THERMAL COMFORT ASSESSMENT

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Contents

Executive Summary

Dynamic simulation software has been used to undertake an assessment in accordance with CIBSE TM59, to analyse the risk of overheating without the use of mechanical cooling.

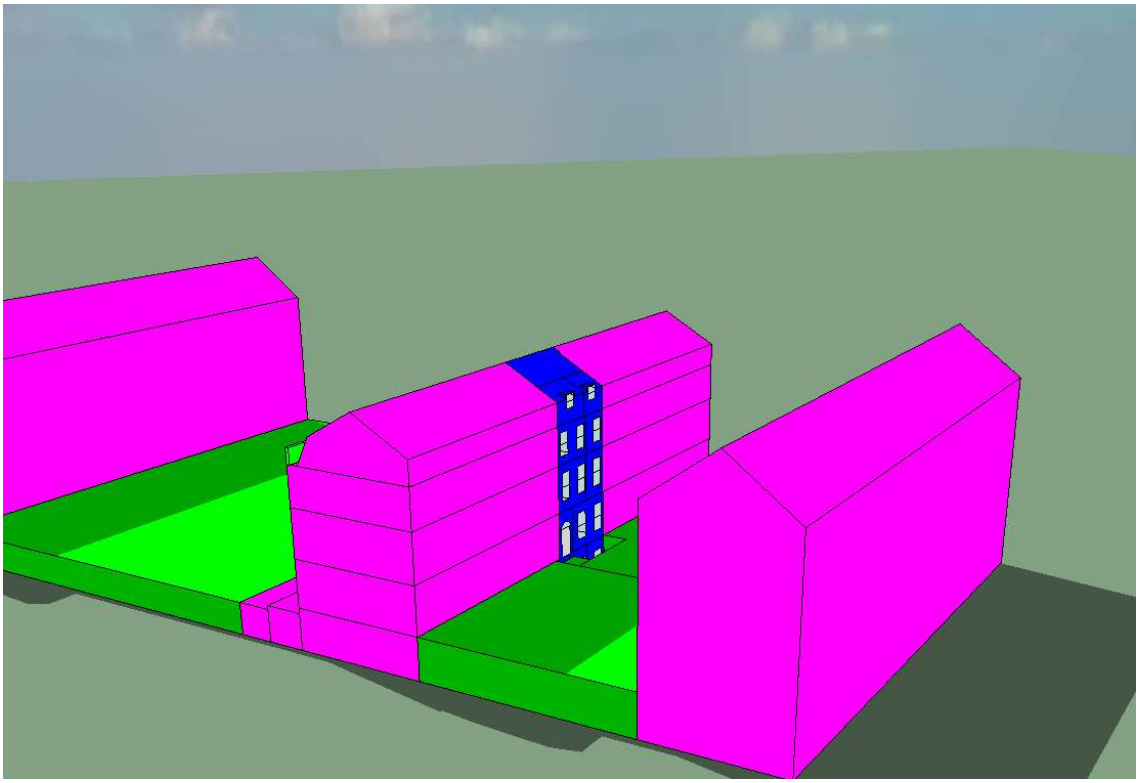
The assessment was carried out using IES Virtual Environment, based on drawings and information provided. Calculations have been carried out by an assessor qualified to provide both Part L SAP calculations (dwellings) and non-domestic Part L calculations to EPC level 5 (dynamic simulation compliance).

Using a natural ventilation strategy, the building overall does not meet the requirements of CIBSE TM59, indicating there is a risk of overheating. Further calculations introducing both solar control glazing and mechanical ventilation demonstrate that compliance is still not met and that active cooling would resolve the overheating issues both in the current and future climate.

Introduction

The following calculations were undertaken using IES Virtual Environment ApacheSim, a whole building energy simulation programme. Weather data is taken from the CIBSE London LWC DSY1 2020 High Emissions 50th percentile file.

The analysis summarised herein has been undertaken to assess the risk of overheating in the subject building. To determine the risk, the assessment follows the guidance and criteria set out in CIBSE TM59 – Design methodology for the assessment of overheating risk in homes. This methodology has been used as it sets out standards for bedrooms both for daytime and nighttime occupancy.



Model image taken from analysis software

Methodology

CIBSE TM59 offers criteria for predominantly naturally ventilated dwellings, which are as follows:

- Criterion 1 of TM52 should also be met for domestic style living rooms, kitchens and bedrooms. Limiting the number of hours that the actual operative temperature can exceed the threshold comfort temperature (upper limit range of comfort temperature) by 1^{o}K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- Operative temperature shall not exceed 26^{o}C for more than 1% of annual hours, between the hours of 10pm and 7am. 1% of the hours during this time frame annually equates to 32 hours, thus 33 or more hours above 26^{o}C would be recorded as a fail.
- Communal corridors should not exceed an operative temperature of 28^{o}C for more than 3% of the annual hours.

For predominantly mechanically ventilated spaces, the following criterion applies:

- All occupied rooms should not exceed an operative temperature of 26^{o}C for more than 3% of the annual occupied hours.

The building has been assessed as Type III existing building.

Model information

Geometry

Drawings have been supplied by Studio Moren and these have been used to create the 3D model. Drawings used are as follows:

1953 A 100 099 P2.pdf
1953 A 100 100 P2.pdf
1953 A 100 101 P2.pdf
1953 A 100 102 P2.pdf
1953 A 100 103 P2.pdf
1953 A 100 200 P0.pdf
1953 A 100 201 P0.pdf
1953 A 100 300 P0.pdf
240429 1953 Proposed Elevations.dwg

Building fabric

Construction information has been supplied for the proposed fabric. The building has been modelled using the following performance.

Category	Description	U-value (W/m^2K)	Cm value ($kJ/(m^2K)$
Door	External door	1.60	22.13
Door	Internal door	2.95	26.77
Door	Personnel uninsulated	3.00	11.25
External Wall	Extension walls - Part L	0.18	55.25
External Wall	Brick walls standard	2.09	135.20
External Wall	Brick walls thick	1.35	135.20
External Wall	Timber frame wall uninsulated	1.20	11.70
External Window	Extension glazing - Part L	1.40	-
External Window	Single wood	5.19	-
External Window	Gecko secondary glazing	2.80	-
External Window	Fineo 8mm vacuum glazing	0.70	-
Ground/Exposed Floor	Extension floor - Part L	0.16	75.60
Ground/Exposed Floor	Solid floor	0.45	160.00
Internal Ceiling/Floor	Internal ceiling/floor	0.38	8.75
Internal Ceiling/Floor	Separating floor	1.00	20.00
Internal Partition	Partition	2.11	84.90
Internal Partition	Stud partitions	0.38	8.75
Roof	300mm mineral wool	0.15	17.45
Roof	Flat roof - Part L	0.16	17.45
Roof	Tiled roof	5.71	34.12
Roof	Flat roof	2.80	125.78
Roof Light	Rooflight – Part L	1.40	-

Window and glazed doors have been modelled from the plans and schedules supplied. Thermal and solar performance figures used are as follows.

Type	U-value (W/m^2K)	G value	Location
Single wood	5.19	0.85	Over entrance door
Gecko secondary glazing	2.80	0.76	All remaining
Fineo 8mm vacuum glazing	0.70	0.62	Bedroom dormers
Rooflight – Part L	1.40	0.63	Rear extension

The building has been modelled to include outside air infiltration of 0.75 air changes per hour. These values have been taken from CIBSE guidance.

Ventilation strategy

The analysis has the building using a natural ventilation strategy to combat overheating. A further analysis was undertaken incorporating mechanical ventilation and those results can be seen later in the report.

The table below lists the mechanical ventilation details used for that additional analysis.

Room	Ventilation type	Flow rate
Bedrooms	Supply	10 l/s

Drawings and discussions with the building surveyor have informed which windows open and by what distance / angle, and which are fixed. Window opening profiles follow the guidance in TM59 for bedrooms and have been updated to follow the Part O guidance on restricting openings where security is considered an issue. Internal doors to bedrooms have been modelled as closed.

Occupancy profiles

Occupancy profiles are set up as required by TM59.

Internal gains

Lighting

Gains have been set at 2W/m^2 and profiled as per TM59 guidance.

People

Gains have been set at 75W sensible and 55W latent, per person, and profiled as per TM59 guidance.

Equipment

Gains have been set and profiled as per TM59 guidance.

Hot water pipework

This is insulated and will run through risers, so has been excluded from the analysis.

Results

Overheating – natural ventilation

For bedrooms, both criteria need to be passed. Criterion A should be 3 or less and criterion B should be 1 or less.

Cells highlighted in green are compliant and those in red are non-compliant.

Bedrooms – naturally ventilated

Room Name	Criterion a - % Hours (Top-Tmax >= 1K)	Criterion b - % (Night Hours Top > 26)
room 01	0	1
room 02	0	0.94
room 03	0	1.07
room 04	0	0.97
room 05	0.33	0.94
room 06	0.71	1.67
room 07	0.41	0.91
room 08	0.41	1.4
room 09	0.68	2.04
room 10	5.34	4.2
room 11	5.07	8.61
room 12	0.52	1.1
room 13	0.46	1.64
room 14	0.82	2.8
room 15	0.65	2.25
room 16	0.54	2.8
room 17	3.76	5.45

Overheating – mechanical ventilation

A further analysis was run using mechanical ventilation to supply fresh air to the bedrooms.

Bedrooms – mechanically ventilated

Room Name	Criterion a - % Hours (Top-Tmax >= 1K)	Criterion b - % (Night Hours Top > 26)
room 01	0	0.91
room 02	0	0.82
room 03	0	0.94
room 04	0	0.79
room 05	0.33	0.88
room 06	0.65	1.46
room 07	0.41	0.91
room 08	0.41	1.31
room 09	0.63	1.83
room 10	4.49	3.74
room 11	3.76	6.64
room 12	0.49	1.07
room 13	0.46	1.55
room 14	0.79	2.47
room 15	0.6	1.95
room 16	0.52	2.31
room 17	2.91	4.47

Overheating – mechanical ventilation and reduced glazing g-value

A final analysis was performed to check the impact of solar control glazing, as well as the mechanical ventilation.

Bedrooms

Room Name	Criterion a - % Hours (Top-Tmax >= 1K)	Criterion b - % (Night Hours Top > 26)
room 01	0	0.88
room 02	0	0.64
room 03	0	0.76
room 04	0	0.61
room 05	0.27	0.76
room 06	0.35	1.16
room 07	0.41	0.82
room 08	0.3	1.13
room 09	0.38	1.28
room 10	1.61	2.71
room 11	1.06	4.93
room 12	0.41	0.91
room 13	0.41	1.31
room 14	0.54	1.77
room 15	0.52	1.83
room 16	0.49	2.07
room 17	2.04	3.71

Planning Policy

Section 10.7 of the Camden Planning Guidance "Energy efficiency and adaptation" document provides a cooling hierarchy that all developments should follow. Comments are noted below based on the numbering system provided.

1. Minimise internal heat generation through energy efficient design

The building is existing and also listed, so geometry and layout options are limited. Low energy lighting has been specified within the design and hot water pipework insulated, also travelling through risers.

2. Reduce the amount of heat entering a building in summer

The building is already there and thus the orientation is fixed. As the building is listed, removing / adding windows is not an option. Shading from other buildings has been modelled (as seen in the model image in the introduction). Reducing g-values helps with daytime overheating but has little to no impact on the overnight temperatures. A very low g-value glass may also not be in keeping with surrounding buildings and the listing, given it can appear a different colour to standard glazing.

3. Manage the heat within the building through exposed internal thermal mass and high ceilings

As an existing and listed building, this is not a viable option.

4. Passive ventilation

This strategy is the main analysis of the report. Some windows are unrestricted and some restricted for security reasons. Layout changes are restricted by the current building geometry and the listing.

5. Mechanical ventilation

The model has been run using a continuous supply air system to the bedrooms and although it improves results a little, it does not offer compliance with CIBSE TM59 guidance. Bringing in outside air will often have a cooling effect but if the air outside is also hot, sometimes that benefit is limited.

6. Active cooling

This option would overcome the nighttime overheating issue seen in most bedrooms, also ensuring compliance for those suffering from daytime overheating.

Conclusion

The building modelling shows non-compliance with CIBSE TM59 and that there is a risk of overheating in 76% of the bedrooms. Introducing mechanical ventilation and solar control glazing assists but still results in over half of the bedrooms showing an overnight overheating issue.

The calculations have all been run using a 2020 weather file (considered to be current). If run under future predicted weather files, the results will likely worsen and more of the bedrooms will be at risk of overheating.

From a business perspective, consistency amongst room specification is also important, so guests can expect the same standard regardless of which room they occupy. This also helps with hotel marketing and management, encouraging tourism and business users in to the area.

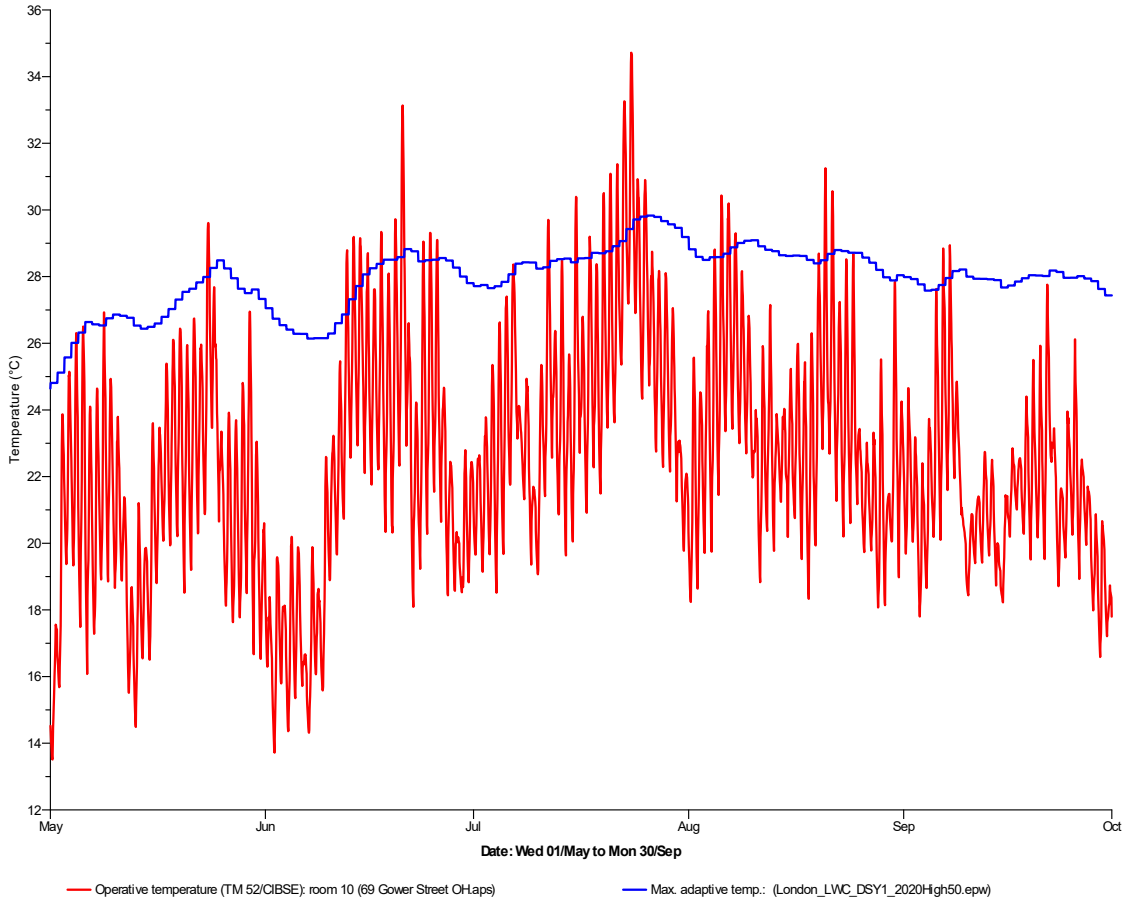
By following the hierarchy, active cooling appears to be the only solution to prevent overheating both now and in the future.

Appendix

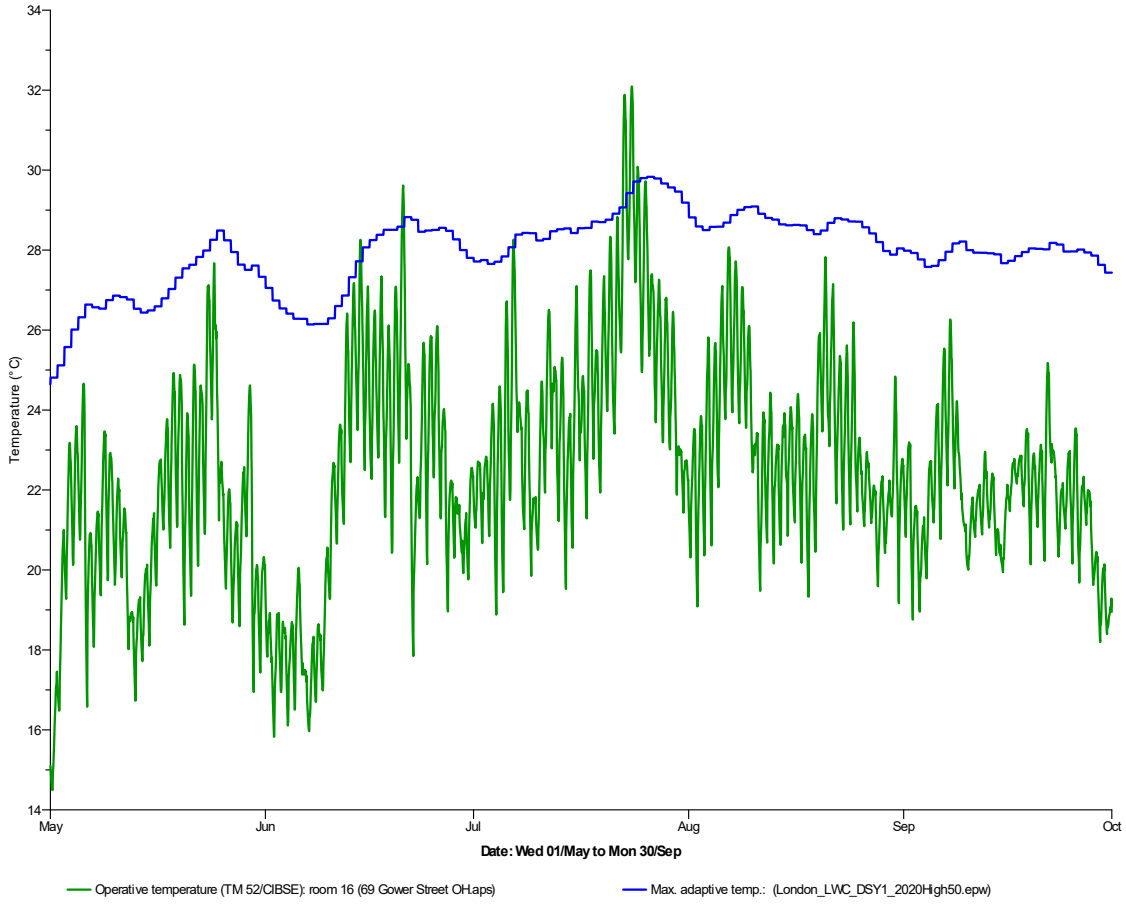
Temperature charts

Below are some sample graphs, taken from two sample rooms. They show the summer operative temperature for the room as well as the maximum adaptive temperature for the period. It is acceptable for the room temperature to surpass the maximum adaptive temperature but on a limited number of occasions, as set out in the compliance criteria.

Room 10



Room 16


34
32
30
28
26
24
22
20
18
16
14
Temperature (°C)
May
Jun
Jul
Aug
Sep
Oct
Date: Wed 01/May to Mon 30/Sep
Operative temperature (TM 52/CIBSE): room 16 (69 Gower Street OHaps)
Max. adaptive temp.: (London_LWC_DSY1_2020High50.epw)

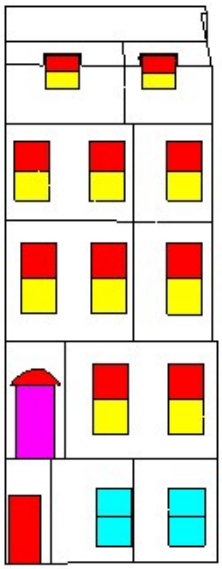
Window openings

Key:

Opening Type

- XTRN0000 (Non-openable)
- XTRN0005 (Bed-side hung-tall-100mm)
- XTRN0033 (Living-external door)
- XTRN0037 (Bed-sash-unrestricted)
- XTRN0038 (Bed-sash-restricted)
- XTRN0039 (Door internal closed)
- XTRN0040 (Living-sash-restricted)

Front



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