LOVE DES/GN STUD\O

11 Albert Terrace Mews

CIBSE TM59 Overheating Assessment

July 2024

Contents

Executive Summary

Love Design Studio have prepared this Overheating Assessment for 11 Albert Terrace Mews, London, NW1 7TA.

The purpose of this overheating assessment is to analyse the internal conditions of the existing site to understand whether overheating risk can be identified. This is to determine whether active cooling can be acceptably installed as an overheating mitigation measure.

To assess the likelihood of overheating risk, the building has been analysed in accordance with "CIBSE Technical Memorandum TM:59 – Design Methodology for the Assessment of Overheating Risk in Homes". A thermal dynamic simulation model (DSM) of the development has been created and three 2020 weather files have been considered:

- DSY1 for the 2020s, high emissions, 50% percentile scenario
- DSY2 for the 2020s, high emissions, 50% percentile scenario
- DSY3 for the 2020s, high emissions, 50% percentile scenario

In addition, the following weather files were also considered to assess the overheating risk under future weather conditions.

- DSY1 for the 2050s, high emissions, 50% percentile scenario
- DSY1 for the 2080s, high emissions, 50% percentile scenario

The entire building was modelled, although active cooling is only proposed within two bedrooms and one office.

The results indicate that all three assessed rooms fail the TM59 criteria under the DSY1 2020s weather file.

Furthermore, under future weather conditions, the three assessed rooms all fail the TM59 criteria under the DSY2 and DSY3 2020 weather files, nor the DSY1 2050s and 2080s weather files.

The site has already utilised the following passive measures to mitigate overheating:

- Windows openings have been maximised to facilitate natural ventilation.
- All windows and rooflights have been upgraded to modern double glazing.
- Solar film has been installed on all windows and rooflights to minimise solar gain, with a g-value of ~0.4.
- Internal shade in the form of roller blinds have been installed to further minimise solar gain.

Further passive measures have been considered within this assessment to mitigate overheating risk in the building, including external shutters and mechanical ventilation with heat recovery.

Results determined that the additional measures reduced the overheating risk only in the office under the DSY1 2020s weather file; however, overheating risk was still determined in all three rooms under DSY2, DSY3 2020s and DSY1 2050s and 2080s weather files.

Furthermore, external shade such as external shutters, canopies, awnings and brise soleil, are not considered appropriate due to the building's location in a conservation area. Additionally, due to the bedrooms and office predominately being served by rooflights, external shutters, or other moveable external shade, are not suitable.

Overall, 11 Albert Terrace Mews has followed the cooling hierarchy by considering all feasible passive measures prior to active cooling. Therefore, as per the last stage of the cooling hierarchy, active cooling is a measure that would mitigate overheating risk within the two bedrooms and office.

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Introduction

This Overheating Assessment has been prepared by Love Design Studio for 11 Albert Terrace Mews, London, NW1 7TA.

The purpose of this overheating assessment is to analyse the internal conditions of the existing site to understand whether overheating risk can be identified. This is to determine whether active cooling can be acceptably installed as an overheating mitigation measure.

A thermal dynamic simulation model (DSM) of the development has been created for the analysis which incorporates the proposed solar control glazing, openable windows and doors, and building layout.

The entire building was modelled for this assessment, although active cooling is only proposed within two bedrooms and one office.

Figure 1: *Site Location (Red)*

Overheating Policy

London Plan (2021)

Regional Policy is governed by the London Plan (March 2021), which is the overall strategic plan for London that sets out an integrated economic, environmental, and social framework for the development of London over the next 20-25 years.

Policy SI 4 Managing heat risk

The design is encouraged to reduce the potential for internal overheating and reliance on active cooling following the cooling hierarchy:

1) Reducing solar heat gain through orientation, shading, high albedo materials, fenestration, insulation and green infrastructure.
2) Minimise internal heat generation through energy efficient design
3) Manage heat within the building through exposed internal thermal mass and high ceilings
4) Provide passive ventilation
5) Provide mechanical ventilation
6) Provide active cooling systems

Local Plan: Strategic Policies (2013-2026)(Adopted 2013)

Camden Local Plan (2017)

Camden Council's Local Plan, adopted in 2017, sets out the Council's vision and strategy for the Borough. It includes a variety of overarching spatial policies to guide future development and land use in the Borough.

Policy CC2 – Adapting to climate change

The Camden Local Plan states the following regarding overheating:

"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."

Home Improvements: Camden Planning Guidance (2021)

Camden Council published the Home Improvements guide in 2021 to provide support for Camden residents regarding adaptations to their home and areas to consider for planning.

Regarding active cooling, the Home Improvements guidance states the following:

"If you are concerned that your home overheats in summer beyond comfort levels, you should consider passive cooling measures which do not rely on an energy source like air conditioning.

The following measures could be taken to reduce overheating:

- *Use shading (blinds, shutters, trees, vegetation), to be carefully designed to take into account the angle of the sun and the optimum daylight and solar gain;*
- *If you are planning an extension, use smaller windows on the south elevation and larger windows on the north (a balance is needed between solar gains (heat) and daylighting);*
- *Include high performance glazing e.g. triple glazed windows, specially treated or tinted glass;*
- *Incorporate green and brown roofs and green walls which help to regulate temperature as well as providing surface water run-off, biodiversity and air quality benefits;*
- *Porches, atriums, conservatories, lobbies and sheltered courtyards can be thermal buffers, they provide a transition between the cold outside and the warmth inside a building (or similarly the reverse in warmer months)."*

Methodology

A Dynamic Software Model (DSM) using IES Virtual Environment software (IES VE) has been used to assess the scheme's likelihood of overheating against the CIBSE TM59 'Design methodology for the assessment of overheating risk in homes (2017)' criteria and targets.

As per the TM59 guidance, the following criteria must be met:

1) For living rooms, kitchens and bedrooms:
The number of hours during which ΔT (the difference between operative and threshold comfort temperatures) is greater than or equal to one degree (K), during the period of May to September inclusive, shall not be more than 3 per cent of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

2) For bedrooms only:
To evaluate 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 failure).

The following was considered as part of the assessment:

1. The site is in a lower density urban area, therefore, London Heathrow data was used for the location weather file.
2. The windows have only been modelled as open when the internal temperature is greater than or equal to 22°C during occupied hours.
3. Bathrooms have been included in the model but are not required to pass.
4. Profiles for occupancy periods, and internal gains (people, lighting, equipment) are standardised and include the following:
    a. 1 person is assumed present in bedrooms during the daytime.
    b. 2 people in the night in a double bedroom.
    c. Living spaces occupied from 9am to 10pm.

Natural ventilation paths are modelled by algorithms that control the window and door openings where applicable. The software incorporates VistaPro, which permits range testing of variables.

The following building classifications are stipulated with Table 2 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.

This current assessment has applied Category (iii)

Category	Description	Range (degK)
Category i	High level of expectation only used for spaces occupied by very sensitive fragile persons	2
Category ii	Normal expectation (for new buildings and renovations)	3
Category iii	A moderate expectation (used for existing buildings)	4

Methodology

A 3D model of the site was developed using DSM software based on drawings prepared by MRJ Rundell + Associates Ltd, received 24th June 2024.

Although all rooms on-site were modelled, rooms where active cooling is not proposed have not been included within the overall results. A total of two bedrooms and one office where active cooling is proposed has been considered within this report.

Based on the CIBSE TM49 Design Summer Years for London, the following weather files were selected to represent current weather conditions for the overheating assessment:

- DSY1 for the 2020s, high emissions, 50% percentile scenario
- DSY2 for the 2020s, high emissions, 50% percentile scenario
- DSY3 for the 2020s, high emissions, 50% percentile scenario

Furthermore, the following weather files were also considered to assess the overheating risk under future weather conditions.

- DSY1 for the 2050s, high emissions, 50% percentile scenario
- DSY1 for the 2080s, high emissions, 50% percentile scenario

A site visit was also undertaken on the 1st July 2024 to understand the existing building and what current overheating mitigation measures are in place.

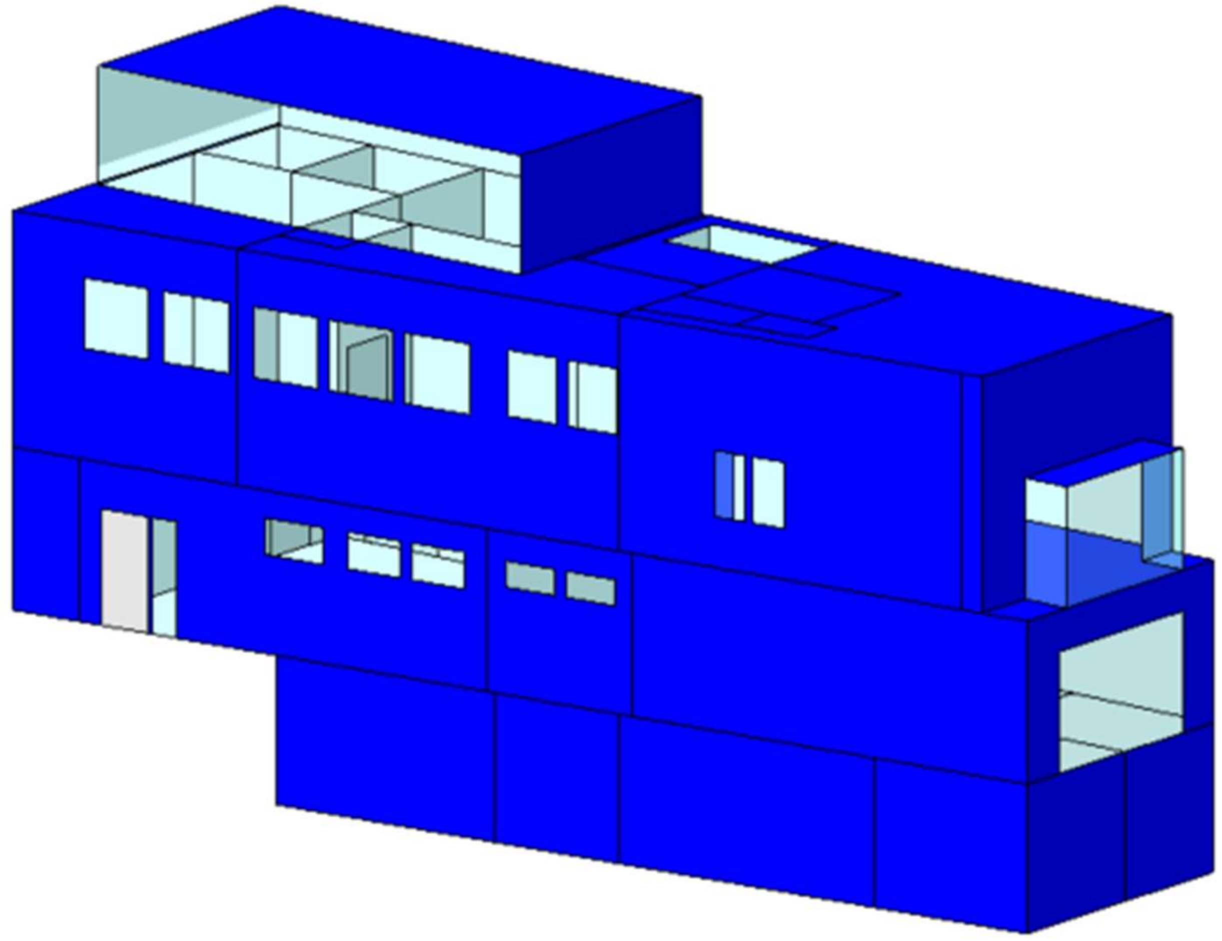

Figure 2: *Model image of the existing development (southeast view)*

Assumptions

Building Fabric

The site's building fabric is summarised to the right.

Building fabric U-values assumptions have been made based on building age against reference data[1]. The building construction age has been extracted from reports within the Camden Planning Portal.

The window g-value information has been extracted from solar film information provided by the client and datasheets from the manufacturer, Solarshield (see Appendix A).

Occupancy

Occupancy refers to the hours a particular room is occupied. The occupancy profiles for this overheating assessment have been extracted from the National Calculation Method (NCM) estimates based on the room types assessed e.g., bedrooms, living rooms.

Internal Heat Gains

Internal Heat Gains consider various conditions within the room, namely the people, lighting, and electrical equipment. The internal gains profiles for people and equipment for this overheating assessment have been extracted from the National Calculation Method (NCM) estimates based on the room types assessed e.g., bedrooms, living rooms.

The internal gains for the baseline model lighting are based on 5.2 w/m2/(100 lux).

Ventilation

As the scheme is not restricted with regards to window openings, natural ventilation is the primary method of ventilation.

Building Fabric	Input	Unit	Comment
External wall U-value	1.6 1 0.27	W/m2K	Main building – 1960s-70s East extension – 1980s Rear extension – 2000s
Ground floor U-value	0.58	W/m2K	Assumed uninsulated solid floor
Roof U-value	1.4	W/m2K	Flat roof – pre-1990s
Door U-value	2.2	W/m2K	Assumed 2013 new doors
Window U-value	1.2	W/m2K	Modern double glazing
Window G-value	0.41	-	As per Solarshield specification
Air permeability	25	@50Pa (m³/(h.m²))	

Table 1: *The building fabric inputs for the overheating analysis*

1. National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in England) – 2021. https://www.uk-ncm.org.uk/filelibrary/NCM_Modelling_Guide_2021_Edition_England_15Dec2021.pdf

Mitigation Measures

Summary results

The building was assessed under the DSY1 2020s weather file; the results indicate that all three assessed rooms fail the TM59 criteria under current weather conditions.

TM59 methodology states that DSY2 and DSY3 weather files can also be tested to determine further overheating risk within homes. None of the three rooms assessed pass the TM59 criteria under the DSY2 and DSY3 2020s weather files.

Additionally, under future weather conditions, none of the three assessed rooms pass the TM59 criteria under the DSY1 2050s and 2080s weather files.

The building has already utilised the following passive measures to mitigate overheating:

- Windows openings have been maximised to facilitate natural ventilation.
- All windows and rooflights have been upgraded to modern double glazing.
- Solar film was installed to minimise solar gain, with a g-value of ~0.4.
- Internal shade in the form of electric roller blinds have been installed to further minimise solar gain.

It should also be noted that during the site visit, the indoor environment was thermally uncomfortable, despite the dry bulb temperature only being ~19°C.

As per the cooling hierarchy, Love Design Studio have also considered further passive measures within the assessment to mitigate overheating in the building, including:

- External shutters
- Mechanical Ventilation with Heat Recovery

Results determined that the additional measures reduced the overheating risk only for the office under the DSY1 2020s weather file; however, overheating risk was still determined in all three rooms under DSY2, DSY3 2020s and DSY1 2050s and 2080s weather files.

Furthermore, external shade, such as external shutters, canopies, awnings and brise soleil, are not considered appropriate due to the building's location in a conservation area. Additionally, due to the bedrooms and office predominately being served by rooflights, external shutters, or other moveable external shade solutions, are not suitable.

Overall, 11 Albert Terrace Mews has followed the cooling hierarchy by providing passive measures prior to active cooling. Although one out of the three rooms assessed passes the TM59 overheating criteria for DSY1 2020s weather file using additional passive measures, the results determine that overheating risk is still identified within all three rooms under DSY2, DSY3 2020s and DSY1 2050s and 2080s.

Overall, 11 Albert Terrace Mews has followed the cooling hierarchy by considering all feasible passive measures prior to active cooling. Therefore, as per the last stage of the cooling hierarchy, active cooling is a measure that would mitigate overheating risk within the two bedrooms and office.

Site Visit

Highly glazed south-facing façade and roof

Electric roller blinds for rooflights

High specification windows

Internal shading

Solar film on glazing

CIBSE TM59 Overheating Results

DSY1 for the 2020s, High Emissions, 50th Percentile					Failures
Iteration	**Openings**	**Solar shading**	**Mechanical Ventilation with Heat Recovery**	**Air conditioning**	**Bedrooms and Office**
1 (Baseline)	All windows to construction specification	• 0.4 g-value • Internal blinds	No	No	3/3
2 (External shutters)	All windows to construction specification	• 0.4 g-value • Internal Blinds • External shutters	No	No	2/3
3 (MVHR)	All windows to construction specification	• 0.4 g-value • Internal blinds	Yes	No	2/3

Table 2: *TM59 Assessment Results under London Weather Centre DSY1, 2020s, High Emissions, 50th Percentile weather file*

DSY2 for the 2020s, High Emissions, 50th Percentile					Failures
Iteration	**Openings**	**Solar shading**	**Mechanical Ventilation with Heat Recovery**	**Air conditioning**	**Bedrooms and Office**
1 (Baseline)	All windows to construction specification	• 0.4 g-value • Internal blinds	No	No	3/3
2 (External shutters)	All windows to construction specification	• 0.4 g-value • Internal Blinds • External shutters	No	No	3/3
3 (MVHR)	All windows to construction specification	• 0.4 g-value • Internal blinds	Yes	No	3/3

Table 3: *TM59 Assessment Results under London Weather Centre DSY2, 2020s, High Emissions, 50th Percentile weather file*

CIBSE TM59 Overheating Results

DSY3 for the 2020s, High Emissions, 50th Percentile					**Failures**
Iteration	**Openings**	**Solar shading**	**Mechanical Ventilation with Heat Recovery**	**Air conditioning**	**Bedrooms and Office**
1 (Baseline)	All windows to construction specification	• 0.4 g-value • Internal blinds	No	No	3/3
2 (External shutters)	All windows to construction specification	• 0.4 g-value • Internal Blinds • External shutters	No	No	3/3
3 (MVHR)	All windows to construction specification	• 0.4 g-value • Internal blinds	Yes	No	3/3

Table 4: *TM59 Assessment Results under London Weather Centre DSY3, 2020s, High Emissions, 50th Percentile weather file*

DSY1 for the 2050s, High Emissions, 50th Percentile					**Failures**
Iteration	**Openings**	**Solar shading**	**Mechanical Ventilation with Heat Recovery**	**Air conditioning**	**Bedrooms and Office**
1 (Baseline)	All windows to construction specification	• 0.4 g-value • Internal blinds	No	No	3/3
2 (External shutters)	All windows to construction specification	• 0.4 g-value • Internal Blinds • External shutters	No	No	3/3
3 (MVHR)	All windows to construction specification	• 0.4 g-value • Internal blinds	Yes	No	3/3

Table 5: *TM59 Assessment Results under London Weather Centre DSY1, 2050s, High Emissions, 50th Percentile weather file*

CIBSE TM59 Overheating Results

DSY1 for the 2080s, High Emissions, 50th Percentile					Failures
Iteration	**Openings**	**Solar shading**	**Mechanical Ventilation with Heat Recovery**	**Air conditioning**	**Bedrooms and Office**
1 (Baseline)	All windows to construction specification	• 0.4 g-value • Internal blinds	No	No	3/3
2 (External shutters)	All windows to construction specification	• 0.4 g-value • Internal Blinds • External shutters	No	No	3/3
3 (MVHR)	All windows to construction specification	• 0.4 g-value • Internal blinds	Yes	No	3/3

Table 6: *TM59 Assessment Results under London Weather Centre DSY1, 2080s, High Emissions, 50th Percentile weather file*

Appendix A – Window g-value details for solar film supplied by SolarShield

Window g-value details for glazing treated with solar film PR 90 from SolarShield

Glass Type	Film Type on 6mm Glass	Visible Light Transmission	Visible Reflection Exterior	Visible Reflection Interior	Heat Gain Reduction	G-value (Solar Heat Gain Coefficient)	Total Solar Energy Rejected
Single Pane							
Clear	No film	89%	8%	9%	N/A	0.82	19%
	PR 90	**88%**	**9%**	**9%**	**21%**	**0.64**	**36%**
Tinted	No film	53%	6%	6%	N/A	0.63	37%
	PR 90	**53%**	**6%**	**6%**	**21%**	**0.50**	**50%**
Double Pane							
Clear	No film	79%	15%	15%	N/A	0.70	30%
	PR 90	**78%**	**15%**	**16%**	**21%**	**0.56**	**45%**
Tinted	No film	47%	8%	13%	N/A	0.51	49%
	PR 90	**47%**	**9%**	**13%**	**20%**	**0.41**	**60%**

Window g-value details for glazing treated with solar film PR 70 from SolarShield

Glass Type	Film Type on 6mm Glass	Visible Light Transmission	Visible Reflection Exterior	Visible Reflection Interior	Heat Gain Reduction	G-value (Solar Heat Gain Coefficient)	Total Solar Energy Rejected
Single Pane							
Clear	No film	89%	8%	9%	N/A	0.82	19%
	PR 70	**69%**	**9%**	**9%**	**38%**	**0.50**	**50%**
Tinted	No film	53%	6%	6%	N/A	0.63	37%
	PR 70	**42%**	**6%**	**7%**	**31%**	**0.43**	**57%**
Double Pane							
Clear	No film	79%	15%	15%	N/A	0.70	30%
	PR 70	**62%**	**15%**	**13%**	**21%**	**0.56**	**44%**
Tinted	No film	47%	8%	13%	N/A	0.51	49%
	PR 70	**37%**	**8%**	**12%**	**18%**	**0.42**	**59%**

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