Building Services Engineering
Sustainability Consultants
Zero Carbon Design

FLATT

FOR:

CHISWICK ARCHITECTURE
12 Grange Gardens
London
NW3 7XG

12 GRANGE GARDENS

ENERGY STATEMENT & OVERHEATING ANALYSIS

Engineering Sustainability

Revision

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1	26/11/2024	Issue 1	--
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EXECUTIVE SUMMARY

This report has been prepared by **FLATT** on behalf of **CHISWICK ACHITECTURE** for the existing 4 Bedroom dwelling at the 12 Grange Gardens, London in support of a retrospective Planning application for comfort cooling to the 2 bedrooms and reception room 1.

This report seeks to demonstrate whether the existing dwelling meets the requirements of TM52/59: The limits of thermal comfort, avoiding overheating in European buildings. If the requirements of TM52/59 are shown not to be met, installing Air Conditioning is an option which may be sought providing the requirements of the Cooling Hierarchy within the Camden Local Plan are investigated and other methods of achieving acceptable comfort levels cannot be introduced as an alternative. As Air Conditioning has already been installed to the dwelling this report is in support of a retrospective planning application for its justification for installation.

The computer modelling incorporates the building layout with the existing 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 and demonstrate that the provision of cooling can be supported retrospectively, as generally the bedrooms and living spaces are unable to meet TM59 Criteria.

The results of the analysis are summarised below:

TM59 and SAP analysis was conducted on the property. A SAP Rating of 66D and $C0_2$ emission of 9.08t/yr was achieved.

Measures were assessed to look to reduce overheating while doing the analysis, where the building failed to meet the overheating target with the application of passive ventilation and then furthermore consideration of changing intermittent bathroom extract ventilation to continuous extract.

A dynamic simulation was conducted on the dwelling and the results showed that even with openable windows and continuous extract ventilation from bathrooms, overheating would still occur and therefore active cooling in the form Air-to-Air heat pumps with small external condensers and internal wall mounted cassette units is required to the 2 bedrooms and reception 1.

1.0 INTRODUCTION

This report has been prepared by **FLATT** on behalf of **CHISWICK ACHITECTURE** for the existing 4 Bedroom dwelling at the 12 Grange Gardens, London in support of Planning application for comfort cooling to the 2 bedrooms and reception room 1.

The project consists of the overheating analysis of an existing 4-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

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

- The buildings Energy Efficiency through SAP
- Demonstrate the use of the Overheating hierarchy

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 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. The model has been prepared for:

The Proposed Building 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

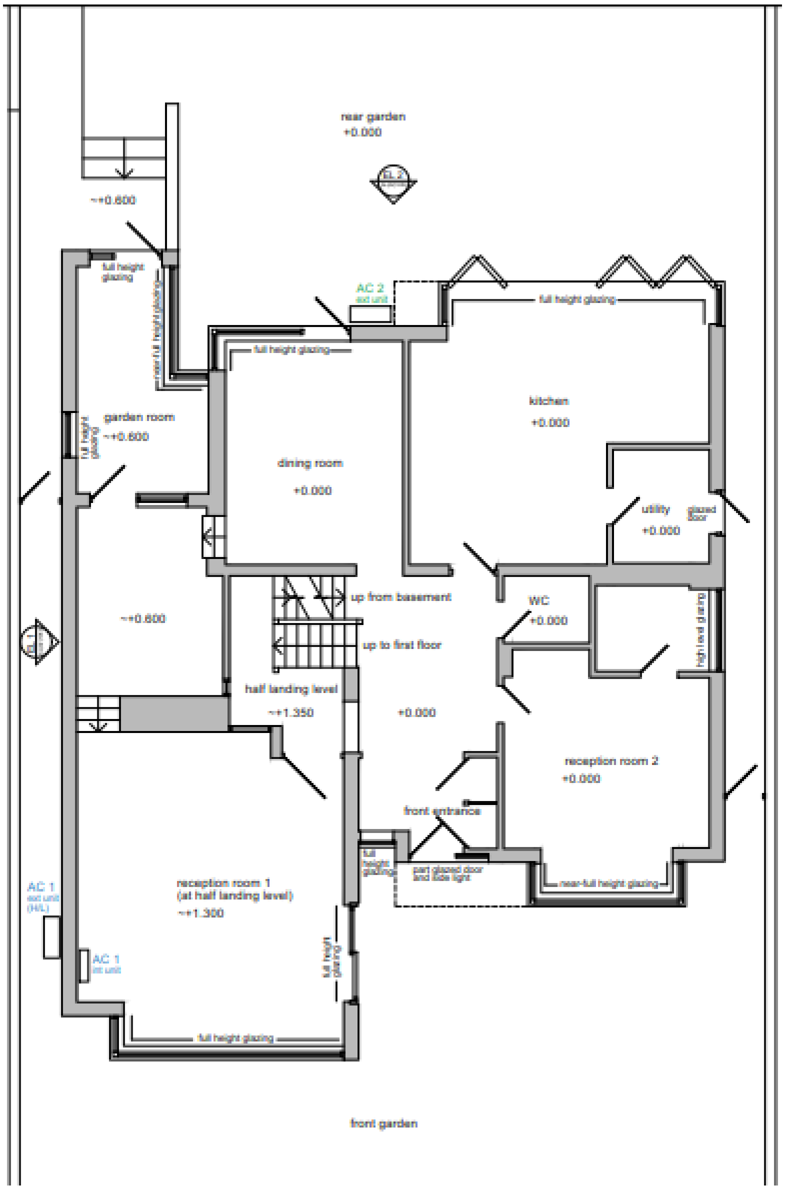

Figure 2: Ground Floor

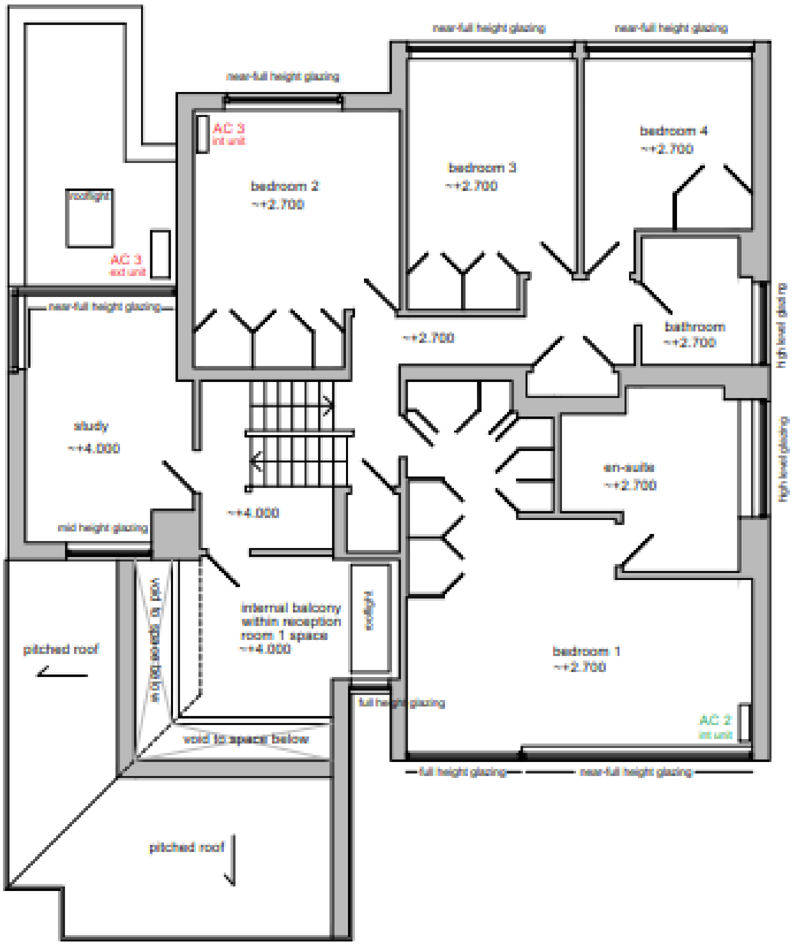

Figure 3: First Floor

2.2 DESIGN INFORMATION RECEIVED

Drawings:

PDF-24/10/2024

- 1080AL(02)1000 Rev 00 - existing plans
- 1080AL(02)1050 Rev 00 - existing elevations

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 the tables below
2. Ventilation - De-centralised Mechanical Extract Ventilation (dMEV)
3. Thermal Bridging - Table K1 Default
4. Lighting Efficiency - 100% Low Energy Lighting
5. U-Values - SAP2005 - 1980's, As the table below

4.3 Existing Dwelling

Building Fabric	Limiting U Value for existing Dwelling (W/m2.K)	SAP2005 - 1980's Building U Values (W/m2.K)	Extension Building U Values (W/m2.K)
Roof	0.35	0.68	-
Flat Roof	-	-	0.2
Wall	0.7	1	0.3
Floor	0.7	1.2	0.22
Party Wall	-	-	-
Doors	-	1.4	2.2
Glazing Specification			
	Entire Dwelling	Kitchen	Garden Room
Glazing Type	Double		
g-value	0.76	0.7	0.76

Table 3 - Building Regulations Part L1A 2021 Edition

	Glazing Specification (W/m2.K)	
	SAP2005 - 1980's U Values (W/m2.K)	Upgraded Glazing U Values (W/m2.K)
Windows	3.1	-
Garden Room	-	2.2
Kitchen	-	1.4

Table 4 –Glazing Specification

System	Notional Design	Existing Design
Ventilation System	Int. Extract Fan	dMEV (Int. EFs)
Heating System	Gas Boiler, Combi	Vaillant ecoTec plus438, Gas Boiler
Hot Water Storage	-	Elson-Zircon 300zi 300L
Lighting	80 lm/W	80 lm/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 both 80's values as well as specific upgraded u-values, as per table 4 above.

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 66D and CO_2 emission of 9.08t/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 nighttime purge ventilation.
4. **Provide passive ventilation**: For example, using 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 solar gains entering the building

The external building fabric is existing and cannot be upgraded without considerable cost and loss of internal floor area. The kitchen has improved glazing which was upgraded in 2014 and the garden room extension, built around 2009 has improved fabric U values over the existing property. These improvements have been taken into account in the overheating modelling.

2. Minimise internal heat generation

The house is served by gas boiler, this is in a separate plant room, away from habitable rooms to minimise consequential heat from the boiler. 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, existing plasterboard ceilings 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. The living space does have high ceiling already which should assist to some extent in managing the heat. The passive measures of opening appropriate windows and doors was modelled, as part of this study.

4. Provide passive ventilation:

Openable windows are provided for purge ventilation. However cross-ventilation, which would improve the situation cannot be achieved, as the rooms studied are all single aspect rooms. There is no cost effective means of achieving cross ventilation.

5. Provide mechanical ventilation:

Natural ventilation is provided generally, however there is de-centralised Mechanical Extract Ventilation (dMEV) from bathrooms, ensuites and toilets, etc. to comply with Building Regulations. The dMEV systems have been included within the modelling. We have included for a 10mm undercut to the doors where these systems exist. In addition we have considered if these intermittent fans were run as continuous extract. This assessment established that there will still be an overheating issue.

6. Provide active cooling systems:

As the passive and active measures outlined above were unable to demonstrate prevention of overheating due to the constraints imposed on the development and also the potential change to continuous mechanical extract ventilation consideration should be given to providing comfort cooling which would overcome the overheating issue.

Therefore cooling can be considered under this retrospective assessment for 12 Grange Gardens and would ensure that the site does not overheat under all-weather file conditions.

6.0 TM59 METHODOLOGY

A dynamic simulation thermal model of the dwelling 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_2050High50.DSY 1 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 existing building and provide a visual indication of how the building is exposed to solar gain. Blue areas are the house, and green areas are local shading such as balconies.

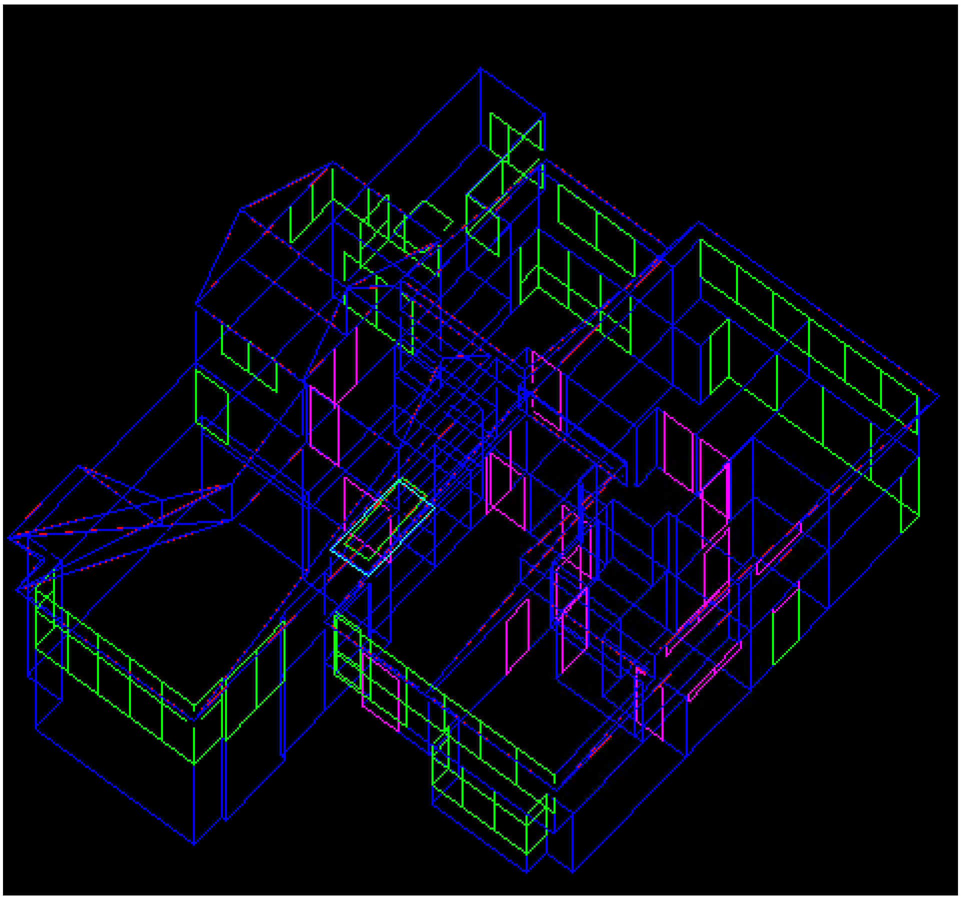

Figure 5: IES-VE Thermal Model

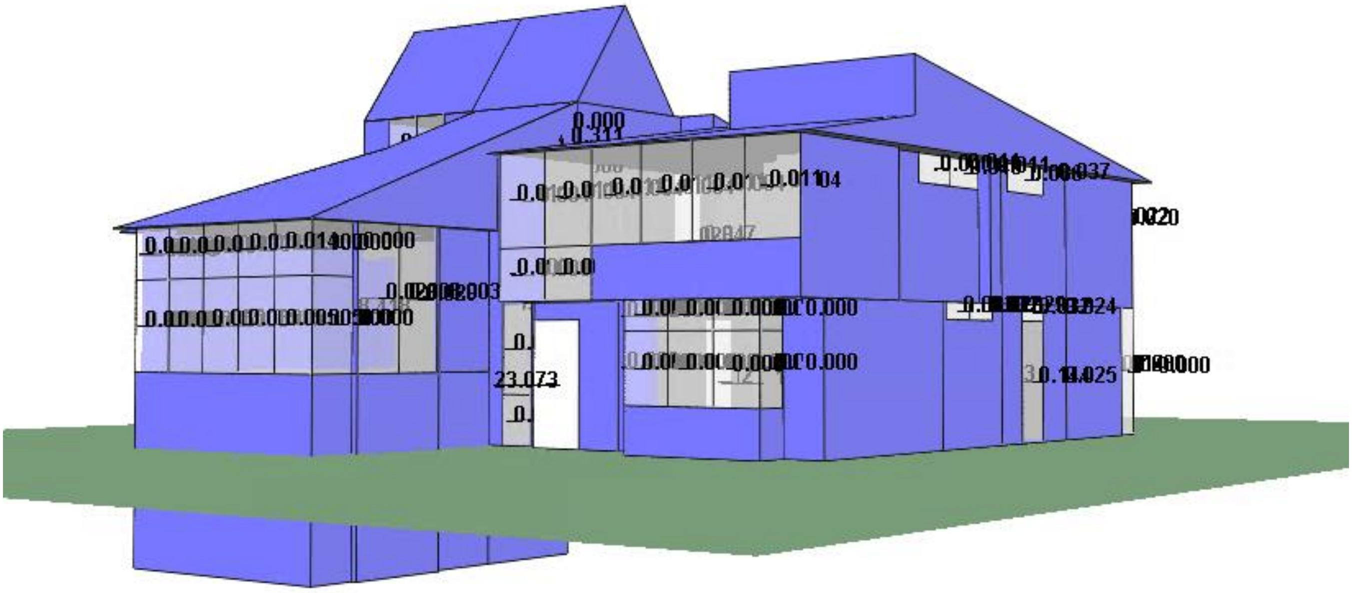

Figure 6: MacroFlo Natural Ventilation

6.1 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.

6.1.1 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 3% of occupied hours.

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

6.1.2 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.

6.1.3 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.

6.2 TM:59 Criteria for Homes Predominantly Mechanically Ventilated

Compliance is based on passing *both* of the following two criteria:

a) For living rooms, kitchens and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1:Hours of exceedance).

b) 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.

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.

6.3 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.

6.4 Design Summer Year (DSY) Weather File

It is a requirement of TM:59 that the most appropriate location file is used for the DSY 2050's High Emissions, 50% percentile scenario. The corresponding weather file applied is the DSY weather file is London_LWC_2050High50_DSY 1.

6.5 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 affects building emissions figures. Therefore, a balance needs to be considered.

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.

6.6 Results

This report includes the impact of future global climate change by considering the 2050 London weather file. The file are summarised below.

- London_LWC_2050HE50.DSY 1

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 3% of occupied hours.

The same data was used on Dynamic Simulation thermal modelling IES and the results is a high risk of overheating when considering both the TM52 and TM59 analysis.

6.6.1 Naturally Ventilated Dwelling with Intermittent Extract Ventilation (Prior to Cooling Installation Works)

TM:59, Para 4.2 (a)

The first part of the analysis all living rooms, kitchens and bedrooms must pass Criteria (a) of TM:59, Para 4.2. Namely Criteria 1 of TM:52 – Hrs of Exceedance at less than 3%. The results are as follows :-

Location	Criteria 1 Hrs of Exceedance (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg-Hrs)	Criteria 3 (Max. Delta)
0/DINING	5.7	7.6	9.6
0/KITCHEN	7.0	8.1	10.7
0/RECEPTION 2	29.2	26.5	27.6
0/RECEPTION1	7.7	10.2	11.2
1/2BED01	3.5	4.9	5.7
1/2BED02	1.9	3.7	4.5
1/1BED03	3.3	4.3	5.6
1/1BED04	3.1	4.2	5.4

Table 8. TM:52 – Hours of Exceedance

It may be seen from the above that all LDK's and Bedrooms do not meet Para 4.2(a) of TM:59. It fails all 3 TM:52 Criteria. The requirement is for it to pass only Criteria 1. Failing all 3 criteria illustrates an overall Failure in terms of Overheating. Bed 02 does show a pass on Criteria 1.

TM:59, Para 4.2 (b)

The second part of the analysis all bedrooms must pass Criteria (b) of TM:59, Para 4.2. Namely – An annual Operative Temperature no greater than 26°C for no more than 1% of the annual occupied period. The results are as follows :-

Location	Operative temperature (TM 52/CIBSE) (°C) - % hours in range
1/2BED01	6.0
1/2BED02	6.4
1/1BED03	5.5
1/1BED04	8.5

Table 9. TM:52 – Operative Temp of 26°C for no more than 1%

It may be seen from the above that all Bedrooms fail to meet Para 4.2(b) of TM:59

Following the cooling hierarchy, applying the passive ventilation, openable windows and internal doors were modelled to be left open in the daytime assumed to be closed when the occupants are sleeping. This proved not to be enough as the results show that overheating occurs. This indicates that further remedial action is required assist in limiting overheating.

6.6.2 Naturally Ventilated Dwelling with Continuous Extract Ventilation (Potential Hierarchy solution)

TM:59, Para 4.2 (a)

The first part of the analysis all living rooms, kitchens and bedrooms must pass Criteria (a) of TM:59, Para 4.2. Namely Criteria 1 of TM:52 – Hrs of Exceedance at less than 3%. The results are as follows :-

Location	Criteria 1 Hrs of Exceedance (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg-Hrs)	Criteria 3 (Max. Delta)
0/DINING	5.6	7.5	4.9
0/KITCHEN	6.9	8	3.7
0/RECEPTION 2	26.9	24.9	4.3
0/RECEPTION 1	7.3	10.1	4.2
1/2BED01	3.5	9.6	5.7
1/2BED02	1.9	10.6	4.4
1/1BED03	3.3	26	5.6
1/1BED04	3.1	11	5.4

Table 10. TM:52 – Hours of Exceedance

It may be seen from the above that all LDK's and Bedrooms do not meet Para 4.2(a) of TM:59. It fails all 3 TM:52 Criteria. The requirement is for it to pass only Criteria 1. Failing all 3 criteria illustrates an overall Failure in terms of Overheating. Bed 02 does show a pass on Criteria 1.

TM:59, Para 4.2 (b)

The second part of the analysis all bedrooms must pass Criteria (b) of TM:59, Para 4.2. Namely – An annual Operative Temperature no greater than 26°C for no more than 1% of the annual occupied period. The results are as follows :-

Location	Operative temperature (TM 52/CIBSE) (°C) - % hours in range
1/2BED01	5.9
1/2BED02	6.3
1/1BED03	5.5
1/1BED04	8.5

Table 11. TM:52 – Operative Temp of 26°C for no more than 1%

It may be seen from the above that all Bedrooms fail to meet Para 4.2(b) of TM:59

It may be seen from the above that none of the Bedrooms meet Para 4.2(b) of TM:59. This indicates that remedial action is required to assist in preventing overheating. The failures are significant with the highest at 8.5% for Bedroom 4. This equates to 272 hrs per annum.

It should be noted that only bedroom 02 passed Criteria 1 of TM:52, however all the other bedrooms did fail. This is because the Bed 02 in at the rear of the building facing North. In simplistic terms, this is approximately any hrs exceeding 28°C for 3 - 3.5% of the annual hours test. So, this indicates that the overheating although not appearing to be severe, as the Bedrooms all failed to met the TM:59 requirement of 26°C for 5.9 – 8.5% which is significantly greater than then 1% pass allowance .

Following the cooling hierarchy, applying the passive ventilation, openable windows, internal doors and Continuous Extract Ventilation were modelled (Windows to be left open in the daytime assumed to be closed when the occupants are sleeping). This proved still not to be enough intervention, as the results show only a very minor improvement in Bed 01 & 02 as well as improvement in Reception 2 space, however significant overheating is still shown to occur. This indicates that remedial action is still required to assist in removing the risk of overheating, which can only be by applying cooling to the property.

The owners have not installed cooling to all the affected rooms, but applied a sensible approach to cover the most used living space, namely Reception 1, as well as the key Bedrooms that they occupy (Bedrooms 01 & 02).

7.0 CONCLUSION

The dwelling has been tested to find any potential solutions to overcome the overheating. The key findings from this assessment are as follows:

Calculations were conducted on TM59 and SAP to test the overheating in the building. SAP does not offer definitive statistics to support the cooling hierarchy and possible upgrades because the building is an existing build. Achieved 66D SAP Rating and 9.08t/yr CO_2 emission.

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

The property was then tested using TM59 Dynamic Modelling on IES and SAP with the existing u-values, passive ventilation, openable windows and openable internal doors during daytime and assumed to be closed at night when the occupants are sleeping. The results indicated that overall performance should be improved because overheating was occurring.

The 2 Bedrooms (Bedroom 01 & 02) and Reception Room 1 all failed to meet the overheating criteria and through following the Overheating hierarchy, with some measures not being able to be implemented, the only 2 potential viable options was to run the domestic extract ventilation in continuous mode or add dedicated cooling. When testing these scenarios the first being the domestic extract ventilation in continuous mode, this was found not to sufficient to overcome the Overheating, however running the comfort cooling did enable the overheating to be resolved.

Therefore the recommended solution, in this instance, is to provide comfort cooling in the form of 3 No. Air to Air Internal Wall mounted Split systems each with a small External Condenser Unit.

The owners have not installed comfort cooling to all the affected rooms, but applied a sensible approach to cover the most used living space, namely Reception 1, as well as the key Bedrooms that they occupy (Bedrooms 01 & 02).

APPENDIX

SAP DOCUMENTS

Overview

Energy Report elmhurst energy

Dwelling Address	12 Grange Gardens, London
Reference	
Assessment Date	12/11/2024
Submission Date	
Property Type	House, Detached
Total Floor Area	291

This Energy Report has been generated using the UK's National Calculation Methodology for dwellings, Standard Assessment Procedure (SAP). This methodology is used to assess the energy efficiency of dwellings which is calculated based on a dwelling's heating, hot water, ventilation and lighting usage.

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

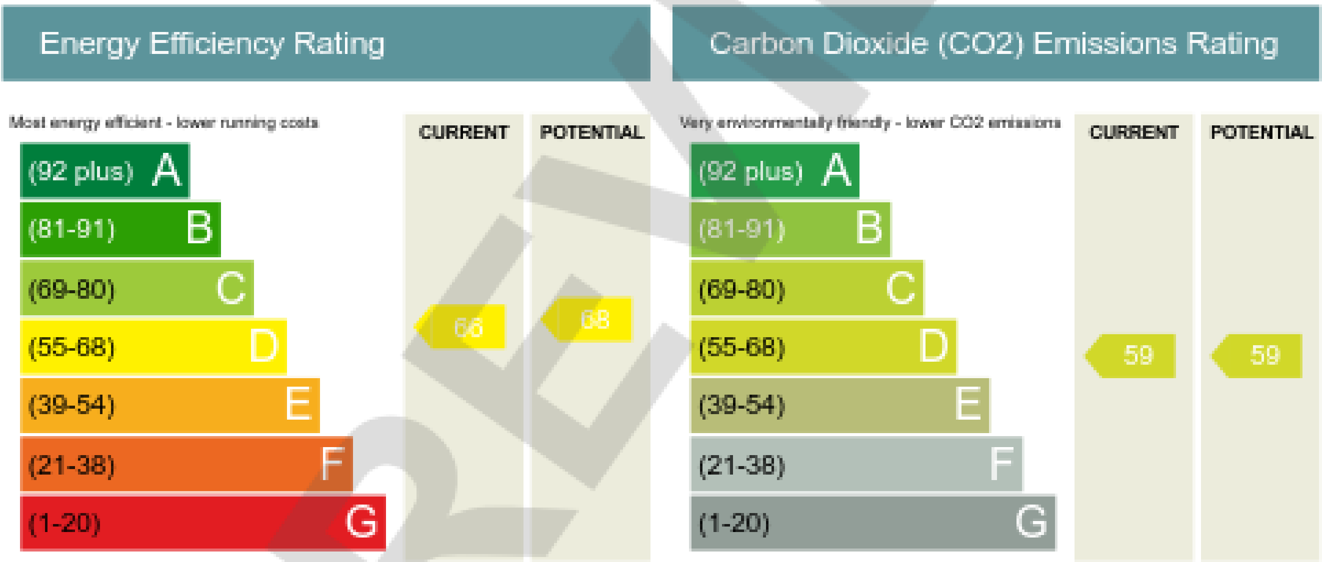

Figure 7: SAP Results

Energy 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 0.78 W/m²K	Average
Roof	Average thermal transmittance 0.66 W/m²K	Poor
Floor	Average thermal transmittance 1.03 W/m²K	Very Poor
Windows	Fully double glazed	Poor
Main heating	Boiler and radiators, mains gas	Very Good
Main heating controls	Programmer, room thermostat and TRVs	Good
Secondary heating	None	
Hot water	From main system	Good
Lighting	Good lighting efficiency	Good
Air tightness	(not tested)	

Figure 8: SAP Results