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# 71B Flask Walk– Overheating Design Note

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## Executive Summary

This document has been prepared to summarize the design parameters used the Thermal Modelling to assess overheating and considers only the residential living areas of 71B Flask Walk development and to justify the provision of a comfort cooling system.

***Please note that results and recommendations are based on the parameters described in this report. If any of the inputs change, results are likely to change. This means the recommendations may no longer be appropriate, or the building may not meet the necessary compliance requirements.***

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# 1. Introduction

This document has been prepared by Meca Engineering to summarise the design parameters used in the IES thermal modelling.

## 1.1 Description of the development

The development is located in London, in Hampstead and is a listed and recently refurbished residential building.

Heating is being produced by a new gas boiler which serves:
- underfloor heating at basement level, bathroom, dining room and kitchen
- radiators in all other rooms

The production of the domestic hot water is being made by a new hot water cylinder.

Intermittent extract fan for toilets.

Proposed Mechanical services are summarised in **Appendix B.**

# 2. Design parameters

- Design Drawings

The thermal model for the building was constructed according to the architect's drawings.

- Building Fabric Details

The façade contractor and / or Architect should confirm that the fabric parameters reported can be met (or improved upon), including:

- External walls U-values of 1.65 W/m²K;
- Floor U-value of 1.1 W/m²K;
- Roof U-value of 0.17 W/m²K;
- Windows U-values of 4.30 W/m²K;
- Air permeability of 10 m³/hr/m².

The impact of thermal bridges (beyond those including in the curtain walling calculations) has been averaged.

## 3. Thermal Comfort

### a. CIBSE TM59 Criteria

CIBSE TM59 provides two sets of criteria for the assessment of overheating in homes, which depends on whether occupants can use natural ventilation for the control of overheating. These are as follows:

**For spaces for which natural ventilation is precluded - windows closed - scenario 1:**

- Daytime: Operative temperatures in occupied spaces should not exceed 26°C for more than 3% of annual occupied hours.
- Night-time: As for naturally ventilated spaces.

**For spaces which can be naturally ventilated – windows opened - scenario 2:**

- Daytime: Operative temperatures in occupied spaces during the period May to September inclusive should not exceed Tmax (see TM59 for further information) for more than 3% of occupied hours.
- Night-time: Operative temperatures in bedrooms should not exceed 26°C for more than 1% of annual hours (translates to 33 hours total) between the hours of 10pm to 07am.

### b. Climate

The CIBSE TM59 guidance requires that developments refer to the latest CIBSE Design Summer Year (DSY) weather files. Developments are required to pass the DSY1 file most appropriate for the site location for the 2020s, high emissions, 50th percentile scenario. The appropriate nearest available weather file location is the London Heathrow DSY1 2020s High 50 weather file, which is used in the baseline modelling.

### c. Building Geometry

The building has been modelled based on architectural layouts received from 4orm on 04/07/2022.

### d. Internal Gains

The following table gives the internal gains and number of occupants modelled for each of the rooms analyzed, based on the CIBSE TM59 guidance.

| Room Type | Lighting Gain ($W/m^2$) | Number of people | Sensible Gain (W/Person) | Latent Gain | Equipment (Peak -W) |
|---|---|---|---|---|---|
| Kitchen | 2 | 2 | 150 | 110 | 300 |
| Dining/Study/Reception | 2 | 3 | 150 | 110 | 150 |
| Bedrooms | 2 | 2 | 150 | 110 | 80 |

**Notes:**

- *Kitchen occupancy dependent on number of bedrooms. Applied at 25% max.*
- *Living occupancy dependent on number of bedrooms. Applied at 75% max.*
- *It has been assumed the corridors will include PIR lighting controls and therefore no associated lighting gains have been modelled, as per CIBSE TM59 guidance. No internal gains have been applied to corridors and these are outside the scope of the assessment.*

### e. Ventilation

Mechanical Ventilation rates have been applied as follows:

WCs: 8 l/s

The size of opening in a façade is expressed in terms of its equivalent area. This is a standard definition used within the industry that considers the aerodynamic effects of a window. We are recommending providing a minimum equivalent opening area **greater than 5% of the room's floor area** to prevent excessive overheating.

## Results

For the purpose of this analysis, two separate scenarios have been modelled as follows and shown in the table below:

- **Scenario 1**: Windows are assumed to remain closed, with ventilation provided only by the extract fan. Under this scenario, all spaces fail to comply with the criteria outlined in CIBSE TM59.

- **Scenario 2**: Windows were assumed to be openable approximately 100 mm. Under this scenario, all spaces have the results improved, however still fail to comply with the criteria outlined in CIBSE TM59. In this scenario, it has been assumed that when the space temperature reaches 23°C, the sliding sash of the window begins to open, provided the outside temperature is less than internal temperature, and is fully open at 25°C.

**Scenario 1**

| | Windows Closed | | | | |
|---|---|---|---|---|---|
| **Location** | **Day % Hrs > 26°C Limit = 3%** | **Night # Hrs > 26°C Limit = 33 or max 1%** | **Night # Hrs > 26°C Limit = 33 or max 1%** | **Night # Hrs > 26°C Limit = 33 or max 1%** | **Result** |
| | | **22 - 00** | **00-07** | **total** | |
| First Floor - Bedroom 1 | | 38.6% * | 12.3% * | 50.9% * | Fail |
| First Floor - Bedroom 2 | | 36.3% * | 11.3% * | 47.6% * | Fail |
| Ground Floor - Dining/Study | 50.1% * | | | | Fail |
| Ground Floor - Reception | 16.8% * | | | | Fail |
| Ground Floor - Kitchen | 11.8% * | | | | Fail |

**Scenario 2**

| | Windows Opened | | | | |
|---|---|---|---|---|---|
| **Location** | **Day % Hrs > 26°C Limit = 3%** | **Night # Hrs > 26°C Limit = 33 or max 1%** | **Night # Hrs > 26°C Limit = 33 or max 1%** | **Night # Hrs > 26°C Limit = 33 or max 1%** | **Result** |
| | | **22 - 00** | **00-07** | **total** | |
| First Floor - Bedroom 1 | | 10.1% * | 1.3% * | 11.4% * | Fail |
| First Floor - Bedroom 2 | | 5.6% * | 0.5% * | 6.1% * | Fail |
| Ground Floor - Dining/Study | 8.5% * | | | | Fail |
| Ground Floor - Reception | 3.8% * | | | | Fail |
| Ground Floor - Kitchen | 3.6% * | | | | Fail |

[*]denotes the duration during which ΔT is greater than or equal to one degree during the period May to September inclusive.

### f. Recommendation

Due to the fact that the building is listed and limited, or no alterations can be done to the external façade or building fabric (such as shutters in front of windows or replacing existing windows with double glazed windows), the overheating measures are limited to the provision of a comfort cooling system.

The reliance on openable windows for the purposes of preventing overheating may not be desirable due to elevated noise levels present on the site. Whilst historically, acoustic considerations were not generally applied to opening windows for the purposes of overheating, more recent guidance from the ANC (Association of Noise Consultants) has sought to address this by stating that [where a] scheme is reliant on open windows to mitigate overheating, it is also necessary to consider the potential noise impact during the overheating condition. (Refer to ANC Residential Design Guide for further details).

In conclusion, we advise that to mitigate overheating a comfort cooling system should be installed.

***Please consider that current analysis was made with existing information and assumptions.***

## APPENDIX B – Mechanical Services

**Mechanical Services**

Heating is being produced by a new gas boiler which serves:

- underfloor heating at basement level, bathroom, dining room and kitchen
- radiators in all other rooms

The production of the domestic hot water is being made by a new hot water cylinder.

Intermittent extract fan for toilets.

The proposed cooling equipment will be manufactured by Daikin and comprise of the following:

- Multi -split residential outdoor AC unit installed on external flat roof above stairs
- Outdoor unit c/w inverter technology that reduces the energy consumption by 30% compared to a traditional on / off system
- Outdoor unit has a 6.8 kW cooling capacity
- Indoor units to basement room, reception and offices space to provide cooling
- Indoor units cooling capacities as follows: 2.5 kW basement room; 5 kW reception

## APPENDIX C – Building Geometry