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Zero Carbon Design

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ENERGY STATEMENT & OVERHEATING ANALYSIS

Engineering Sustainability

Revision

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EXECUTIVE SUMMARY

This report has been prepared by **FLATT** on behalf of **SERENA MIGNATTI** for the existing 3 Bedroom dwelling at the 11 Cannon Lane, Hampstead in support of Planning application for comfort cooling to the Hobby Room.

The computer modelling incorporates the building layout with the proposed windows, window reveals, overhangs, glazing, doors and balconies.

This Energy Statement outlines the measures taken to reduce overheating in the property by considering the cooling hierarchy as it relates to the existing building.

The results of the analysis are summarised below:

TM59 and SAP analysis was conducted on the property;

Measures were taken into account to reduce overheating while doing the analysis, where the building failed to meet the overheating target with the application of passive and mechanical ventilation.

A dynamic simulation was conducted on the hobby room and the results showed that even with improved glazing size, u-values and mechanical ventilation, overheating would still occur and therefore active cooling in the form of internal Fan Coil Units and External Condenser is required to this room.

A SAP Rating of 72C and C02 emission of 11.97t/yr was achieved.

1.0 INTRODUCTION

This report has been prepared by **FLATT** on behalf of **SERRENA MIGNATTI** for the existing dwelling at the 11 Cannon Lane, Hampstead in support of Planning application for comfort cooling to the Hobby Room.

The project consists of the refurbishment of an existing 3-bedroom house.

To assess the likelihood of overheating risk within the residential development the following assessment is considered :

- CIBSE Technical Memorandum TM:59 – Design Methodology for the Assessment of Overheating Risk in Homes.

TM:59 is essentially an updated version of TM:52 specifically for dwellings and is the stipulated assessment within the London Plan guidance.

These methodologies consider the effect of how occupants perceive indoor temperatures and provides limitations on exposure to higher temperatures under certain conditions.

Using TM59, this report records the outcome of the overheating analysis and summarises the results including confirming the glazing specification in terms of solar control and requirement for cooling.

To understand the energy and emissions implications on the dwelling, SAP calculations have been undertaken to benchmark the initial project proposals against the Building Regulations Part L. In this manner the effect of different services strategies has been assessed. This Energy Strategy outlines how the reductions in emissions are achieved using energy efficient services and using low carbon technologies, thereby demonstrating compliance with Building Regulations.

The report also focuses on:

- Building Regulations / SAP Compliance
- Government and Local Authority Policies
- Enhanced Building Fabric & Systems

The aim is to ensure the client, design team and planners are fully informed as to how the development in context to the planning conditions, will:

- Minimises its Carbon Footprint
- Maximises its Energy Efficiency

The report follows the guidance detailed within the Camden Council's local planning guidance as well as the London Plan.

1.1 OBJECTIVES

To comply with the requirements of the Existing and current Building Regulations and local planning requirements by maximising fabric performance, where possible and following the cooling hierarchy, maximise passive ventilation, & minimising mechanical ventilation.

1.2 SAP METHODOLOGY

SAP analysis has been carried out for the house to obtain a representation of the carbon emissions produced and reduced. The model has been prepared for:

The Proposed Buildings within Elmhurst Design SAP10 which is the current version at the time of writing.

The building was run using the Existing Building Regs SAP2005.

2.0 THE DEVELOPMENT

Figure 1 - Site

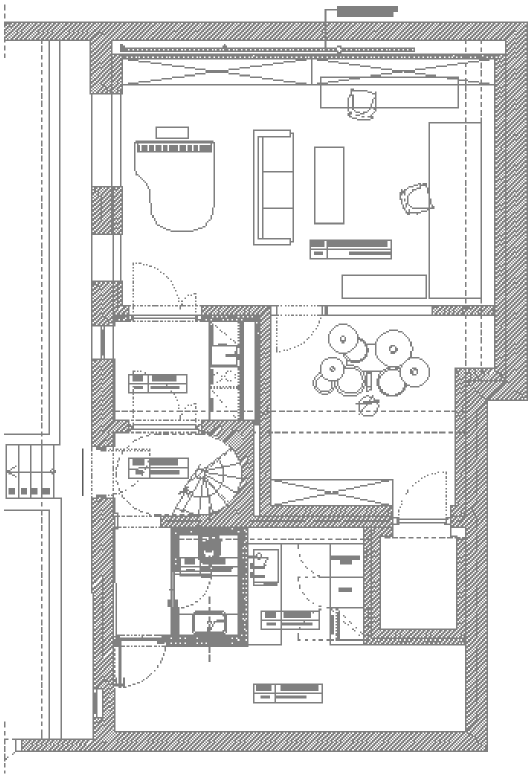

Figure 2: Basement

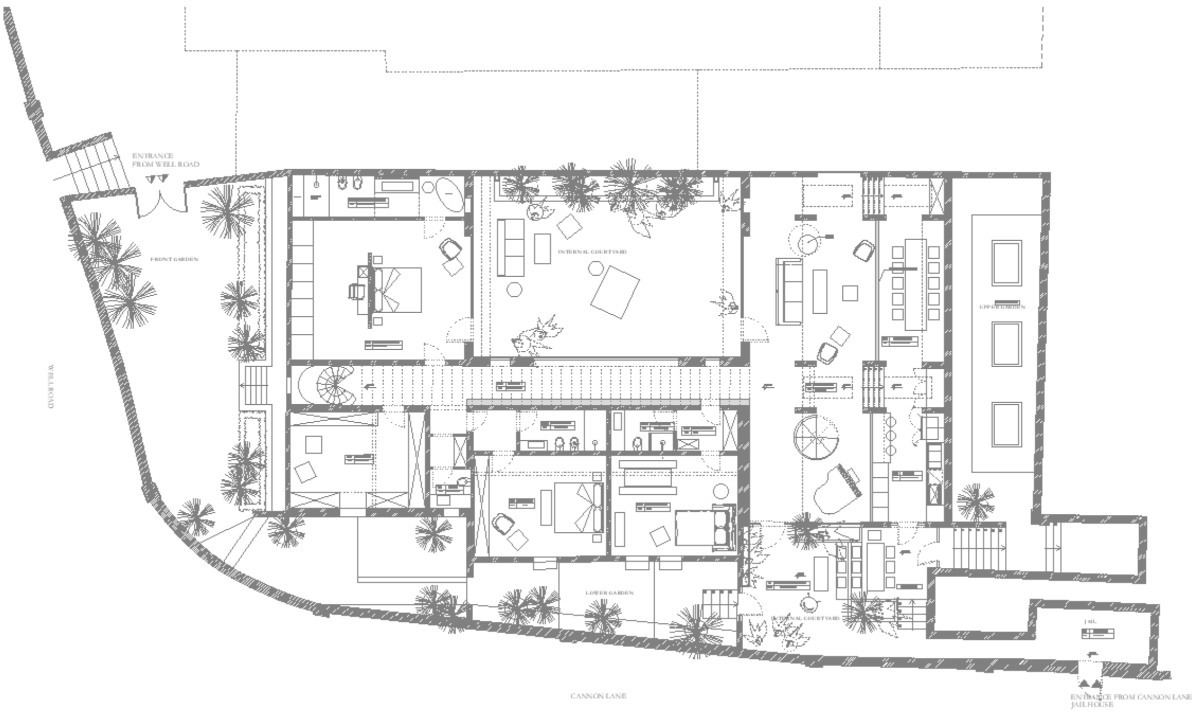

Figure 3: Ground Floor

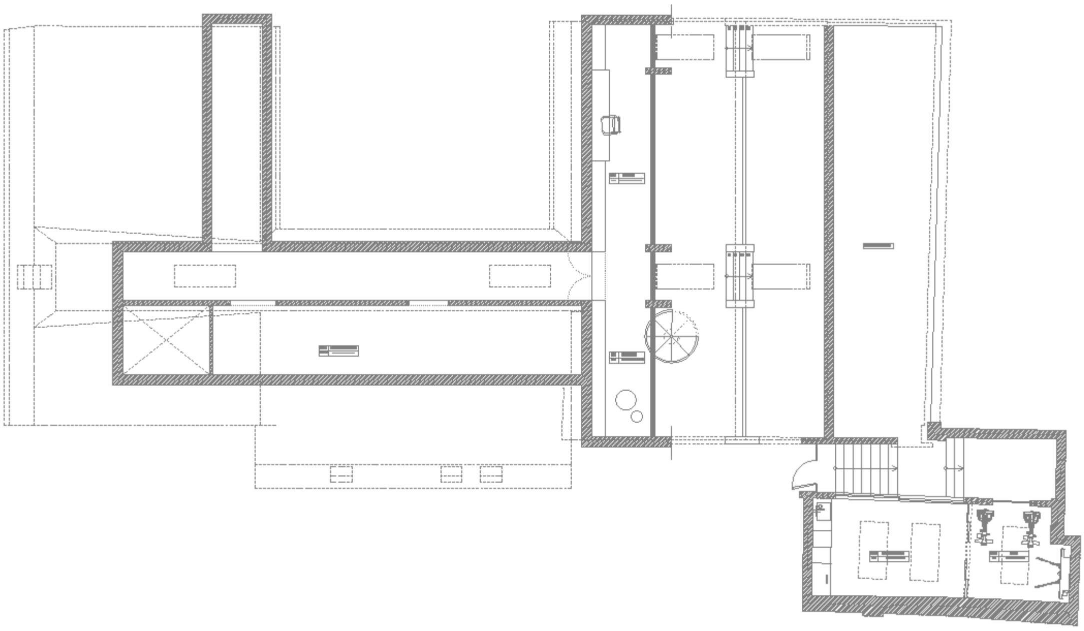

Figure 4: Mezzanine

2.2 DESIGN INFORMATION RECEIVED

Drawings:

DWG–17/06/2024

- CL-XREF_PIANTA.dwg
- CL-BASE_RIL.dwg

3.0 PLANNING POLICY AND CONTEXT

3.1 National Policy

The National Planning Policy Framework (NPPF) was first published on 27 March 2012 This document rescinds the national planning policy statements and guidance. The framework sets out a structure for delivering sustainable development with relevance for energy and carbon issues.

3.2 Building Regulations 2021

This existing dwelling is required to comply with Part L1 2021 Edition of the Building Regulations for dwellings, however, it is not required to pass SAP and therefore reduction in Carbon emissions is not required.

3.3 Camden Local Plan

The Camden Local Plan was adopted on 3rd July 2017 and It has replaced the Core Strategy and Camden Development Policies documents. It is now the basis for planning decisions and future development in Camden.

Climate change mitigation

8.1 The Council aims to tackle the causes of climate change in the borough by ensuring developments use less energy and assess the feasibility of decentralised energy and renewable energy technologies.

8.2 Green Action for Change: Camden's environmental sustainability plan (2011-2020) commits Camden to a 27% borough wide Carbon Dioxide (CO_2) reduction by 2017 and a 40% borough wide CO_2 reduction by 2020 (London carbon reduction target). Over 90% of Camden's carbon dioxide emissions are produced by the operation of buildings.

8.3 Any new development in Camden has the potential to increase carbon dioxide emissions in the borough. If we are to achieve local, and support national, carbon dioxide reduction targets, it is crucial that planning policy limits carbon dioxide emissions from new development wherever possible and supports sensitive energy efficiency improvements to existing buildings.

3.3.2 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 emissions have been met;
c) ensure that the location of 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, King's 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.

3.3.3 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.

3.3.4 Climate change adaptation measures

To minimise the risks connected with climate change we will expect the design of developments to consider anticipated changes to the climate. It is understood that some adaptation measures may be challenging for listed buildings and some conservation areas, and we would advise developers to engage early with the Council to develop innovative solutions.

3.3.5 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 southwest facing glazing) will be required to complete dynamic thermal modelling to demonstrate that any risk of overheating has been mitigated.

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

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.

4.0 BUILDING REGULATIONS COMPLIANCE

4.1 SAP 2010

In order to assess the energy and CO_2 emissions for the development, the building geometry, building fabric thermal properties and building services systems options have been entered into Elmhurst Energy Systems Ltd Design SAP10 Software, the latest version available at the time of writing.

The dwelling was modelled within the software. These selections comprise of property location within the site, property size, and orientation, and thus provide a good representation of the development.

4.2 Design Criteria

The SAP10 energy modelling is based on the following criteria:

1. Primary Heating – As proposed in the tables below
2. Ventilation - Centralised Mechanical Extract Ventilation & MVHR (Nuaire)
3. Thermal Bridging - Table K1 Default
4. Lighting Efficiency - 100% Low Energy Lighting
5. Air Permeability - As proposed in the table below
6. U-Values - As proposed in the table below

4.3 Existing Dwelling

Building Fabric	Limiting U Value for existing Dwelling (W/m2.K)	80's Building U Values (W/m2.K)
Roof	0.35	0.4
Wall	0.7	0.6
Floor	0.7	0.5
Party Wall		
Doors	-	1.4
Infiltration	**Notional Building**	**Proposed**
Air Tightness	10 $m^3/h/m^2$ @ 50Pa	5 $m^3/h/m^2$ @ 50Pa

Table 3 - Building Regulations Part L1A 2021 Edition

	Glazing Specification ((W/m2.K)
Minimal Windows sliding doors	1.
Sieger 70 tilt windows	1.4
Sieger Lux doors	1.6
Sieger Slim casement windows	1.4
Rooflights	1.2
G-Value	0.7

Table 4 – Upgraded Glazing Specification

System	Notional Design	Design Options
Ventilation System	Int. Extract Fan	MVHR and MEV (Nuaire)
Heating System	Gas Boiler, Combi	2* Vaillant boiler 44kW
Hot Water Storage	-	300 litres
Lighting	80 Im/W	86.25 Im/W

Table 5 - MEP Systems

4.4 Result Summary

The SAP rating is related to the predicted annual energy cost per square meter of floor area for space heating, water heating, ventilation and lighting. This does not include energy consumed in cooking or using other domestic and personal appliances. The SAP rating is expressed on a scale of 1-100. A rating of 1 represents very high running costs per square meter, while a SAP of 100 represents zero energy cost. SAP ratings are rounded to the nearest integer.

The property was tested using the existing building u-values from when the house was built for the external wall, roof and floor, whereas the windows were tested using upgraded u-values.

The Environmental Impact Rating (EIR) is based on the Carbon Dioxide (CO_2) emissions associated with space heating, water heating, ventilation, and lighting, having regard to the emissions saved by energy generation technologies. The EIR is an environmental indicator used in the Energy Performance Certificate. The Part L Building Regulations does not require to meet the TER, TPER and TFEE for an existing building.

Due to the building being an existing build SAP does not provide conclusive results to support the cooling hierarchy and improvements that can be made. SAP Rating of 72C and C02 emission of 11.97t/yr was achieved.

5.0 COOLING AND OVERHEATING

AD Part O (2021) provides 2 methods of compliance for overheating. The simplified method, which is assessed manually via a calculation of glazing area to floor area for each façade elevation and the Dynamic Thermal Modelling approach. As the glazing modestly exceeds that within the simplified method then this indicates that the TM:59 DTM analysis should be undertaken.

5.1 Cooling Hierarchy

The cooling hierarchy is set out as follows:

1. **Reduce the amount of heat entering the building** through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure. It is also expected that external shading will form part of major proposals.
2. **Minimise internal heat generation** through energy efficient design: For example, heat distribution infrastructure within buildings should be designed to minimise pipe lengths, particularly lateral pipework in corridors of apartment blocks, and adopting pipe configurations which minimise heat loss e.g. twin pipes.
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 night time purge ventilation.
4. **Provide passive ventilation**: For example, through the use of openable windows, shallow floorplates, dual aspect units or designing in the 'stack effect' where possible.
5. **Provide mechanical ventilation**: Mechanical ventilation can be used to make use of 'free cooling' where the outside air temperature is below that in the building during summer months. This will require a by-pass on the heat recovery system for summer mode operation.
6. **Provide active cooling systems**: The increased use of air conditioning systems is generally not supported, as these have significant energy requirements and, under conventional operation, expel hot air, thereby adding to the urban heat island effect. However, once passive measures have been prioritised if there is still a need for active cooling systems, such as air conditioning systems, these should be designed in a very efficient way and should aim to reuse the waste heat they produce.

The following summarises how this development responds to the cooling hierarchy.

1. Reduce the amount of heat entering the building

The external building fabric is existing and cannot be upgraded without considerable cost and loss of internal floor area. The glazing is replaced with new with improved U values and window solar control glazing.
The g-value has been reduced to provide a balance between mid-season passive gains and reducing direct solar load.

2. Minimise internal heat generation

The house is served by gas fired boilers, these are in a separate plant room, away from habitable rooms to minimise consequential heat from the boilers. Internal gains are set via TM:59 templates which define occupancy, equipment and lighting gains.

3. Manage the heat within the building

As a domestic premises, plasterboard ceilings are proposed which creates a disconnect between the space and the structure to utilise the building thermal mass. However, this does allow the space to act as thermally lightweight allowing heat to be purged out of the space rapidly by the ventilation system and / or openable windows.

4. Provide passive ventilation:

Openable windows are provided for purge ventilation. Generally, cross-ventilation cannot be achieved as they are single aspect rooms.

5. Provide mechanical ventilation:

Natural ventilation is provided generally. Mechanical ventilation is mechanical extract from bathrooms, ensuites and toilets etc. to comply with Building Regulations. The exception is the Hobby Room on the lower ground floor which is provided with MVHR, supply and extract ventilation.

6. Provide active cooling systems:

If the passive and active measures outlined above fail to prevent overheating due to the constraints imposed on the development consideration shall be given to providing comfort cooling.

Cooling could be considered for Cannon Lane. This would secure the site under all-weather files. However, this may only be necessary for future climate mitigation.

6.0 SIMPLIFIED OVERHEATING METHOD

Simplified Overheating analysis was conducted for the dwelling and the result in the below table shows that the house has a high risk of overheating. The total calculated glazing area for the entire dwelling is 66.5 m^2 whereas the permitted area for the maximum glazing is 11% (57.3m^2) which is 16% more than required leading to overheating. The dwelling fails to meet the target with overheating occurring and a Dynamic Simulation thermal modelling is required for further analysis.

Simplified Method - Overheating Calculation			
Dwelling Input Data :			
1	Apartment Ref.		Cannon Lane
2	Total Floor Area	(m^2)	488
3	Floor Area most glazed room	(m^2)	109
4	Total glazed area	(m^2)	66.5
5	Total glazed area in most glazed room	(m^2)	18.2
6	Bedroom glazed area	(m^2)	11.7
Limiting Solar Gains :			
7	Shading Strategy		Glazing g>0.4
8	Largest Glazed façade orientation		East
9	Natural Ventilation		No Cross-ventilation
Permitted Maximum Area of Glazing :			
10	Permitted Maximum area of glazing	%	11%
11	Calculated Maximum area of glazing	(m^2)	**57.3**
12	Excess Glazing in Dwelling	(m^2)	**9.2**
13	Percentage Excess Glazing in Dwelling	%	**16%**
Permitted Maximum area of glazing in most glazed room :			
14	Permitted Maximum area of glazing in most glazed room	%	18%

15	Maximum area of glazing in most glazed room	(m^2)	**19.6**
16	Excess Glazing in Most Glazed Room	(m^2)	**0.0**
17	Percentage Excess Glazing in Most Glazed Room	%	**0%**
18	Overheating Analysis Strategy		**DSM Required**
Window Opening Min Free Area :			
19	Window opening equivalent area factor		1.39
20	Total **Minimum** Free Area on Floor Area	(m^2)	**52.1**
21	Total **Minimum** Free Area on Glazed Area	(m^2)	**87.6**
22	Calculated **Actual** Total Free Area	(m^2)	**92.3**
23	Bedroom **Minimum** Free Area on Glazed Area	(m^2)	**1.5**
24	Calculated Bedroom **Actual** Free Area	(m^2)	**16.3**
	Key		**PASS**

Table 6 –Overheating – Simplified Method

7.0 TM59 METHODOLOGY

A dynamic simulation thermal model of the Hobby Room was carried out, using Virtual Environment (IES-VE) software. The version is VE2023.5.1.0, which was current at time of this report.

This approach provides a robust analysis with all floors being modelled.

The thermal modelling is for the project as existing and incorporates windows, window reveals and roof overhang external shading.

Natural ventilation paths are modelled by algorithms that control the window and door openings where applicable. Within the dwelling, internal doorways between living spaces and bedrooms are incorporated to allow cross ventilation to occur between rooms. However, bedroom doors are only operable outside the TM59 designated occupied period. i.e., they are scheduled closed during occupancy (at night) as per TM:59 Para 3.3.

The assessment is undertaken in accordance with methodology and criteria contained within CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes (2017) using current Design Summer Year London_LWC_2020High50.DSY 1 and London_LWC_2020High50.DSY2 & 3) weather data. This provides a robust method of assessment and is in line with London Plan guidance, current 'industry' standards and best practice.

The software incorporates the TM52 Adaptive Comfort analysis tool to assess the overheating of buildings based on the criteria outlined in CIBSE Technical Memorandum TM:52 –2013. This is used to assess Criteria 1: Hours of Exceedance as per Chapter 4.2 Par (a) of TM:59 for Living rooms, kitchens and dining rooms (LKD).

The software also incorporates VistaPro, which permits range testing of variables. Such as Operative Temperatures in excess of 26°C between the hours of 10pm to 7am as per Chapter 4.2 Para (b) of TM:59 for bedrooms.

The following images are taken from the thermal models and demonstrate the buildings 'likeness' to the proposed building for construction and provide a visual indication of how the building is exposed to solar gain. Blue areas are the houses, and green areas are local shading such as balconies.

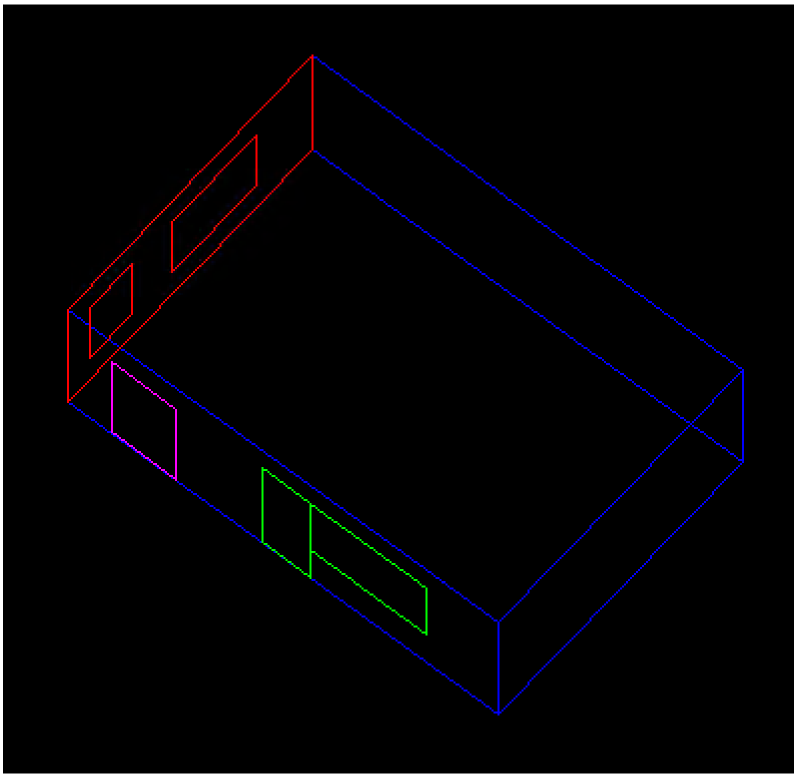

Figure 5: IES-VE Thermal Model- Hobby Room

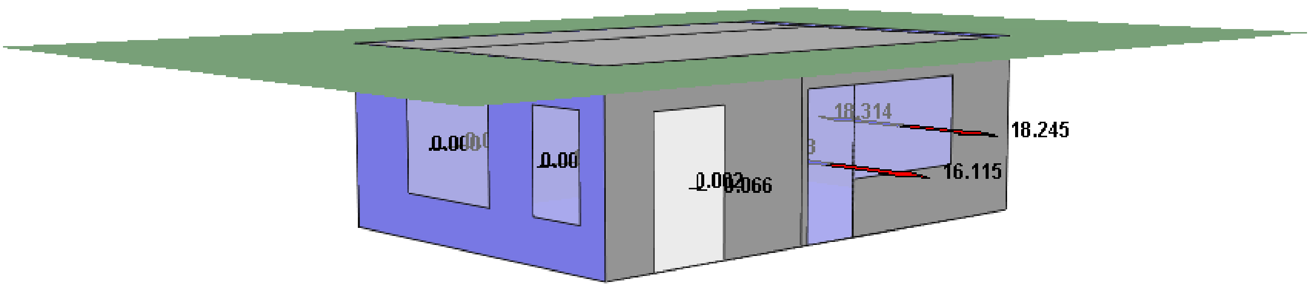

Figure 6: MacroFlo Natural Ventilation illustrating Airflows

7.1 TM:52 Adaptive Comfort Criteria

The following three criteria are used to assess the risk of overheating of buildings in the UK and Europe.

If a room or building fails any two of the three criteria it is classed as overheating and fails TM:52 as a consequence. TM:59 only uses Criterion 1 for the Living Rooms, Kitchens and Dining Rooms but applies a different data set for occupancy profiles and internal gains.

Criterion 1.

This 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 or more during the occupied hours of a typical non-heating season (1st May to 30th September).

Criterion 2.

This 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.

Criterion 3.

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

Further information on these criteria can be found in TM52 – 2013, section 6.1.2.

7.1.1 Criterion 1 - Hours of Exceedance – For Living/Dining/Kitchen/Bedrooms only.

The number of hours during which the temperature difference (ΔT) is greater than or equal to one degree (°K), during the period May to September inclusive, this period shall not be more than 1% of occupied hours.

The ΔT is defined as operative temperature less the maximum acceptable temperature and is rounded to the nearest whole degree.

7.1.2 Criterion 2 - Daily Weighted Exceedance – Not Required for TM:59

To allow for the severity of overheating, the weighted exceedance shall be less than or equal to 6°K in any one day.

7.1.3 Criterion 3 - Upper Limit Temperature – Not Required for TM:59

To set an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4 °K.

7.2 TM:59 Criteria for Homes Predominantly Mechanically Ventilated

Compliance is based on Para 4.3 of TM:59 for Homes that are Mechanically Ventilated. The following excerpt from TM:59 (2017) states :-

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 hours (CIBSE Guide A (2015a))

7.3 TM:59 Internal Loads, Occupancy and Equipment Data Sets

TM:59 provides a schedule of room data sets for the residential accommodation. CIBSE technical memorandum recognises that NCM room templates, profiles and schedules may not be appropriate for all residential properties and has thus assigned a set of room data sets which more realistically represents domestic properties. All rooms have been assigned the appropriate room data set in accordance with Table 2 TM:59.

7.4 Design Summer Year (DSY) Weather File

It is a requirement of TM:59 that the most appropriate location file is used for the DSY 2020's High Emissions, 50% percentile scenario. The corresponding weather file applied is the DSY weather file is London_LWC_2020High50_DSY 1. The DSY1 files have all been replaced with the equivalent files available from the University of Exeter.

Future climate change scenarios have been modelled using corresponding data for 2020 weather years. Namely London_LWC_2020High50 DSY.

7.5 Building Classification

The following building classifications are stipulated with Table 1 CIBSE TM:52. These classifications determine the benchmark values within each criterion that the building must be seen to meet or better. Depending on the classification a greater or lesser benchmark is set with corresponding level of expectation.

Category	Explanation	Suggested Acceptable Range (°K)
Category I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	2
Category II	Normal expectation (for new buildings and renovations)	3
Category III	A moderate expectation (used for existing buildings)	4

Table 7. TM:52 Building Classification

In line with the recommendations within Table 2 CIBSE TM:52, the classification for this building has been applied as Category II.

7.6 Windows and Doors

Combined living room, dining room and kitchen (LDK's) tend to have a greater glazed area than bedrooms as well as an occupancy and load profile which presents a more onerous overheating risk when compared to bedrooms. LKD's are also principally occupied during the day when solar gain is stronger, therefore, the LDK's are subject to a greater overheating risk than bedrooms.

Bedrooms generally have smaller square meterage and internal doors are required to be closed at night thus overheating can also be problematic with the TM:59 imposed internal gains. These can begin to be the dominant gain as the rooms floor are reduces.

Glazing specification can be problematic. Imposing low g-value glazing will have an adverse effect on Building Regulations SAP calculations. These will tend to mar the TFEE/DFEE calculations as low g-value glazing reduces passive mid-season gains with a resulting increase in heating energy. This effects building emissions figures. Therefore, a balance needs to be considered.

If blinds are to be included in the modelling, they must not interfere with the opening of windows, or the reduction in free area when they are operating should be considered in the model.

Internal doors can be included and left open in the model in the daytime but should be assumed to be closed when the occupants are sleeping. The compliance report should explain the basis of all assumptions.

7.7 Results

The same data was used on Dynamic Simulation thermal modelling IES and the results is a high risk of overheating in the hobby room.

Weather File	Location	Operative temperature (TM 52/CIBSE) (°C) - hours in range > 26.00
DSY 1	Hobby Room	69
DSY 2	Hobby Room	116
DSY 3	Hobby Room	153

Table 8 – Hours Exceedance

An annual Operative Temperature no greater than 26°C for no more than 3% of the annual occupied period. This is 32 hrs per annum. Using different weather files, the results show that there are failures for the Hobby Room as it exceeded the 32 hours required for a pass.

Following the cooling hierarchy, applying the passive ventilation, mechanical ventilation and improved glazing proved not to be enough as the results showed that even with mechanical ventilation, overheating occurs. This indicates that remedial action may be required to assist overheating.

8.0 CONCLUSION

The dwelling has been tested to find the solution best suited to their applications. The key findings from this assessment are as follows:

Calculations were conducted on TM59 and SAP to test the overheating in the building.

An analysis of the property using a simplified TM59 showed that overheating occurs failing to pass the overheating strategy.

The property was then tested using TM59 Dynamic Modelling on IES and SAP with the improved u-values, passive ventilation, and mechanical ventilation, and the results indicated that overall performance could be improved because overheating was occurring. A dynamic simulation of the hobby room revealed that overheating would still happen despite better glass size, u-values, and mechanical ventilation.

SAP does not offer definitive statistics to support the cooling hierarchy and possible upgrades because the building is an existing build. Achieved 72C SAP Rating and an 11.97t/yr C02 emission.

The recommended solution, in this instance, is to provide comfort cooling in the form of internal Fan Coil Unit and External Condenser.

APPENDIX

SAP DOCUMENTS

Overview

Overview Report

elmhurst energy

Dwelling Address	11 Cannon Lane, Hampstead
Report Date	19/06/2024
Property Type	House, Semi-Detached
Floor Area [m^2]	488

This document is not an Energy Performance Certificate (EPC) as required by the Energy Performance of Buildings Regulations

Energy Rating

The current energy rating represents the overall energy efficiency of the dwelling. The potential energy rating is the overall energy rating of the dwelling after all of the recommend measures provided on the next page have been installed. A higher score represents a more energy efficient dwelling with lower fuel bills.

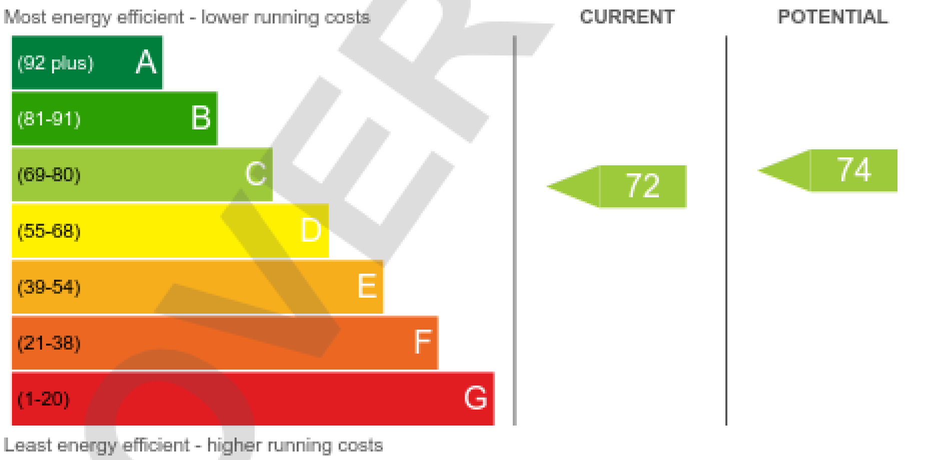

Figure 7: SAP Results

Overview Report

elmhurst energy

Breakdown of property's energy performance

Each feature is assessed as one of the following:

Very Poor	Poor	Average	Good	Very Good

Feature	Description	Energy Performance
Walls	Average thermal transmittance 0.6 W/m²K	Good
Roof	Average thermal transmittance 0.4 W/m²K	Average
Floor	Average thermal transmittance 0.5 W/m²K	Poor
Windows	High performance glazing	Good
Main heating	Boiler with radiators and underfloor heating, mains gas	Good
Main heating	Boiler with radiators and underfloor heating, mains gas	Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Main heating controls	Not applicable (heating provides DHW only)	
Secondary heating	None	
Hot water	From main system, no cylinder thermostat	Average
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Primary Energy use

The primary energy use for this property per year is 134 kilowatt hour (kWh) per square metre

Estimated CO_2 emissions of the dwelling

The estimated CO rating provides an indication of the dwelling's impact on the environment in terms of carbon dioxide emissions; the higher the rating the less impact it has on the environment.

Figure 8: SAP Results