Gondar Gardens (site RO 12 Sarre Road)

London NW2 3SL

Dynamic Summertime Overheating Analysis

1. Introduction

In the realm of sustainable building design, the assessment of overheating risk has emerged in recent years as a critical consideration. With the escalating challenges posed by climate change, the United Kingdom's Building Regulations have evolved to address the potential risks associated with overheating in buildings. Part O of the Building Regulations, in conjunction with the Chartered Institution of Building Services Engineers (CIBSE) Technical Memorandum 59 (TM59), sets the guidelines and standards for evaluating and mitigating overheating within various building types.

Part O of the UK Building Regulations, titled "Security Against Overheating," underscores the necessity for new buildings to be designed and constructed in a manner that minimizes the risk of overheating. It mandates that sufficient thermal comfort should be achieved, even during exceptionally warm weather, without relying solely on energy-intensive cooling systems. This regulation encourages the adoption of passive design strategies, intelligent architectural features, and effective ventilation to naturally manage internal temperatures.

The dynamic method for assessing overheating involves using computer simulation software to model and analyse the thermal behaviour of a building over time, particularly during periods of high external temperatures. This method takes into account a variety of factors, such as the building's design, orientation, materials, insulation, glazing, ventilation strategies, and occupancy patterns. By simulating the building's response to changing external conditions and internal heat gains, the dynamic method provides a more comprehensive and accurate assessment of the potential for overheating compared to simpler steady-state calculations.

Dynamic simulation software models how heat is transferred within and around a building, including how solar radiation enters through windows, how heat is conducted through walls and roofs, and how ventilation systems affect indoor air temperatures. It also considers the thermal mass of the building, which can help moderate temperature fluctuations by absorbing and releasing heat slowly.

Overheating assessment for the newly proposed house at **site RO 12 Sarre Road** has been carried out to check compliance with CIBSE TM59 and building regulations Part O overheating criteria.

The proposed end-terrace house comply with CIBSE TM59 (Part O) criteria under DSY1 weather data set, with natural ventilation through openable windows and mechanical ventilation.

2. Project description

The proposed development includes Erection of a two storey single family dwelling house in the rear garden fronting Gondar Gardens, with rear garden, bin and bike store.

3. Inputs

The building fabric parameters applied are as follows and are in line with the SAP calculation and energy statement presented separately:

Building Elements	U Values	Thermal mass
Ground floor	0.13 W/m²K	Insulated slab on ground
Exposed floor	0.13 W/m²K	Insulated timber floor
External walls	0.18 W/m²K	Insulated cavity walls
Pitched roof	0.11 W/m²K	Pitched roof insulated at rafter level
Internal walls	N/A	Lightweight partitions
Internal floors	N/A	Timber joist floor
Windows, glazed doors and rooflights	1.2 W/m²K	N/A
Glazing g-value	0.63	N/A
External doors	1.0	N/A
Infiltration rate	0.5 AC/hr	N/A

Natural ventilation through openable openings is included in the model.

Mechanical ventilation is included in all flats with flow rate of 0.5 air changes / hour.

Lighting: 2 W/m2 (6pm – 11pm)

Window blinds are not included in the model (in line with BR Part O)

Weather data set used for the simulation is CIBSE DSY1 (design summer year) London Weather Centre for the 2020s, high emissions, 50% percentile scenario

Occupancy density equipment gains and schedules are modelled as per CIBSE TM59 guidance:

Unit/ room type	Occupancy	Equipment load
Studio	2 people at all times	Peak load of 450 W from 6 pm to 8 pm*. 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room	1 person at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
1-bedroom apartment: kitchen	1 person at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
2-bedroom apartment: living room/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bedroom apartment: living room	2 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
2-bedroom apartment: kitchen	2 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
3-bedroom apartment: living room/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room	3 people at 5% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
3-bedroom apartment: kitchen	3 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm base load of 50 W for the rest of the day
Double bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gain in the bedroom from 9 am to 10 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom (too small to accommodate double bed)	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during sleeping hours
Communal corridors	Assumed to be zero	Pipework heat loss only; see section 3.1 above

* All times in GMT

4. Methods

Compliance is based on passing both of the following criteria:

Criterion 4.2a: Hours of Exceedence (He):

For living rooms, kitchens and bedrooms:
Same as CIBSE TM52 Criterion 1. The first criterion 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 (1 May to 30 September).
The number of hours (He) 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.

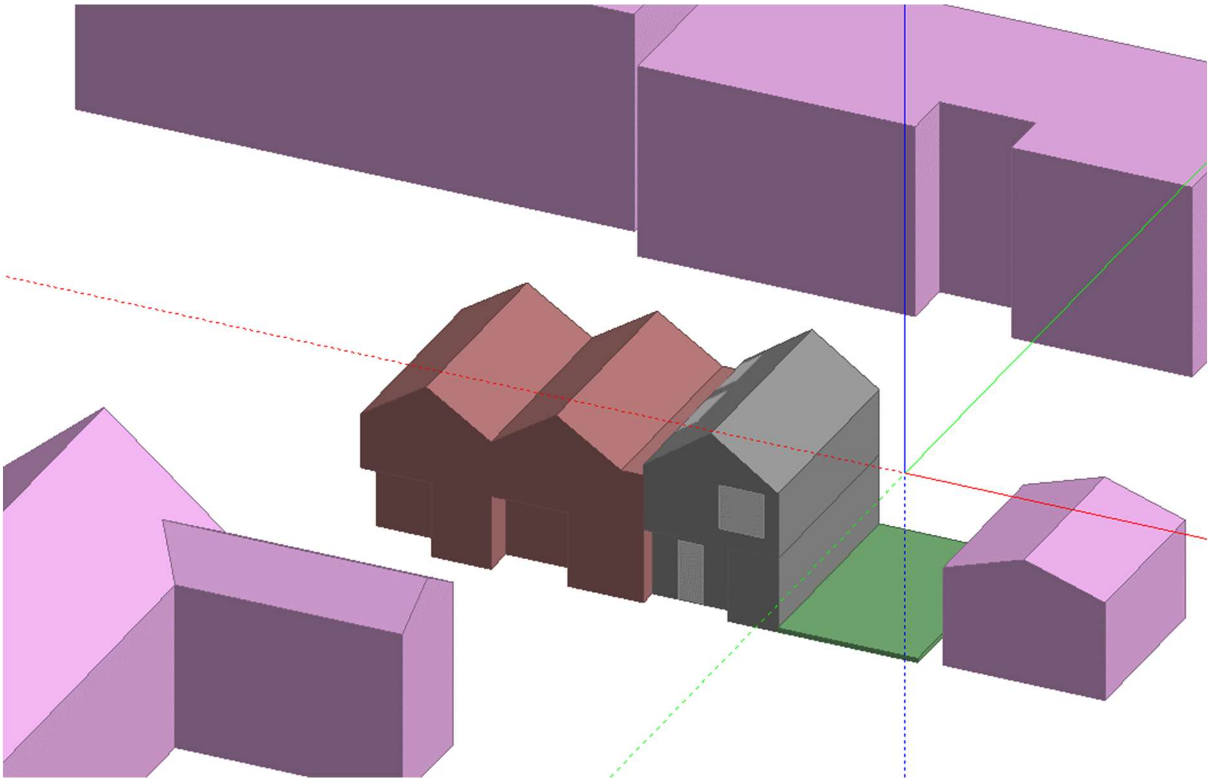
Criterion 4.2b:

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. (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 fail).

The Design Summer Years (DSY1) weather dataset represents a set of weather conditions that are specifically designed to simulate the hottest and most extreme summer conditions that a building might experience. This dataset is used to assess the risk of overheating in buildings during peak hot weather periods. It provides hourly weather data for a chosen location, focusing on a design summer year that reflects the conditions that buildings need to be prepared for to ensure occupant comfort and well-being.
The DSY1 weather data takes into account factors like high outdoor temperatures, solar radiation, and other relevant parameters that contribute to overheating. This data is used in dynamic thermal simulation software to model how a building responds to these extreme summer conditions and how its design features, insulation, glazing, ventilation systems, and other elements interact to influence indoor temperatures.

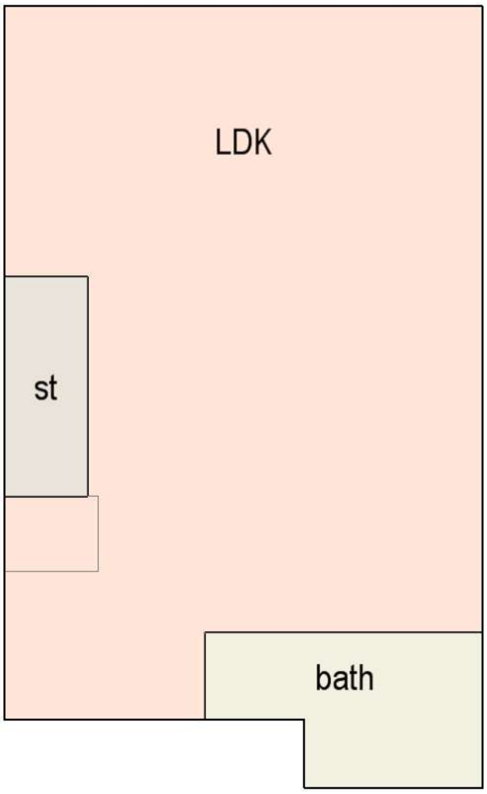
The dynamic thermal simulation has been carried out using DesignBuilder software with EnergyPlus v8.9 engine.

Axonometric View of the modelled buildings

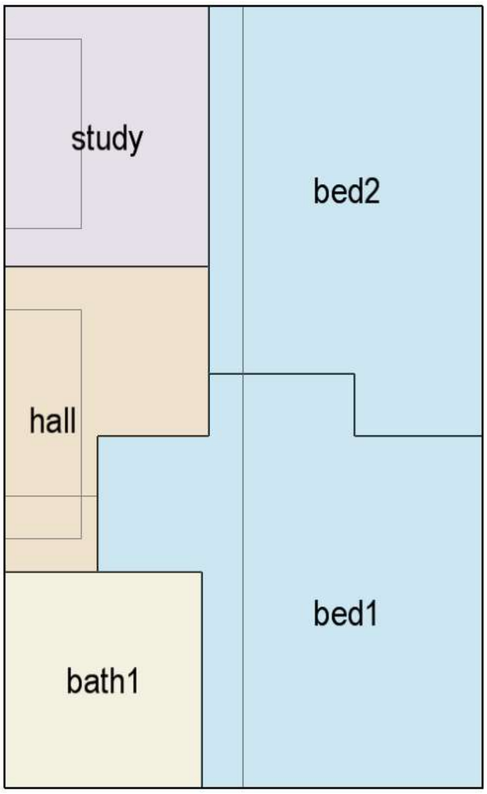


Layouts of the modelled building

Ground floor



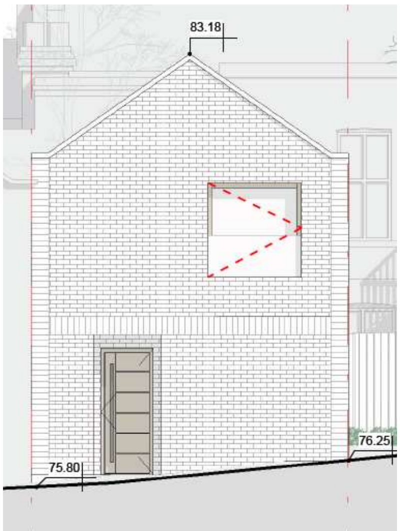
1st floor



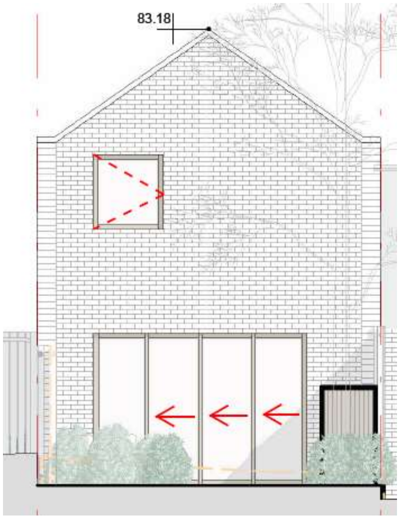
5. Overheating mitigation measures

Windows & glazed doors have been modelled with openable and fixed parts as shown below:

East elevation



West elevation



Rooflights have to be at least 25% openable.

As a minimum, this window openability has to be adhered to in order to comply with Part O and no other mitigation measures are required.

6. Results

CIBSE TM59 Results for DSY1

Criteria for predominantly naturally ventilated homes				
Block	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
0GF	LDK	0.81	N/A	Pass
1st	Bed1	0	16.5	Pass
1st	Bed2	0.19	27	Pass

7. Conclusion

The proposed house complies with CIBSE TM59 (Part O) criteria under DSY1 weather data set, with natural ventilation through openable windows as described in mitigation measures and mechanical ventilation as indicated.

Ondrej Gajdos, Consult JA Ltd, 13/08/2024