

Frederick Morfill House, Borough of Haringey
Overheating Assessment

Version 01.1

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1 Introduction

This report assesses the overheating potential of the proposed development on Frederick Morfill House, Bounds Green Road, N22 8DG in order to meet the sustainability requirements of the London Plan, Part O and AECB Building Standard. The proposed development comprises two three bedroom homes. The site is shown in Figure 1-01.



Figure 1-1 – Frederick Morfill House site

2 Guidance

2.1 The London Plan Policy SI 4 Managing heat risk

- A. Development proposals should minimise adverse impacts on the urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure.
- B. Major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy:
 - 1) reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure
 - 2) minimise internal heat generation through energy efficient design

- 3) manage the heat within the building through exposed internal thermal mass and high ceilings
- 4) provide passive ventilation
- 5) provide mechanical ventilation
- 6) provide active cooling systems.

2.2 Part O – Requirement O1 : Overheating mitigation

The aim of requirement O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

In the Secretary of State's view, requirement O1 is met by designing and constructing the building to achieve both of the following.

- a. Limiting unwanted solar gains in summer.
- b. Providing an adequate means of removing excess heat from the indoor environment.

2.3 CIBSE TM 59 - Design methodology for the assessment of overheating risk in homes

TM 59 outlines specific criteria for assessing overheating in residential buildings. For homes with restricted windows openings, the following criteria must be passed in order to ensure the building does not overheat:

- All occupied rooms should not exceed an operative temperature of 26°C for more than 3% of the annual occupied annual hours

2.4 AECB Building Standard

The AECB Building Standard can be said to be achieved where The proposed building design is modelled using the Passivhaus Planning Package (PHPP) in accordance with current Passivhaus methodology and meets the following requirements:

- Low overheating frequency : $\leq 10\%$ of the annual hours (876 hours) in a given year are over 25°C within internal spaces

3 Overheating

3.1 Overheating Checklist

The London Plan overheating checklist has been used to assess the risk of overheating in the flats.

Section 1 – Site features affecting vulnerability to overheating		Yes or No
Site location	Urban – within central London ²⁹ or in a high density conurbation	No
	Peri-urban - on the suburban fringes of London ³⁰	Yes
Air quality and/or Noise sensitivity - are any of the following in the vicinity of buildings?	Busy roads / A roads	Yes
	Railways / Overground / DLR	Yes
	Airport / Flight path	No
	Industrial uses / waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	N/A
	Are residents likely to be at home during the day (e.g. students)?	No
Dwelling aspect	Are there any single aspect units?	No
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	No
	If yes, is this to allow acceptable levels of daylighting?	-
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	No
	Vulnerable areas identified by the Police Architectural Liaison Officer	-
	Other	N/A

²⁹ Urban - as defined in CIBSE Guide TM49. Broadly equivalent to Central Activities Zone and Inner London areas in Map 2.2 of the London Plan

³⁰ Peri-urban – as defined in CIBSE Guise TM49. Broadly equivalent to Outer London areas in Map 2.2 of the London Plan

Section 2 – Design features implemented to mitigate overheating risk		Please Respond
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	No
	Will green roofs be provided?	N/A
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	No
Materials	Have high albedo (light colour) materials been specified?	TBC
Dwelling aspect	% of total units that are single aspect	0%
	% single aspect with N orientation	0%
	% single aspect with E orientation	0%
	% single aspect with S orientation	0%
	% single aspect with W orientation	0%
Glazing ratio - What is the glazing ratio (glazing: internal floor area) on each facade?	N	0%
	E	7.6%
	S	0%
	W	21.9%
Daylighting	What is the average daylight factor range?	-
Window opening	Are windows openable?	Yes
Window opening	What is the average percentage of openable area for the windows?	65.6%
	Fully openable	No

Window opening - What is the extent of the opening?	Limited (e.g. for security, safety, wind loading reasons)	Yes
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	N/A
Shading	Is there any external shading?	Yes, from proposed surrounding buildings
	Is there any internal shading?	TBC
Glazing specification	Is there any solar control glazing?	Yes, low emissivity glazing is specified
Ventilation - What is the ventilation strategy?	Natural – background	TBC
	Natural – purge	TBC
	Mechanical – background (e.g. MVHR)	Yes
	Mechanical – purge	Yes
	What is the average design air change rate	-
Heating system	Is communal heating present?	No
	What is the flow/return temperature?	-
	Have horizontal pipe runs been minimised?	-
	Do the specifications include insulation levels in line with the London Heat Network Manual ³¹	-

³¹ http://www.londonheatmap.org.uk/Content/uploaded/documents/LHNM_Manual2014Low.pdf

3.2 Part O Section 3 : Ensuring the overheating mitigation strategy is usable

3.2.1 Noise

In locations where external noise may be an issue, the overheating mitigation strategy should take account of the likelihood that windows will be closed during the sleeping hours (11pm to 7am).

As the External Noise Assessment has not been completed by the time that this report is written, two different scenarios are going to be examined to cover both the case that the development passes or fails to comply with the levels of internal noise set by Part O.

3.2.2 Pollution

Buildings located near to significant local pollution sources should be designed to minimise the intake of external air pollutants.

As the Air Quality Assessment has not been completed by the time that this report is written, two different scenarios are going to be examined to cover both the case that the development passes or fails to comply with the levels of air quality set by Part O.

3.3 Cooling Hierarchy

3.3.1 Reduce the amount of heat entering a building

The development is surrounded by a number of other buildings, which will provide shading to the lower floors.

The development has been proposed with glazing with a reduced g-value and brise soleil above the glazing areas on the ground and first floor, to reduce solar gains. The development will have highly insulated external walls, which minimise any heat gain through conduction.

3.3.2 Minimise internal heat generation

Internal heat generation will be minimised throughout the development. Highly efficient LED lighting will be required as part of the energy strategy, which minimises internal heat generation.

The pipes of the heating system should be fully insulated, where is possible, to minimise any heat loss and prevent heat build-up in the spaces.

3.3.3 Manage the heat within the building

All the thermal elements of the building have been designed with high standards that will provide a significant amount of thermal mass. This provides a damping effect, allowing the development to buffer itself from extremely high temperatures outside.

3.3.4 Passive ventilation

All occupied rooms are provided with operable windows. As by the time that this assessment is completed is uncertain if the windows can remain open at night to provide passive ventilation and cool down the houses. However, in all cases, there will still be some passive ventilation opportunities from the windows at the less noise sensitive times of the day or when rooms are not in use.

3.3.5 Mechanical ventilation

The development has been specified with MVHR and mechanical cooling which can be used to provide background ventilation rates to the development. This means ventilation is possible even in situations when occupants cannot leave windows open, as well as allowing ventilation to rooms that do not have external windows.

3.3.6 Active cooling systems

In the case that the windows need to remain closed during the sleeping hours, the development needs to have a mechanical cooling system to comply with the overheating criteria set by TM 59, Part O. To assess the necessity of implementation of an active cooling system 2 different scenarios

have been tested. In the first the windows stay open during sleeping hours, according to Part O guidelines, and in the second the windows are closed during sleeping hours. The results are presented in section 5.

4 Assessment Methodology

The assessment was undertaken using IES Virtual Environment software. A model of the proposed development was created in the IES Modellt module using drawings provided by the architect. The surrounding buildings have been modelled based on satellite imagery and information provided in the drawings. An indicative model of the proposed adjacent development has also been included.

A dynamic thermal assessment was conducted using the IES Apache module, which is a CIBSE AM11 compliant thermal modelling software.

All the occupied rooms of the two units have been assessed for their overheating potential which include bedrooms and LKDs.

The Design Summer Year 1 (DSY1), Design Summer Year 2 (DSY2) and Design Summer Year 3 (DSY3), London Weather Centre, high emission, 50% percentile weather files have been used from 2020 for the current scenarios.

The three DSY scenarios represent different types of hot summers:

- DSY1 – moderately warm summer, with a return period of seven years
- DSY2 – short, intense warm spell, about the same length as the moderate summer year but with a higher intensity
- DSY3 – long, less intense warm spell, which is less intense than the high-intensity year, but longer and more intense than the moderate summer year

5 Results

The results for the overheating assessment using 2020 weather data without mechanical cooling is outlined in Table 5-1 below.

	DSY1	
	Windows opened during sleeping hours	Windows closed during sleeping hours
	<= 3 % Div	<= 3 % Div
L00_A_lkd 3b	6.8	8.1
L00_B_lkd 3b	6.9	8.2
L01_A_bed double 1	3.5	7.1
L01_A_bed double 2	3.2	7.1
L01_B_bed double 1	3.4	6.7
L01_B_bed double 2	3.2	7.1
L02_A_bed double 3	2.8	6.9
L02_B_bed double 3	2.9	6.9
Totals	2	0
	8	8
	25%	0%

Table 5-1 – Overheating results for 2020 weather file

The results for the overheating assessment using DSY1, DSY2 and DSY3 2020 weather files with mechanical cooling and closed windows during sleeping hours are presented in Table 5-2 below.

	DSY1	DSY2	DSY3
	<= 3	<= 3	<= 3
L00_A_lkd 3b	0	0	0
L00_B_lkd 3b	0	0	0
L01_A_bed double 1	0	0	0
L01_A_bed double 2	0	0	0
L01_B_bed double 1	0	0	0
L01_B_bed double 2	0	0	0
L02_A_bed double 3	0	0	0
L02_B_bed double 3	0	0	0
Totals	8	8	8
	8	8	8
	100%	100%	100%

Table 5-2 – Overheating results for 2020 weather files

The results for the overheating assessment with mechanical cooling and closed windows during sleeping hours using the AECB Building Standard overheating criterion is outlined in Table 5-3 below.

	DSY1	DSY2	DSY3
	<= 876 Hr P.A.	<= 876 Hr P.A.	<= 876 Hr P.A.
L00_A_lkd 3b	0	0	0
L00_B_lkd 3b	0	0	0
L01_A_bed double 1	0	0	0
L01_A_bed double 2	0	0	0
L01_B_bed double 1	0	0	0
L01_B_bed double 2	0	0	0
L02_A_bed double 3	0	0	0
L02_B_bed double 3	0	0	0
Totals	8	8	8
	8	8	8
	100%	100%	100%

Table 5-3 Overheating results for 2020 weather files

6 Discussion

The results show that without mechanical cooling the majority of the assessed units don't pass the overheating criterion for the DSY1, 2020, High emission 50th percentile scenario either with the windows open during sleeping hours or not. On the other hand with the windows open during sleeping hours and with all measure of passive cooling that have been implemented in the development, the 75% of the rooms assessed either pass the criterion set by TM 59 or they are very close to the limit.

With the implementation of mechanical cooling the 100% of the assessed rooms comply with the overheating criteria set by TM 59, Part O and AECB Building Standard, assessed under all three DSY files according to the guidance of TM 59. All the necessary design steps have been taken into consideration, such as minimising solar gains and openable windows to allow purge ventilation at occupants will when the external conditions allow it, to minimise the cooling energy demand.

7 Conclusion

This report assesses the overheating potential of the proposed development on Frederick Morfill House, Bounds Green Road, N22 8DG in order to meet the sustainability requirements of the London Plan, Part O and AECB Building Standard. Action was taken at each stage of the cooling hierarchy in order to minimise overheating.

A TM 59 assessment undertaken using IES Virtual Environment software, which is a CIBSE AM11 compliant thermal modelling software. The DSY1, DSY2 and DSY3, London Weather Centre, high emission, 50% percentile weather files were used to assess current overheating potential.

The results show that all of the assessed units within the development pass the overheating assessment with the implementation of an active cooling system in the occupied spaces for DSY1, DSY2 and DSY3 weather files.

8 Appendix

8.1 Model Assumptions

The building and modelling assumptions used in the assessment are outlined below. The building fabric used are outlined in Table 8-1.

Building Element	U – Value (W/m²K)	G - Value
External wall – EWS 01	0.143	
External wall – EWS 02	0.190	
Ground floor – FLS 01	0.103	
Flat roof – RFS 01	0.12	
Flat roof – RFS 03	0.102	
Pitched roof – RFS 02	0.09	
Glazing	0.67	0.52
Roof lights	0.67	0.52

Table 8-1 – Building fabric properties

Spaces were generally modelled in line with the internal gain and occupancy profiles outlined in CIBSE TM 59.

Auxiliary ventilation was modelled within the apartments, providing 0.8 ACH to living rooms, kitchens, bedrooms and bathrooms.

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