undertaken to review the level of overheating that may occur in spaces that are regularly occupied for significant periods of time.

The proposed development comprises a medium sized dwelling. A mixed ventilation strategy is proposed for the occupied spaces, with background extract ventilation in bathrooms and kitchen and fresh air supplying the gym, kitchen/living area and the basement hallway.

The temperature conditions occurring in these spaces have been compared against the standards described in the CIBSE TM59 document 'methodology for the assessment of overheating risk in homes'. The analysis has been carried out on behalf of Allwood Design.

The analysis has been carried out on behalf of IESIS Consult.

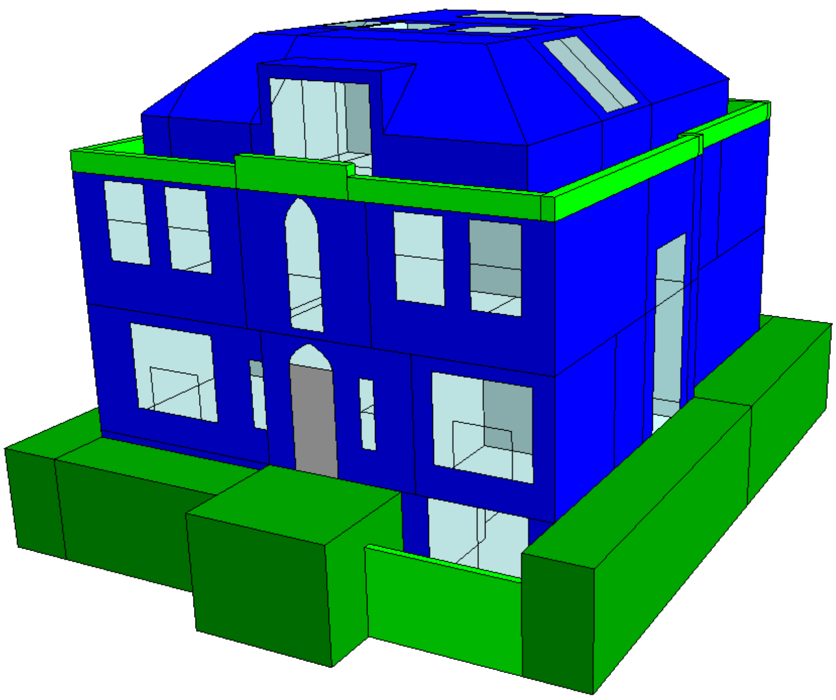


Figure 1: IES model screenshot of the proposed development

2. METHODOLOGY

2.1 SOFTWARE

The analysis summarised in this report has been performed using IES software which provides full dynamic thermal analysis. This analysis has been carried out in accordance with user instructions set out in IES manuals and CIBSE AM11 Building Energy and Environmental Modelling.

Where possible, modelling data and inputs have been taken from the architectural drawings, supplementary data (detailing the construction materials and the ventilation strategy) or written instructions from the design team. Where no data has been provided, outline estimations have been made and recorded in this document for review and analysis.

This analysis has been undertaken using the detailed dynamic thermal simulation program ApacheSIM (IESVE, 2023) to predict the building's environmental performance.

Solar Penetration Analysis was performed using Suncast (IESVE, 2023). Suncast enhances the thermal analysis by its prediction of solar gains, using the geometric relationship between the proposed building and the sun. Suncast also takes into consideration and shading associated with adjacent buildings and landscape features.

Bulk airflow models (Macroflo), within the IES software suite, were used to predict ventilation rates from openable windows.

2.2 WEATHER FILE SELECTION

The latest CIBSE weather files have been selected based on TM59 recommended 2020's CIBSE Design Summer Year (DSY) dataset. As part of this dataset there are three separate DSY scenarios available for various sites in the UK which represent the following:

- DSY 1 – Moderate
    - Represents a moderately warm summer year.

Best guidance suggests that for the purposes of modelling currently proposed developments as a minimum the DSY1 2020's weather files should be tested against.

TM59 states that the minimum requirement is that a DSY1 weather file should be used. This is the primary condition modelled in this study.

Guidance in TM59 suggests modelling of future weather files should only occur in circumstances where the client deems it appropriate, or they have a particular concern such as vulnerable occupants.

The following weather data set has been selected as per CIBSE Guidance TM59 and GLA requirements:

- London LWC DSY1 2020 50% High Emissions

2.3 CIBSE TM59 GUIDANCE / APPROVED DOCUMENT PART O

The 2017 CIBSE TM59 document 'Design methodology for the assessment of overheating risk in homes' is the main point of reference for establishing the overheating criteria used in this report. The contents of this document set out a standardised approach to predicting overheating risk for residential building design using dynamic thermal analysis.

This document provides a few assumptions associated with internal gains and occupancy usage patterns to enable a common approach across the industry. The details modelled in this study relating these aspects are provided for reference in this report (see Section 3 & Appendix 2).

TM59 sets out different thermal comfort assessment criteria depending on the room function type and the ventilation strategy in each space. The different criteria are set out below:

2.3.1 Criteria for Homes Predominantly Naturally Ventilated

a) For living rooms, kitchens and bedrooms: the number of hours during which operative temperature 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).(see section 2.4 for more detail)

a) For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

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

2.3.2 Criteria for Homes Predominantly Mechanically Ventilated

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 ˚C for more than 3% of the annual occupied annual hours (CIBSE Guide A [2015a]).

2.3.3 Criteria for Corridors

TM59 states that the overheating test for corridors should be based on the number of annual hours for which an operative temperature of 28 °C is exceeded. Whilst there is no mandatory target, if an operative temperature of 28 °C is exceeded for more than 3% of total annual hours, this should be flagged as a significant risk within the report.

2.3.4 Approved Document Part O – Limits on TM59

Approved Document Part O assessment is a new planning requirement for residential developments. It essentially follows the TM59 guidance with a few limits.

The limits on CIBSE TM59 modelling are detailed below:

'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°.

ii. Be fully open when the internal temperature exceeds 26°.

iii. Start to close when the internal temperature falls below 26°.

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 on 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.

i. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely.

ii. At night, windows, patio doors and balcony doors should be modelled as closed.

d. An entrance door should be included, which should be shut at all times.'

Additionally, internal blinds and curtains should not be included in the Part O assessment

2.4 TM52: ADAPTIVE THERMAL COMFORT CRITERIA

Overheating within the occupied spaces in this building have been evaluated against the first criterion set out within CIBSE TM52 'The Limits of Thermal Comfort: Avoiding Overheating in European Buildings'.

Rather than purely focussing on the number of hours 'out of range', TM52 looks at how likely someone is to be "comfortable". Simplistically this is trying to estimate what most people might feel, most of the time. All 'occupied' rooms within the proposed building have been analysed in this study occupied rooms are typically those occupied for more than 30 minutes at a time.

Although there are three criteria that CIBSE TM52 assesses, section 4.2 of TM59 states that compliance only needs to be met with TM52 Criterion 1, a description of this criterion is provided below:

A brief description of each of the three TM52 criteria are as follows:

2.4.1 Criterion 1

The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K (i.e. 1 °C) or more during the occupied hours of a typical non-heating season (1 May to 30 September).

2.4.2 Criterion 2

The second criterion 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. This performance is calculated using a non-linear, non-unitised calculation that is derived from each day's temperature data. The calculation produces a score, and if this score is below the numerical number of six, compliance with this criterion is achieved.

The figure of six was derived from research and statistical analysis of the data to define what most people thought was acceptable most of the time.

2.4.3 Criterion 3

The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

2.5 RELEVANCE OF RESULTS

Fundamentally it is important to consider that TM59/TM52 or CIBSE Guide A benchmarks cannot truly measure whether an individual will be "comfortable".

As we are all individuals, by default you cannot predict how one individual will react to internal environmental conditions. Gender, age, health, mental state and familiarity with the space all affect the perception of comfort.

Furthermore, the modelling is undertaken using weather data that has been derived from historic weather data and adjusted to represent a "warm year". Therefore, it can never truly mimic future levels of occupancy, accurately portray how the building was actually built or accurately predict the weather using future data.

The analysis can only ever be read as guidance and should never be seen as an absolute guarantee of either performance or comfort. At best it should be seen as an indicator of what many people might think, most of the time.

Therefore, it is recommended that the client for this project should try to understand this report, seek advice from the design team and review their own thoughts on comfort levels. Only once this has occurred will the client be able to decide on whether the level of comfort indicated in this report is likely to be acceptable once the building is in operation.

2.6 PLANNING AND LOCAL POLICIES

Under legislation establishing the GLA, a London Spatial Development Strategy known as the London plan is an overall strategic plan for London that sets out an integrated economic, environmental, transport and social framework for the development of London. In accordance with the legislation the Plan regards to climate change and the consequence of climate change, and sustainable infrastructure.

Several policies are outlined in the London Plan, with Policy SI 4 Managing heat risk relevant to this development assessment. Policy SI 4 Managing heat risk requires that developments should minimise adverse impacts on the urban heat island through good design and construction practices. It suggests that major developments demonstrate reduction of potential overheating in accordance with the cooling hierarchy, shown below:

- Reduction in the amount of heat entering a building through use of orientation, shading, materials, fenestration, insulation or green infrastructure
- Minimisation of internal heat generation
- Management of heat within the building through use of exposed internal mass and high ceilings.
- Passive ventilation
- Mechanical ventilation
- Active cooling

The Camden Local Plan also sets out the Council's planning policies and replaces the Core Strategy and Development Policies adopted in 2010, with the goal of ensuring Camden has a robust, effective, and up-to-date planning policies. It is also in general conformity with the London Plan.

To achieve its aim of making Camden a better borough, the Camden Local Plan contains a set of strategic objectives and planning policies. Strategic Objective 9, ensuring the development in Camden is designed to adapt to the effects of climate change, is identified as relevant to this assessment, along with The Camden Local Plan Policy CC2 Adapting to climate change.

Within Plan Policy CC2, overheating is a key risk identified which requires adaptation measures. Policy CC2 Adapting to climate change suggests that all developments adopt adaptation measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy.

3. MODELLING DATA

3.1 MODEL IMAGES

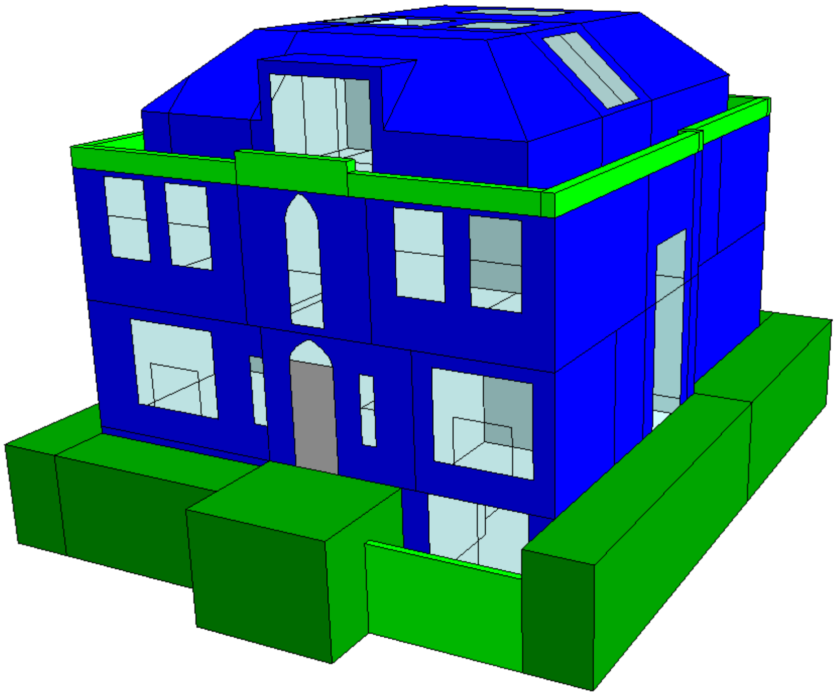


Figure 2: IES model screenshot (View from West)

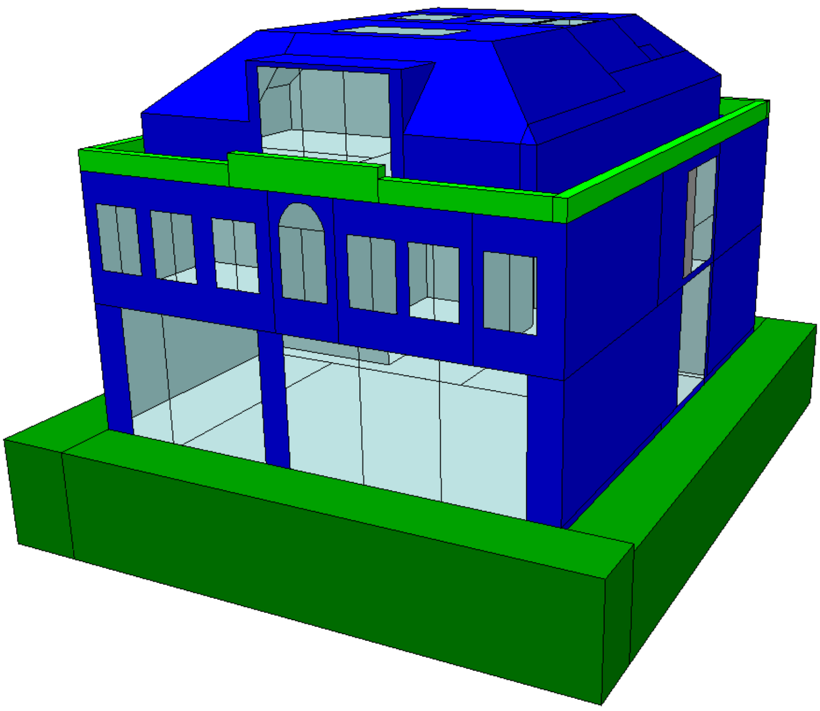


Figure 3: IES model screenshot (View from East)

3.2 BASIC THERMAL MODELLING ASSUMPTIONS

3.2.1 Spaces under Assessment

The following spaces have been assessed under the following criteria to determine their levels of overheating.

- TM59
  - Basement – Bedroom
  - GF – Kitchen/Living/Dining
  - 1F – Master Bedroom
  - 1F – Childrens Bedroom 01
  - 1F – Childrens Bedroom 02
  - 1F – Guest Bedroom
  - 2F – Bedroom
- TM52
  - Basement – Gym
  - GF – Playroom
  - 2F – Office

In addition, circulation spaces were assessed as to their levels of overheating.

3.2.2 Internal Gains

A number of internal gains have been applied to the spaces within our model. Refer to Appendix 1 of this document where a summary of the details associated with each gain type and how they have been incorporated into the model have been placed in a table.

The information relating to these internal gains, including the occupancy profiles associated with each, have been derived by either appropriate industry conventions (i.e. TM59), experience on modelling buildings of a similar type, or from information provided by the design team.

It is important to note that although best practice TM59 guidelines regarding occupancy usage profiles have been followed in this study, this cannot accurately reflect likely occupancy patterns across the flats in reality. For example, TM59 recommends that a 24-hour occupancy profile is applied in bedrooms, although this allows for continual internal gains occurring in the space, it also means that an occupant is present to open and close the windows. In reality it is likely that bedrooms could remain completely unoccupied during the day with the windows closed.

It is difficult to account for every eventuality in computer modelling, however logic dictates that if any occupant enters a space that is perceived as too warm, they will subsequently open windows to alleviate the situation.

Detailed information about the internal gains in each space can be found in appendix 1.

3.2.3 Openings

Another important aspect of the model relates to profiles and openable areas that have been set for the windows and doors. Following CIBSE TM59 guidance and discussions with the architect, we created the different window profiles shown below.

Firstly, recessed windows will not provide the same degree of free openable area when compared with windows flush to the façade and this must be considered when reading this report. As the diagram below illustrates, this recess could significantly lower the total effective free area of a window. To incorporate this a percentage reduction will be added to the opening area for windows and doors based on the extent of the reveals and other obstructions.

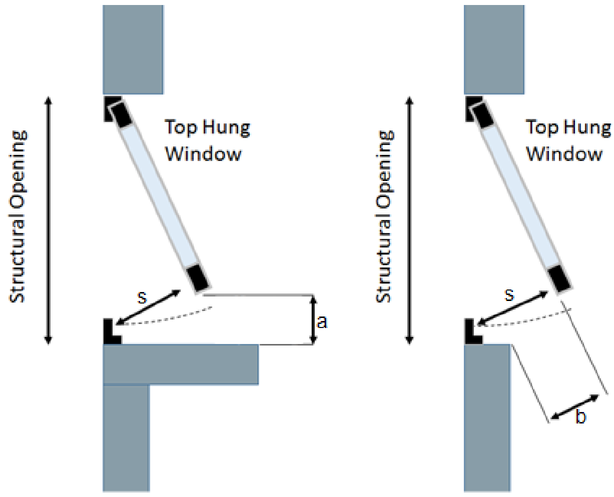


Figure 4: Example of effective free opening area reduced by protrusion of window sill (from BB101 figure 8-1).

The equivalent area of the windows was calculated using the BB101 discharge coefficient calculator, in line with Part O guidance, Appendix D. As it states that the equivalent area of a window can be calculated using one of the following.

a. The discharge coefficient calculator, available online at: https://www.gov.uk/government/publications/classvent-and-classcool-school-ventilation-design-tool.

b. Tables D1 to D9 in Approved Document O: Overheating.

In line with Part L, Part O and Part K, openable windows below 1100mm would need to be restricted to 100mm, whilst windows above 1100mm are restricted to 650mm as this is considered the maximum arm length which one can use to open the windows.

Information about each window, their fabric performance and opening area are available in appendix 2. The location of the openable windows can be found in appendix 3.

3.2.4 Mechanical Ventilation

Mechanical ventilation is considered and assessed where natural ventilation is not sufficient to provide thermal comfort compliance.

Where applied, the setback flow rate for the kitchen/living room is modelled at 13 l/s. Bathrooms are modelled with a setback flow rate of 8 l/s. All spaces that contain a mechanical supply are modelled with 0.3 l/s/m^2. This is done per floor basis so all spaces on each floor contain a supply rate as agreed with the client.

An additional simulation was run with an adjusted flow rate of +50% to further show the effect of ventilation rates on compliance.

It should be noted these values are input as per Part L 2021 ventilation rates and are not with consideration to other mechanical engineering requirements or acoustic compliance.

More information about ventilation rates can be found in appendix 4.

3.2.5 Shading Devices

72 Maresfield Gardens doesn't have any prominent external shading features other than the external blinds fixed to the rooflights and the buildings that surround the property. These are situated to the North and South facing facades and supply a small amount of shading in the early and later periods in the day.

External blinds are fixed to the rooflights of the building which provide good shading. They are modelled to open and close when the window experiences a certain amount of solar gains through the pane. In addition, they only allow 20% of light through.

A parapet wall which surrounds the top floor, and the basement bedroom provides limited shading to the glazing on the those areas however it is deemed insignificant to be classed as a 'shading device'

3.2.7 Infiltration Rate

Based on the proposed target air leakage and the guidance in CIBSE Guide A Table 4.24, an average infiltration rate of 0.25 air changes per hour has been applied throughout the modelled areas.

3.3 BASIC BUIDLING FABRIC DETAILS

Correspondence with the design team confirmed the following design intent relating to the buildings' fabric thermal performance. A breakdown of the building fabric build ups and the thermal performance of each element are provided in Table 2 below. The notes in red are assumptions that need to be reviewed by the design team.

Model Element	Input Used	Evidence References (For SCS use)
Basic Details for Part L		
Building Type	Residential Spaces	Modellers Judgement
Building Category	Other	
Drawing Version Used for Geometry	Drawing No - Plans - 158-(99-103) Drawing No - Sections - 158-(131-133) Drawing No - Elevations - 158-(141-145)	Drawings sent through from 'Ben Allwood' - 20/02/2024
Opaque Building Fabric Details - External Walls		
Wall Type 4 (2F) - 0.15u - U Value (W/m^2.K)	0.15	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Wall Type 4 (2F) - 0.15u - Fabric	CLAY TILE 4.0mm, CELLULAR POLYISOCYANURATE - (ASHRAE) 120.0mm, VCL 1.0mm, Plywood 18.0mm, Membrane 1.0mm, 25 25.0mm	
Wall Type 1 (Basement) - 0.25u - U Value (W/m^2.K)	0.25	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Wall Type 1 (Basement) - 0.25u - Fabric	BRICKWORK (OUTER LEAF) 102.5mm, Cavity 50.0mm, BRICKWORK (INNER LEAF) 102.5mm, CELLULAR POLYISOCYANURATE - (ASHRAE) 50.0mm, Plasterboard 25.0mm	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Wall Type 3 (GF;1F) - 0.7u - U Value (W/m^2.K)	0.7	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Wall Type 3 (GF;1F) - 0.7u - Fabric	BRICKWORK (OUTER LEAF) 102.5mm, Cavity 50.0mm, BRICKWORK (INNER LEAF) 102.5mm, CELLULAR POLYISOCYANURATE - (ASHRAE) 50.0mm, Plasterboard 25.0mm	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Opaque Building Fabric Details - Ground/Exposed Floors		
Basement Floor - 0.25u - U Value (W/m^2.K)	0.25	Confirmed via email from 'Antoine Reaud' - 11/03/2024

Basement Floor - 0.25u - Fabric	Reinforced Concrete 250.0mm, Insulation 50.0mm, SCREED 55.0mm, Chipboard Flooring 21.0mm	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Opaque Building Fabric Details - Roofs		
Roof Type 3 (Flat) - 0.15 u - U Value (W/m².K)	0.15	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Roof Type 3 (Flat) - 0.15 u - Fabric	Rainscreen 4.0mm, CELLULAR POLYISOCYANURATE - (ASHRAE) 120.0mm, Roof Membrane 1.0mm, VCL 1.0mm, Plywood 18.0mm, Plasterboard 25.0mm	
Roof Type 2 (Pitched) - 0.15 u - U Value (W/m².K)	0.15	
Roof Type 2 (Pitched) - 0.15 u - Fabric	CLAY TILE 4.0mm, CELLULAR POLYISOCYANURATE - (ASHRAE) 120.0mm, VCL 1.0mm, Plywood 18.0mm, Membrane 1.0mm, 25 25.0mm	
Roof Type 1 (Flat) - 0.13 u - U Value (W/m².K)	0.13	
Roof Type 1 (Flat) - 0.13 u - Fabric	VCL 1.0mm, CELLULAR POLYISOCYANURATE - (ASHRAE) 175.0mm, VCL 1.0mm, Plywood 18.0mm, 25 25.0mm	
Opaque Building Fabric Details - Exterior Doors/Opaque Panels		
Front Door - 1.4u - U Value (W/m².K)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Front Door - 1.4u - Fabric	Plywood 54.0mm	Confirmed from '158_Schedules_Construction.pdf'
Openable Vent - 1.4u - U Value (W/m².K)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Openable Vent - 1.4u - Fabric	Plywood 54.0mm	Confirmed from '158_Schedules_Construction.pdf'
Opaque Building Fabric Details - Internal Walls		
Internal Partition - 50mm Insulation - U Value (W/m².K)	0.57	Software default value generated using build-up
Internal Partition - 50mm Insulation - Fabric	Plasterboard 25.0mm, GLASSWOOL 50.0mm, Plasterboard 25.0mm	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Opaque Building Fabric Details - Internal Floors/Ceilings		
Ground Floor - 175mm Concrete - U Value (W/m².K)	2.2	Software default value generated using build-up

Ground Floor - 175mm Concrete - Fabric	Reinforced Concrete 175.0mm, SCREED 20.0mm, Chipboard Flooring 21.0mm	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
General Internal Floor - U Value (W/m².K)	0.29	Software default value generated using build-up
General Internal Floor - Fabric	Plasterboard 25.0mm, Cavity 38.0mm, GLASSWOOL 100.0mm, Plywood 30.5mm, Chipboard Flooring 22.0mm	Confirmed from '190426_158_Maresfield Gardens - Section - Construction.pdf'
Transparent Building Fabric Elements - External Glazing - W0.05 Fixed Panel (1.4u; 0.76g; 6.6%FF)		
U Value (W/m².K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	6.6	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W0.06 (1.4u; 0.76g; 19.5%FF)		
U Value (W/m².K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	19.5	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.01/02/04/05 (1.4u; 0.76g; 36.8%FF)		
U Value (W/m².K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	36.8	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.01/02/04/05 Fixed Panel (1.4u; 0.76g; 32.6%FF)		
U Value (W/m².K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	32.6	Calculated using elevation drawings

G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.03 (1.4u; 0.76g; 22.9%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	22.9	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.03 Fixed Panel (1.4u; 0.76g; 33%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	33	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.06/07/08/10/11/12 (1.4u; 0.76g; 35.2%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	35.2	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.09 (1.4u; 0.76g; 21.9%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	21.9	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	

Transparent Building Fabric Elements - External Glazing - W1.13 (1.4u; 0.76g; 17.1%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	17.1	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W1.13 Obscured (1.4u; 0.76g; 19.5%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	19.5	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W2.01 (1.4u; 0.76g; 31.4%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	31.4	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W2.02 (1.4u; 0.76g; 10.5%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	10.5	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - D1.04/05 GF (1.4u; 0.76g; 25.9%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024

Frame Percentage (%)	25.9	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - WB.01 Basement Door (1.4u; 0.76g; 22.6%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	22.6	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W0.01/02 (1.4u; 0.76g; 36.2%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	36.2	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W0.01/02 Fixed Panel (1.4u; 0.76g; 35.3%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	35.3	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W0.04 Door (1.4u; 0.76g; 14.3%FF)		
U Value ($W/m^2.K$) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	14.3	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024

Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W0.04 Fixed Panel (1.4u; 0.76g; 7.2%FF)		
U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	7.2	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - W0.05 Sliding Door (1.4u; 0.76g; 6.6%FF)		
U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	6.6	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - External Glazing - D1.GF Fixed Panel (1;4u; 0.76g; 31%FF)		
U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	31	Calculated using elevation drawings
G Value (SHGC)	0.55	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - Skylights - RL.01 (1.4u; 0.76g; 50.4%FF)		
U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	50	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - Skylights - RL.02/03 (1.4u; 0.76g; 37.2%FF)		

U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	37.2	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - Skylights - RL.04 (1.4u; 0.76g; 33.1%FF)		
U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	33.1	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Transparent Building Fabric Elements - Skylights - RL.05 (1.4u; 0.76g; 35.8%FF)		
U Value (W/m^2.K) (including frame)	1.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Frame Percentage (%)	35.8	Calculated using elevation drawings
G Value (SHGC)	0.4	Confirmed via email from 'Antoine Reaud' - 11/03/2024
Light Transmittance Factor	0.8	
Other Fabric Details		
Infiltration Method	0.25	CIBSE Guide A Table 4.24

Table 1: Construction build ups and thermal performances of building fabric

4. RESULTS

4.1 TM59 COMPLIANCE

4.1.1 Results – DSY1 2020 High Weather Data – MVHR/Mech Ven

In line with the GLA guidance, the model has been assessed using the CIBSE DSY1 2020 High weather year. The results are reported in Table 3,4 & 5.

	TM52	Bedrooms Only	TM59
	Criterion 1 (%Hrs Top-Tmax>=1K)	No hours > 26°C	PASS / FAIL
Basement - Bedroom	16.1	551	FAIL
1F - Master Bedroom	3.2	113	FAIL
1F - Childrens Bedroom 01	10	385	FAIL
1F - Childrens Bedroom 02	12	433	FAIL
1F - Guest Bedroom	4	225	FAIL
2F - Bedroom	6.7	209	FAIL
GF - Kitchen/Living/Dining	2.8	N/A	PASS

Table 2: *TM59 Results Using DSY1 2020 Weather Data.*

	TM52			
	Criterion 1 (%Hrs Top-Tmax>=1K)	Criteria 2: (Max. Daily Deg.Hrs)	Criterion 3 (Max.DeltaT)	Criteria Failed
Basement - Gym	10.5	9	4	1 & 2
GF - Playroom	21.2	18	5	1 & 2 & 3
2F - Office	18.2	37	7	1 & 2 & 3

Table 3: *TM52 Results Using DSY1 2020 Weather Data.*

Corridors	Percentage hours>28°C	Risk of Overheating?
Basement - Circ	1.6	NO
Basement - Stairway Hall	1.7	NO
GF - Stairway	3.6	YES
GF - Entrance Hall	1.7	NO
1F - Master Circ	10.4	YES
2F - Stairway Hall	9.7	YES
1F - Stairway Hall	6.4	YES

Table 4: *TM59 Results Using DSY1 2020 Weather Data for Circulation Spaces.*

4.1.2 Results – DSY1 2020 High Weather Data – MVHR/Mech Ven +50% Boost

This model represents mechanical ventilation flow rates boosted by 50%. As exact flow rates are unknown all space use guidance from Part F. This methodology uses 0.3 l/s per m^2 of floor area. Extract rates in bathrooms, utility rooms and kitchens are as per Part F.

	TM52	Bedrooms Only	TM59
	Criterion 1 (%Hrs Top-Tmax>=1K)	No hours > 26°C	PASS / FAIL
Basement - Bedroom	11.1	469	FAIL
1F - Master Bedroom	3	108	FAIL
1F - Childrens Bedroom 01	8.4	352	FAIL
1F - Childrens Bedroom 02	10.3	388	FAIL
1F - Guest Bedroom	3.3	203	FAIL
2F - Bedroom	6	193	FAIL
GF - Kitchen/Living/Dining	2.6	N/A	PASS

Table 5: *TM59 Results Using DSY1 2020 Weather Data with Boosted Ventilation Rates.*

	TM52			
	Criterion 1 (%Hrs Top-Tmax>=1K)	Criteria 2: (Max. Daily Deg.Hrs)	Criterion 3 (Max.DeltaT)	Criteria Failed
Basement - Gym	6.5	9	4	1 & 2
GF - Playroom	17	16	5	1 & 2 & 3
2F - Office	16.7	37	7	1 & 2 & 3

Table 6: *TM52 Results Using DSY1 2020 Weather Data with Boosted Ventilation Rates.*

Corridors	Percentage hours>28°C	Risk of Overheating?
Basement - Circ	1.6	NO
Basement - Stairway Hall	1.7	NO
GF - Stairway	2.8	NO
GF - Entrance Hall	1.7	NO
1F - Master Circ	8.6	YES
2F - Stairway Hall	7.4	YES
1F - Stairway Hall	4.8	YES

Table 7: *TM59 Results Using DSY1 2020 Weather Data for Circulation Spaces with Boosted Ventilation Rates.*

5. CONCLUSION

In summary, based on the details modelled in this report, and a typical summer scenario, compliance with TM59 and TM52 targets have not been met for all of the relevant spaces when assessed against the DSY1 2020 50% high emissions weather file. This means that further steps should be taken to help manage the levels of overheating.

This is likely due to the reduced opening areas of the glazed panels due to restrictions, along with many fabric elements of the retained building having a relatively high u-value, resulting in a combination of higher heat gains with reduced capacity of purging through natural ventilation.

It should be noted that the current assessment does not include for internal blinds or curtains since these can vary considerably in performance and are normally installed by the occupant. Additionally, these are to be excluded as per Part O guidance.

As general guidance to occupants during heat waves, curtains or blinds could certainly be utilised to reduce operative temperatures, especially if used correctly.

In general (and if safe to do so), curtains and windows should be left open at night to allow cooler, nighttime air to flow freely and reduce the air temperature of the rooms to as low as possible by morning. Curtains should then be closed when occupants wake to minimise solar gains that enter the flats from that point forward.

If the dwelling is to be unoccupied during the day, closing the windows as well as the blinds early in the morning might help to preserve the cooler, nighttime air and keep out the warmer external air, thus resulting in lower temperatures when the occupant returns later in the day.

In addition, air movement speed can be a significant factor in occupant perception of temperature. During heat waves, we would recommend that occupants have access to localised fans.

Relating to the London Plan and Camden Local Plan, the assessment follows the cooling hierarchy and passive design measures have generally been followed. As this existing development is within a conservation zone, opportunities to reduce heat entering the development through design measures are limited by the existing building mass and form. Internal heat generation is likely minimal as it is a residential dwelling and will likely not have any installed plant that generates large amount of heat in its operation.

Compliance according to the London Plan Policy SI 4 and when assessing the CIBSE 2020 High Emissions has previously always been difficult to pass with most developments due to the extremity of the weather file. Usually, this assessment is for the design of new builds therefore there is flexibility in building form/fabric and glazing which allow for alterations to be made based on simulation results. However, being an existing building there isn't such allowance for design changes.

There are a number of assumptions made in this report that should be carefully reviewed when using these results to determine design strategies for the proposed building going forward. Details relating to façade openings, internal gains, occupancies and building fabric details are all critical in determining the thermal comfort conditions occurring in each space so should be scrutinised appropriately to ensure any simulation of the building is an accurate reflection of the conditions likely to occur in each space when the building is in use.

There are a number of limitations in the modelling associated with the outputs in this report. In some cases, window openings have been set to open at a given temperature, where in reality, their ability to open is solely reliant upon the occupants in the room. It is highly likely that some windows will be opened sooner, and some will be opened later. Computer modelling cannot truly represent the actions (or inaction) of people.

Finally, it is important to consider that benchmarks set out in the legislation referred to in analysis cannot truly measure whether an individual will be "comfortable". The analysis can only ever be read as guidance and should never be seen as an absolute guarantee of either performance or comfort. At best is should be seen as an indicator of what many people might think, most of the time.

Therefore, it is recommended that the client for this project should try to understand this report, seek advice from the design team and review their own thoughts on comfort levels. Only once this has occurred will the client be in a position to decide on whether the level of comfort indicated in this report is likely to be acceptable once the building is in operation.

APPENDICES

APPENDIX 1 - INTERNAL GAINS

TM59 Specific Table – Profiles and gains sourced directly from relevant guidance found in TM59 and CIBSE Guide A.

Room Type	Internal Gain Type	Maximum Sensible Gain	Maximum Latent Gain	Maximum Occupancy	Profile
Kitchen/Living/Dining	People	75 W	55 W	6	100% from 9am to 10pm
	Lighting	2 W/m^2			On from 6pm to 11pm
	Equipment	450 W			24.4% from 9am to 6pm and 10pm to 12pm 100% from 6pm to 8pm 44.4% from 8pm to 10pm 18.8% rest of the day
Double Bedrooms	People	75 W	55 W	2	70% from 11pm to 8am 100% from 8am to 9am and from 10pm to 11pm 50% from 9am to 10pm
	Lighting	2 W/m^2			On from 6pm to 11pm
	Equipment	80 W			80 W from 8am to 11pm 10 W during sleeping hours
Double Bedrooms - (Children)	People	56.25 W	41.25 W	2	70% from 11pm to 8am 100% from 8am to 9am and from 10pm to 11pm 50% from 9am to 10pm
	Lighting	2 W/m^2			On from 6pm to 11pm
	Equipment	80 W			80 W from 8am to 11pm 10 W during sleeping hours

Office	People	75 W	55 W	2	100% from 7:30am to 12pm 0% from 12pm to 1pm 100% from 1pm to 6:30pm
	Lighting	4 W/m^2			
	Equipment	1000 W			
Playroom - (Children)	People	56.25 W	41.25 W	4	100% from 4pm to 9pm
	Lighting	4 W/m^2			
	Equipment	150 W			
Gym	People	150 W	99 W	3	100% from 6pm to 9pm
	Lighting	4 W/m^2			
	Equipment	500 W			
Utility	Lighting	2 W/m^2			On from 8am to 10am On from 6pm to 8pm
	Equipment	400 W			
Plant Room	Lighting	2 W/m^2			On from 6pm to 11pm
	Equipment	25 W/m^2			On continuously
WC & Bathrooms	Lighting	2 W/m^2			On from 6pm to 11pm
Circulation	Lighting	2 W/m^2			On continuously (if no PIR)
Storage	Lighting	2 W/m^2			On from 6pm to 11pm

APPENDIX 2 – WINDOW OPENINGS

<table>
<tr><th>Opening Type Ref</th><th>Width (mm)</th><th>Height (mm)</th><th>Area (m^2)</th><th>Glazed Area (m^2)</th><th>Frame Factor</th><th>U value</th><th>G value</th><th>Opening Type</th><th>Opening Restriction mm</th><th>Openable Area %</th><th>Profile Active Hours</th></tr>
<tr><td>D1.GF - Front Entrance Door</td><td>950</td><td>2100</td><td>2.00</td><td colspan="2">Solid</td><td>1.4</td><td>-</td><td colspan="4" rowspan="4">Fixed</td></tr>
<tr><td>D1.GF - Fixed Panel</td><td>950</td><td>-</td><td>0.29</td><td>0.20</td><td>31.0%</td><td>1.4</td><td>0.55</td></tr>
<tr><td>D1.04/05.GF</td><td>300</td><td>1350</td><td>0.41</td><td>0.30</td><td>25.9%</td><td>1.4</td><td>0.55</td></tr>
<tr><td>WB.01 (Basement Bedroom) - Lightwell Door</td><td>1000</td><td>2300</td><td>2.30</td><td>1.78</td><td>22.6%</td><td>1.4</td><td>0.55</td></tr>
<tr><td>W0.01 (Playroom) - Window</td><td>900</td><td>1150</td><td>1.04</td><td>0.66</td><td>36.2%</td><td>1.4</td><td>0.55</td><td>Sash</td><td>100</td><td>8.70%</td><td>0000 to 1700 - 0%
1700 to 2100 - 100%*
2100 to 2400 - 0%</td></tr>
<tr><td>W0.02 (Coat Room) - Window</td><td>900</td><td>1150</td><td>1.04</td><td>0.66</td><td>36.2%</td><td>1.4</td><td>0.55</td><td colspan="4">Fixed due to unoccupied room</td></tr>
<tr><td>W0.(01)/(02) (Playroom)/(Coat Room) - Fixed Panel</td><td>1950</td><td>1750</td><td>2.38</td><td>1.54</td><td>35.3%</td><td>1.4</td><td>0.55</td><td colspan="4" rowspan="2">Fixed</td></tr>
<tr><td>W.03 (Kitchen/Living/Dining) - Fixed Panel</td><td>1950</td><td>2650</td><td>5.17</td><td>4.91</td><td>5.0%</td><td>1.4</td><td>0.55</td></tr>
<tr><td>W.04 (Kitchen/Living/Dining) - Door</td><td>1000</td><td>2650</td><td>2.65</td><td>2.27</td><td>14.3%</td><td>1.4</td><td>0.40</td><td>Side Hung Door</td><td>1130</td><td>63.30%</td><td>0000 to 0900 –0%
0900 to 2200 –100% **
2200-2400 –0%</td></tr>
</table>

<table>
<tr><th>Opening Type Ref</th><th>Width (mm)</th><th>Height (mm)</th><th>Area (m^2)</th><th>Glazed Area (m^2)</th><th>Frame Factor</th><th>U value</th><th>G value</th><th>Opening Type</th><th>Opening Restriction mm</th><th>Openable Area %</th><th>Profile Active Hours</th></tr>
<tr><td>W.04 (Kitchen/Living/Dining) - Fixed Panel</td><td>2200</td><td>2650</td><td>5.83</td><td>5.41</td><td>7.2%</td><td>1.4</td><td>0.40</td><td colspan="4">Fixed</td></tr>
<tr><td>W.05 (Kitchen/Living/Dining) - Sliding Door</td><td>1600</td><td>2650</td><td>4.24</td><td>3.96</td><td>6.6%</td><td>1.4</td><td>0.40</td><td>Sliding Door</td><td>-</td><td>80.00%</td><td>0000 to 0900 –0%
0900 to 2200 –100% **
2200-2400 –0%</td></tr>
<tr><td>W.05 (Kitchen/Living/Dining) - Fixed Panel</td><td>1600</td><td>2650</td><td>4.24</td><td>3.96</td><td>6.6%</td><td>1.4</td><td>0.40</td><td colspan="4" rowspan="2">Fixed</td></tr>
<tr><td>W.06 (GF & 1F Stairway) - Fixed Panel</td><td>1600</td><td>4100</td><td>6.56</td><td>5.28</td><td>19.5%</td><td>1.4</td><td>0.40</td></tr>
<tr><td>W1.01/02/04/05 (Childrens Bedroom) - Window</td><td>950</td><td>800</td><td>0.76</td><td>0.48</td><td>36.8%</td><td>1.4</td><td>0.55</td><td>Sash</td><td>100</td><td>12.50%</td><td>0000 to 0800 –100% *
0800 to 2300 –100% **
2300-2400 –100% *</td></tr>
<tr><td>W1.01/02/04/05 (Childrens Bedroom) - Fixed Panel</td><td>950</td><td>750</td><td>0.71</td><td>0.48</td><td>32.6%</td><td>1.4</td><td>0.55</td><td colspan="4">Fixed</td></tr>
<tr><td>W1.03 (Childrens Bathroom) - Window</td><td>700</td><td>1000</td><td>0.70</td><td>0.54</td><td>22.9%</td><td>1.4</td><td>0.55</td><td colspan="4">Fixed due to unoccupied room</td></tr>
<tr><td>W1.03 (Childrens Bathroom) - Fixed Panel</td><td>700</td><td>-</td><td>0.88</td><td>0.59</td><td>33.0%</td><td>1.4</td><td>0.55</td><td colspan="4">Fixed</td></tr>
<tr><td>W1.06/07/08 (Master Bedroom)</td><td>475</td><td>1300</td><td>0.62</td><td>0.40</td><td>35.2%</td><td>1.4</td><td>0.55</td><td>Side Hung</td><td>100</td><td>23.80%</td><td>0000 to 0800 –100% *
0800 to 2300 –100% **
2300-2400 –100% *</td></tr>
</table>

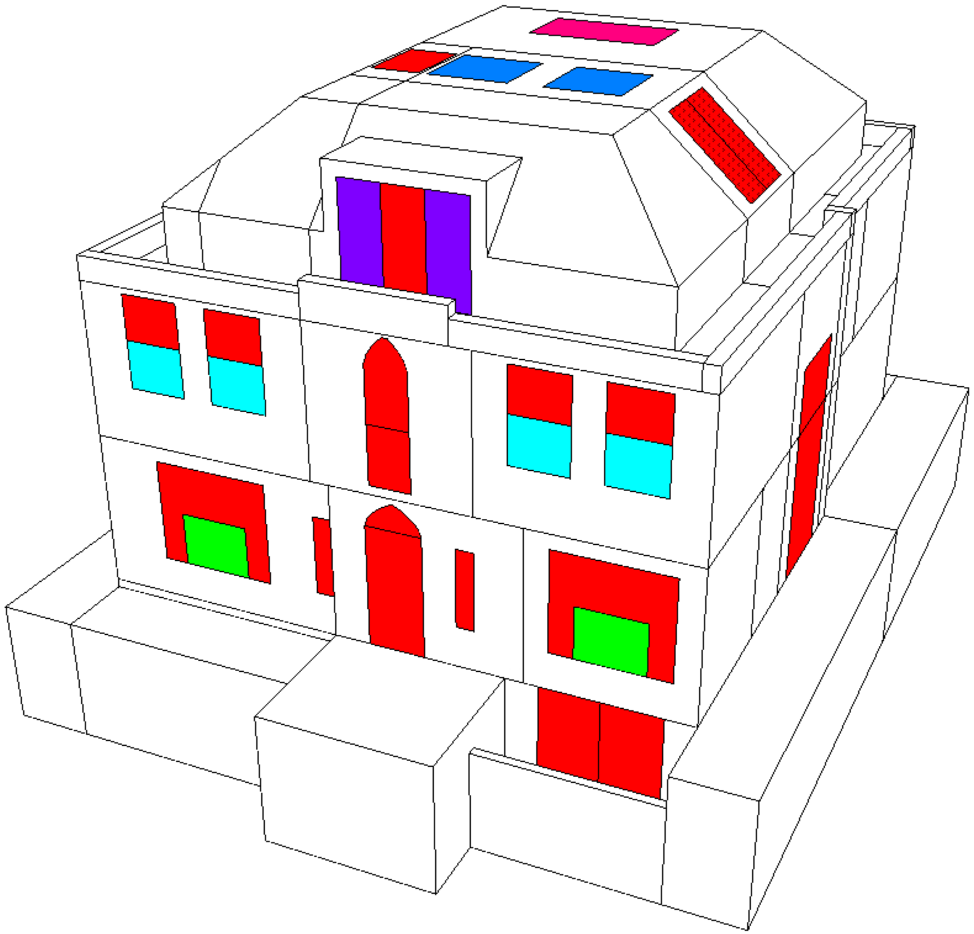
Opening Type Ref	Width (mm)	Height (mm)	Area (m^2)	Glazed Area (m^2)	Frame Factor	U value	G value	Opening Type	Opening Restriction mm	Openable Area %	Profile Active Hours
W1.09 (Master Circulation) - Window	475	1300	0.62	0.40	35.2%	1.4	0.55	Side Hung	100	23.80%	0000 to 0900 –0% 0900 to 2200 –100% ** 2200-2400 –0%
W1.09 (Master Circulation) - Fixed	475	-	0.32	0.25	21.9%	1.4	0.55	Fixed			
W1.(10/11)/(12) (Dressing Room/Master Bathroom)	475	1300	0.62	0.40	35.2%	1.4	0.55	Fixed due to unoccupied room			
W1.13 (Guest Bedroom) - Openable Vent	550	2200	1.21	Solid		1.4	-	Side Hung	100	23.80%	0000 to 0800 –100% * 0800 to 2300 –100% ** 2300-2400 –100% *
W1.13 (Guest Bedroom) - Fixed Panel	1400	1250	1.75	1.45	17.1%	1.4	0.55	Fixed			
W1.13 (Guest Bedroom) - Fixed Obscured Panel	1400	950	1.33	1.07	19.5%	1.4	0.55				
W2.01 (Bedroom) - Window	700	1750	1.23	0.84	31.4%	1.4	0.40	Side Hung	100	19.80%	0000 to 0800 –100% * 0800 to 2300 –100% ** 2300-2400 –100% *
W2.01 (Bedroom) - Fixed	700	1750	1.23	0.84	31.4%	1.4	0.40	Fixed			
W2.02 (Office) - Window	900	1950	1.76	1.57	10.5%	1.4	0.40	Side Hung	100	16.60%	0000 to 0730 - 0% 0730 to 1200 - 100%* 1200 to 1300 - 0% 1300 to 1830 - 100%* 1830 to 2400 - 0%
W2.02 (Office) - Fixed	900	1950	1.76	1.57	10.5%	1.4	0.40	Fixed			

Opening Type Ref	Width (mm)	Height (mm)	Area (m^2)	Glazed Area (m^2)	Frame Factor	U value	G value	Opening Type	Opening Restriction mm	Openable Area %	Profile Active Hours
RL.01 (WC)	1400	850	1.19	0.59	50.0%	1.4	0.40	Fixed due to unoccupied room			
RL.02/03 (Stairway Hall)	1400	1400	1.96	1.23	37.2%	1.4	0.40	Top Hung	300	29.40%	0000 to 0900 –0% 0900 to 2200 –100% ** 2200-2400 –0%
RL.04 (Office)	1300	2300	2.99	2.00	33.1%	1.4	0.40	Top Hung	300	23.80%	0000 to 0730 - 0% 0730 to 1200 - 100%* 1200 to 1300 - 0% 1300 to 1830 - 100%* 1830 to 2400 - 0%
RL.05 (Stairway Hall)	800	1850	1.48	0.95	35.8%	1.4	0.40	Top Hung	300	30.90%	0000 to 0900 –0% 0900 to 2200 –100% ** 2200-2400 –0%
* Open when internal temperature exceeds 23°C and internal temperature is greater than the outdoor temperature ** Start opening when internal temperature exceeds 22°C and be fully open at 26°C and close in a similar manner											

APPENDIX 3 – WINDOW OPENINGS FOR SAMPLED SPACES

Opening Type

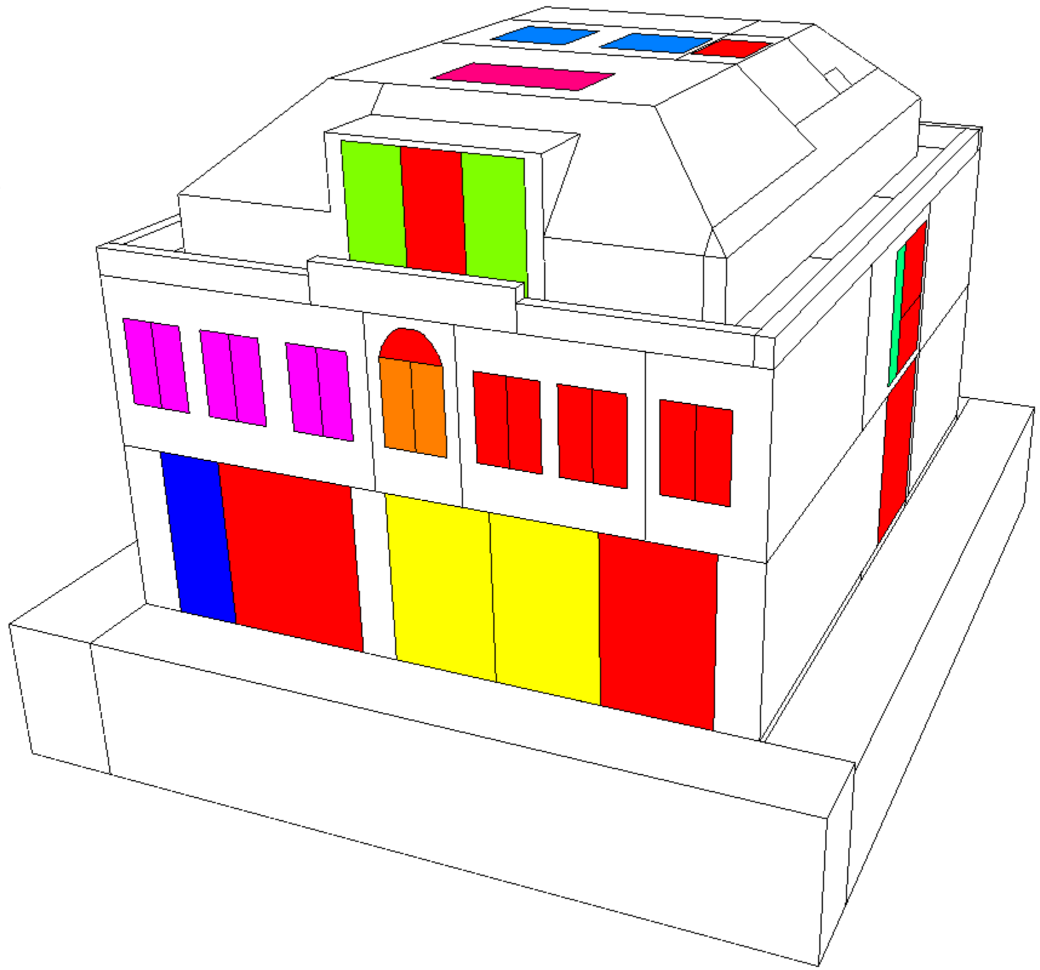
- XTRN0000 (Fixed)
- XTRN0001 (W0.01 - (Playroom) - Sash)
- XTRN0002 (W0.04 (KLD) - Side Hung Door)
- XTRN0003 (W0.05 (KLD) - Sliding Door)
- XTRN0004 (W1.01/02/04/05 - (Childrens Bedroom) - Sash)
- XTRN0005 (W1.06/07/08 - (Master Bedroom) - Side Hung)
- XTRN0006 (W1.09 - (Master Circulation) - Side Hung)
- XTRN0007 (W1.13 - (Guest Bedroom) - Openable Vent)
- XTRN0009 (W2.01 - (Bedroom) - Side Hung)
- XTRN0010 (W2.02 - (Office) - Side Hung)
- XTRN0011 (RL.02/03 - (Stairway Hall) - Top Hung)
- XTRN0012 (RL.04 - (Office) - Top Hung)
- XTRN0013 (RL.05 - (Stairway Hall) - Top Hung)



West Elevation

Opening Type

- XTRN0000 (Fixed)
- XTRN0001 (W0.01 - (Playroom) - Sash)
- XTRN0002 (W0.04 (KLD) - Side Hung Door)
- XTRN0003 (W0.05 (KLD) - Sliding Door)
- XTRN0004 (W1.01/02/04/05 - (Childrens Bedroom) - Sash)
- XTRN0005 (W1.06/07/08 - (Master Bedroom) - Side Hung)
- XTRN0006 (W1.09 - (Master Circulation) - Side Hung)
- XTRN0007 (W1.13 - (Guest Bedroom) - Openable Vent)
- XTRN0009 (W2.01 - (Bedroom) - Side Hung)
- XTRN0010 (W2.02 - (Office) - Side Hung)
- XTRN0011 (RL.02/03 - (Stairway Hall) - Top Hung)
- XTRN0012 (RL.04 - (Office) - Top Hung)
- XTRN0013 (RL.05 - (Stairway Hall) - Top Hung)



East Elevation

APPENDIX 4 – MECHANICAL VENTILATION RATES

Room	Ventilation Type	Supply Rate (l/s)	Extract Rate (l/s)	Supply Rate +50% (l/s)	Extract Rate +50% (l/s)
Basement - Bathroom	Extract	-	8.00	-	12.00
Basement - Utility	Extract	-	8.00	-	12.00
Basement - Storage Room	Extract	-	8.00	-	12.00
Basement - Stairway Hall	Supply	6.78	-	10.17	-
Basement - Bedroom	Supply	5.23		7.85	
Basement - Gym	Supply/Extract	30.22	-	45.33	-
GF - Kitchen/Living/Dining	Supply/Extract	22.35	13.00	33.53	19.50
GF - Coat Room	Supply	36.64	-	54.96	-
GF - Playroom	Supply	5.04		7.56	
GF - WC	Extract	1.20	8.00	1.79	12.00
GF - Entrance Hall	Supply	3.89		5.83	-
GF - Stairway	Supply	2.02		3.02	
1F - Stairway Hall	Supply	4.16		6.24	
1F - Childrens Bedroom 01	Supply	4.76		7.13	
1F - Childrens Bedroom 02	Supply	4.61		6.91	
1F - Childrens Bathroom	Extract	-	8.00	-	12.00
1F - Guest Bedroom	Supply	4.56		6.83	
1F - Master Bedroom	Supply	4.53		6.79	
1F - Master Bathroom	Extract	-	8.00	-	12.00
1F - Dressing Room	Supply	2.44		3.65	
1F - Master Circ	Supply	2.19		3.28	
1F - Guest WC	Extract	-	8.00	-	12.00
2F - Stairway Hall	Supply	22.83	-	34.25	-
2F - Bedroom	Supply	5.25		7.88	
2F - Office	Supply	11.49		17.24	

2F - Ensuite Bathroom	Extract	-	8.00	-	12.00
2F - WC	Extract	-	8.00	-	12.00