RIBA Stage 2
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Document prepared for
Dimitar Stoyanov
AS Studio

Date of issue
30/09/2020

Issue no.

Our reference
5207-6 Lindfield Gardens-Overheating-2009-07yp-RS.docx

Document prepared by
Yiota Paraskeva

Quality assured by
Chris Hocknell

Disclaimer

Contents:

Executive Summary
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Overview

This report has assessed the proposed scheme in accordance with CIBSE Guide A, CIBSE TM52 and TM59 requirements relating to overheating. Results are provided which show how the occupied spaces perform against the thermal comfort standards for overheating

The scheme has implemented passive design measures and the modelling results indicate that the scheme is compliant with the overheating requirements for DSY1 weather file.

The proposal maximises passive design measures by responding to the local context in the following ways:

- Energy efficient lighting and appliances have been recommended to reduce internal heat gains;
- The new building fabric will be insulated over and above the standards set out by Building Regulations and reduced solar gains from a glazing solar factor of 0.50 (for new windows and rooflights) will help to keep heat out of the building;
- Internal shading devices to further limit solar gains;
- Natural ventilation to supply fresh air to the building through openable windows (as per ventilation rates section of this report).

Note that the analysis was performed assuming that opening windows were controlled based on the level of occupancy and the operative indoor temperature of the space. To achieve the thermal comfort levels shown in this report the level of occupant control for the opening windows would need to be optimum i.e. fully responsive to indoor temperature.

Introduction
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Introduction

Eight Associates has been appointed in order to undertake an overheating analysis of 6 Lindfield Gardens to provide design stage guidance and maximise occupant comfort levels. Consequently, thermal modelling has been undertaken to demonstrate compliance with CIBSE TM59 requirements. The current proposal is to minimise overheating risk by following the Cooling Hierarchy.

Building Summary

The proposal comprises refurbishment and extension of an existing house to create 9 residential units with an internal floor area of approximately 711m^2. The development is located in the London Borough of Camden.

Planning Context

The Camden Local Plan does not set out any specific requirements for avoiding overheating. This report is aligned with national standards and regulations. The scheme is required to achieve compliance for DSY1 weather file. However, the DSY2 and DSY3 should also be investigated.

Methodology

The methodology used within this report has been to establish the thermal comfort levels in the occupied spaces through using dynamic simulation modelling and respond with suitable passive design measures to mitigate solar gains, provide adequate ventilation and increase thermal mass. National regulations have set high standards and numerous iterations have been undertaken to determine suitable fabric improvements. All assumptions in the modelling are provided in the model inputs section of this report.

Please note that the climate change scenario has been excluded from this report. External temperatures are likely to increase because of climate change. The consequences of increased summer peak temperatures could be non-compliance with the thermal comfort recommendations unless further measures were implemented.

Criteria for defining overheating

According to the CIBSE TM59: 2017 – Design methodology for the assessment of overheating risk in homes, to reduce the risk of overheating the space has to comply with the following criteria:

1. For living rooms, kitchen 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 per cent of occupied hours.
2. 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 the annual hours (1% of the annual hours between 22:00 and 07:00, equivalent to 32 hours).

Modelling Inputs
Overheating Analysis
6 Lindfield Gardens

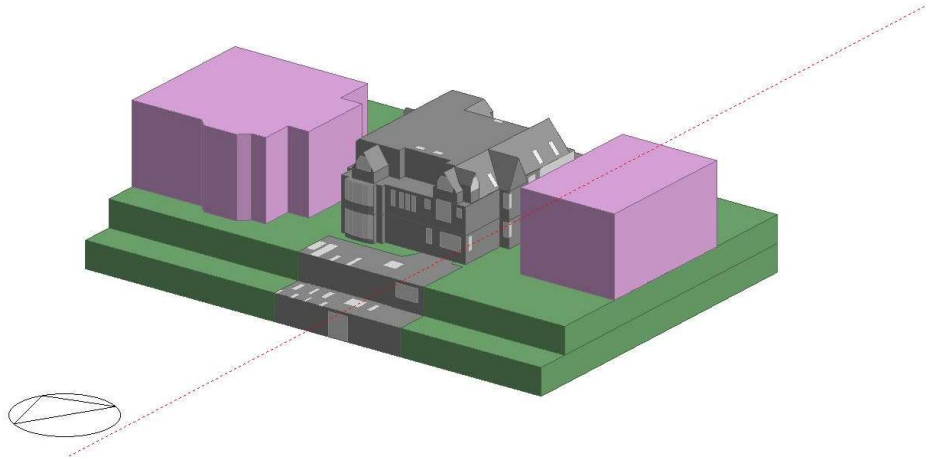
eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Simulation Software

An overheating analysis has been undertaken using Dynamic Simulation Modelling, Design Builder has been employed for this. Design Builder is a DCLG approved simulation environment that complies with the requirements of CIBSE Guide A. A screenshot of the model is shown below.



Weather File

The CIBSE Design Summer Year (DSY1), London Heathrow, for the 2020s, high emissions, 50% percentile scenario, has been used for the purposes of this report. DSY2 and DSY3 have also been investigated.

The three DSYs represent summers with different types of hot events.

- DSY1 – Moderately warm summer
- DSY2 – Short intense warm spell
- DSY3 – Long, less intense warm spell

Building Fabric U-Values

Element	Proposed U-value W/m^{2}K
Flat roof – Existing	0.18
Flat roof – New	0.14
Pitched roof – Existing	0.18
Pitched roof – New	0.14
Wall – Existing	0.55
Wall – New	0.14
Corridor wall	0.55
Ground floor	0.55
Exposed floor	0.55
Windows – Existing	1.60 (g-value 0.63)
Windows – New	1.30 (g-value 0.50)
Rooflights – Existing	1.60 (g-value 0.63)
Rooflights – New	1.30 (g-value 0.50)
Doors	1.30

Internal Gains

Typical hours based, according to TM 59 and CIBSE Guide A on the relative activity for class use, on weekdays and weekends throughout the year have been specified for lighting, equipment and occupancy.

Space	Occupancy people	Lighting W/m^2	Small power W
Bedroom	2	2	80
Kitchen / Living room	2-3	2	450

Passive Design Measures
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Cooling Hierarchy

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building in summer through shading, albedo, fenestration, insulation and green roofs and walls;
3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation;
6. Active cooling systems (ensuring they are the lowest carbon options).

Cooling Strategy

The cooling strategy is to implement energy efficient lighting and appliances to reduce internal heat gains; create a super-insulated fabric with shading devices and solar control glazing to keep the heat out.

Windows

Glazing will be a crucial aspect to ensure thermal comfort of the occupied spaces. In order to minimise solar gains, and consequently cooling demand, windows with a solar factor of 0.50 have been modelled for the new extension.

Shading

Internal blinds with medium reflective slats have been modelled to reduce solar gains. This system will manually operate using inside air temperature controls, shadings will be activated when the inside temperature exceeds the threshold temperature of 18°C.

Thermal Mass

The development consists of a brick and block structure which will provide thermal mass. This will absorb heat energy during the day and release it at night, keeping spaces at a steadier temperature.

Mechanical Ventilation Rates

Extract mechanical ventilation has been specified. The system will be in line with Part F.

Natural Ventilation Rates

Natural ventilation through openable windows has been adopted for this scheme. The ventilation rate has been calculated by the software according to the free opening area of each window and the varying environmental conditions throughout the year. All windows and second floor rooflights to habitable rooms (bedroom, kitchen, living room) should be fully openable.

Moreover, the scheme has been modelled with a discharge coefficient rate of 0.65 and a wind factor of 1. The windows were open when the internal temperature what above 22°C and when the room were occupied.

Summary of Results
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

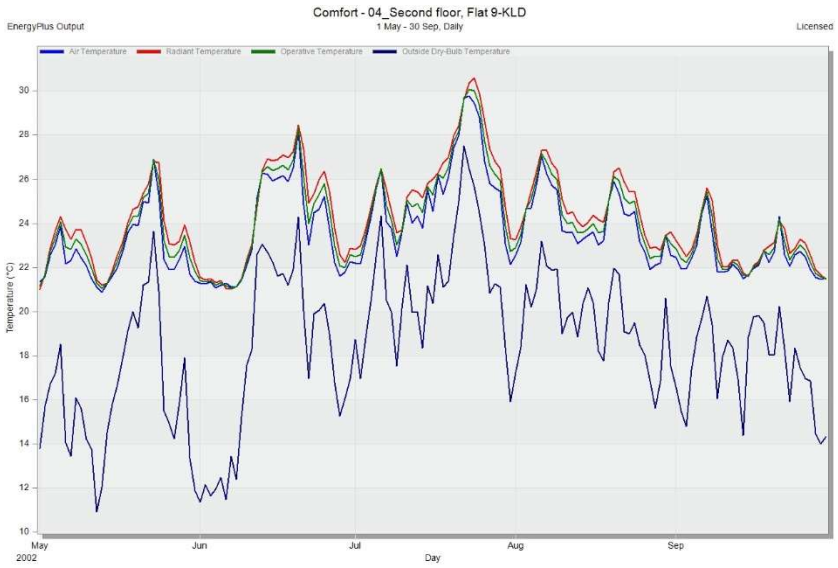
www.eightassociates.co.uk
info@eightassociates.co.uk

Results

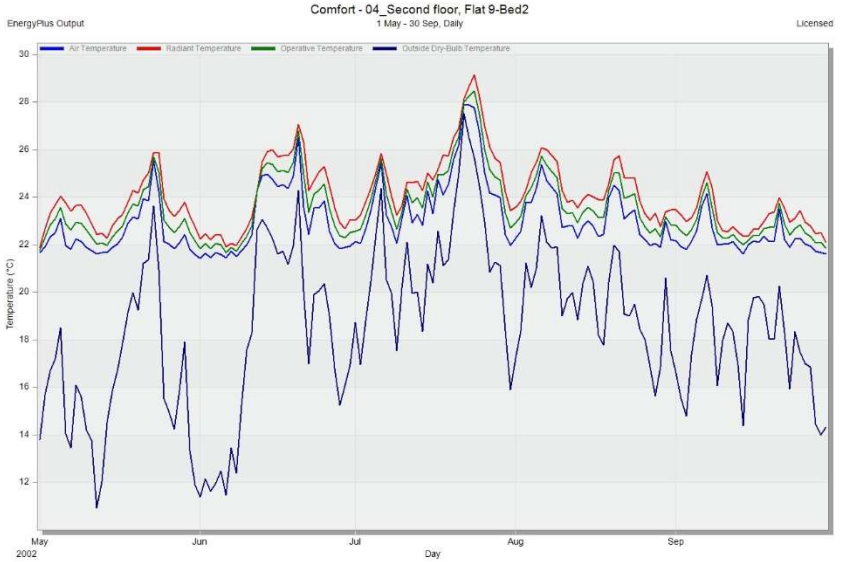
The graphs below present the outdoor, indoor mean air, indoor mean radiant and operative temperature for a sample of the worst performing rooms. A table confirming the results for all rooms is shown in Appendix A.

In summary, all rooms meet CIBSE TM59 requirements for DSY1 weather file. 73.9% and 26.1% of the rooms meet overheating requirements for DSY2 and DSY3 weather file respectively.

Flat 9, Living room / kitchen



Flat 9, Bedroom 2



Conclusions
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Conclusions

The proposal has responded to CIBSE TM59 requirements relating to overheating. The report has set out how the occupied spaces perform against strict thermal comfort standards for overheating. The scheme has implemented passive design measures and the modelling results indicate that the scheme is compliant with the overheating requirements as set out in CIBSE TM59 for DSY1 weather file.

The proposal maximises passive design measures by responding to the local context in the following ways:

- Energy efficient lighting and appliances have been recommended to reduce internal heat gains;
- The new building fabric will be insulated over and above the standards set out by Building Regulations and reduced solar gains from a glazing solar factor of 0.50 (for the new windows and rooflights) will help to keep heat out of the building;
- Internal shading devices to further limit solar gains;
- Natural ventilation to supply fresh air to the building through openable windows (as per ventilation rates section of this report).

As it is demonstrated above, the scheme can achieve compliance for DSY1 weather file, which is the main requirement. The overheating risk has also been investigated for DSY2 and DSY3. DSY2 includes a short and intense warm spell. DSY3 includes a long and less intense warm spell. All living rooms meet TM59 requirements for DSY2. Six bedrooms fail to meet Criterion 2. Almost all rooms fail the TM59 requirements because of the intensity of the DSY3 weather file. It must be considered that it is very difficult to be able to address these variables in the future without substantially changing the design or retrofitting active cooling which is not considered viable. Moreover, as seen from the assessment, most living spaces meet overheating requirements in the future climate scenario and these spaces are more likely to be used during daytime, which is the warmest part of the day.

Future occupants will be made aware of overheating risks via the home user guide and that they would need to activate internal shading devices and open windows at a lower temperature set point than assumed for this study. Moreover, night ventilation for living rooms/kitchen could improve the overheating results. Plug-in fans could be used as an additional measure during heatwaves.

Note that the analysis was performed assuming that opening windows were controlled based on the level of occupancy and the operative indoor temperature of the space. To achieve the thermal comfort levels shown in this report the level of occupant control for the opening windows would need to be optimum i.e. fully responsive to indoor temperature.

Appendix A
Overheating Analysis
6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Appendix A – Results

Overheating Analysis

6 Lindfield Gardens

eight associates

+44 (0)207 0430 418

www.eightassociates.co.uk
info@eightassociates.co.uk

Floor / Flat / Room	DSY1			DSY2			DSY3		
	Criterion 1 (%)	Criterion 2 (hr)	Compliance	Criterion 1 (%)	Criterion 2 (hr)	Compliance	Criterion 1 (%)	Criterion 2 (hr)	Compliance
LowerGroundFloor-Flat1-Bed1	0.7	19.5	Pass	1.0	47	Fail	2.0	71.75	Fail
GroundFloor-Flat1-Bed2	0.0	8	Pass	0.0	28.75	Pass	0.0	40.75	Fail
GroundFloor-Flat1-Bed3	0.0	5	Pass	0.0	11.5	Pass	0.0	21.75	Pass
GroundFloor-Flat1-KLD	0.1	N/A	Pass	1.2	N/A	Pass	3.0	N/A	Pass
GroundFloor-Flat2-Bed1	0.0	7.25	Pass	0.0	17.25	Pass	0.0	29.5	Pass
GroundFloor-Flat2-Bed2	0.0	3.75	Pass	0.0	11.25	Pass	0.0	23.25	Pass
GroundFloor-Flat2-Bed3	0.0	7.25	Pass	0.0	20.25	Pass	0.0	44.5	Fail
GroundFloor-Flat2-KLD	0.2	N/A	Pass	1.1	N/A	Pass	2.7	N/A	Pass
GroundFloor-Flat3-Studio	0.0	8.25	Pass	0.0	22.25	Pass	0.0	36	Fail
FirstFloor-Flat4-Bed1	0.0	14.75	Pass	0.0	35.5	Fail	0.0	44.5	Fail
FirstFloor-Flat4-Bed2	0.0	12.75	Pass	0.0	29.25	Pass	0.0	60.5	Fail
FirstFloor-Flat4-KLD	0.2	N/A	Pass	1.2	N/A	Pass	2.8	N/A	Pass
FirstFloor-Flat5-Bed1	0.0	9	Pass	0.0	22	Pass	0.0	33	Fail
FirstFloor-Flat5-Bed2	0.0	24.25	Pass	0.0	60.75	Fail	0.0	81.75	Fail
FirstFloor-Flat5-KLD	0.4	N/A	Pass	1.6	N/A	Pass	3.4	N/A	Fail
FirstFloor-Flat6-Bed1	0.2	17.75	Pass	0.7	50.25	Fail	1.3	75	Fail
FirstFloor-Flat6-Bed2	0.0	24	Pass	0.5	60	Fail	0.6	84.5	Fail
FirstFloor-Flat6-KLD	1.2	N/A	Pass	2.4	N/A	Pass	4.9	N/A	Fail
SecondFloor-Flat7-Studio	0.1	11.75	Pass	0.5	24.75	Pass	0.8	37.25	Fail
SecondFloor-Flat8-Studio	0.1	11.75	Pass	0.6	23.75	Pass	0.9	35	Fail
SecondFloor-Flat9-Bed1	0.1	11	Pass	0.8	28	Pass	0.9	36.25	Fail
SecondFloor-Flat9-Bed2	0.0	30.75	Pass	0.5	58.5	Fail	1.0	87.75	Fail
SecondFloor-Flat9-KLD	1.3	N/A	Pass	2.4	N/A	Pass	4.7	N/A	Fail
Total Rooms	23			23			23		
Pass	23	100.0%		17	73.9%		6	26.1%	
Fail	0	0.0%		6	26.1%		17	73.9%	