Overheating Analysis
87 Leather Lane

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Executive summary

Overview

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

The proposal comprises a residential fit-out within a listed building. Owing to the heritage value of the property it is not feasible to upgrade the thermal elements to increase fabric performance. Moreover, a noise survey carried out by Noico Limited (Nov, 2024) has found that windows will need to be closed to achieve satisfactory internal noise levels for sleeping. Moreover, it is recommended that windows will need to be closed during the day to ensure the property owners are not adversely impacted by noise *(BS 8233:2014 Guidance on sound insulation and noise reduction for buildings) and (World Health Organisation (WHO) Environmental Noise Guidelines for the European Region)*.

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

- Energy efficient lighting and appliances have been recommended to reduce internal heat gains
- Reduced solar gains from a glazing solar factor of 0.50 will help to keep heat out of the building
- Mechanical extract ventilation (only to Bathroom and Kitchen)

A dynamic thermal analysis to assess compliance with CIBSE TM59 for the current and future weather scenarios finds that none of the bedrooms or the reception room are able to meet the criteria through passive design, predominantly because windows are expected to remain closed to meet satisfactory internal noise levels. Moreover, since the development comprises an existing listed building, it is not feasible to employ strategies such as a high-performance fabric, redesigning window openings etc. Therefore, cooling will need to be introduced to ensure a comfortable indoor environment for occupants.

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Introduction

Eight Versa has been appointed in order to undertake an overheating analysis of 87 Leather Lane to provide design stage guidance and maximise occupant comfort levels. Consequently, thermal modelling has been undertaken to demonstrate compliance with TM59 requirements.

Building Summary
The proposal comprises or the residential fit-out of the 4-storey listed building at 87 Leather Lane. The scheme has total gross internal area of approximately 207m^2.

Planning Context
The London Borough of Camden does not set out any specific requirements for avoiding overheating. This report is aligned with national standards and regulations.

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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, etc. However, given this is an existing listed property, it is not feasible to incorporate all stages of the 'cooling hierarchy' due to constraints on modifications that are permissible and feasible.. 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.

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 (Same as Criterion 1 of TM52).
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).
3. For communal corridors, the operative temperature should not exceed 28 °C for more than 3% of the annual hours.

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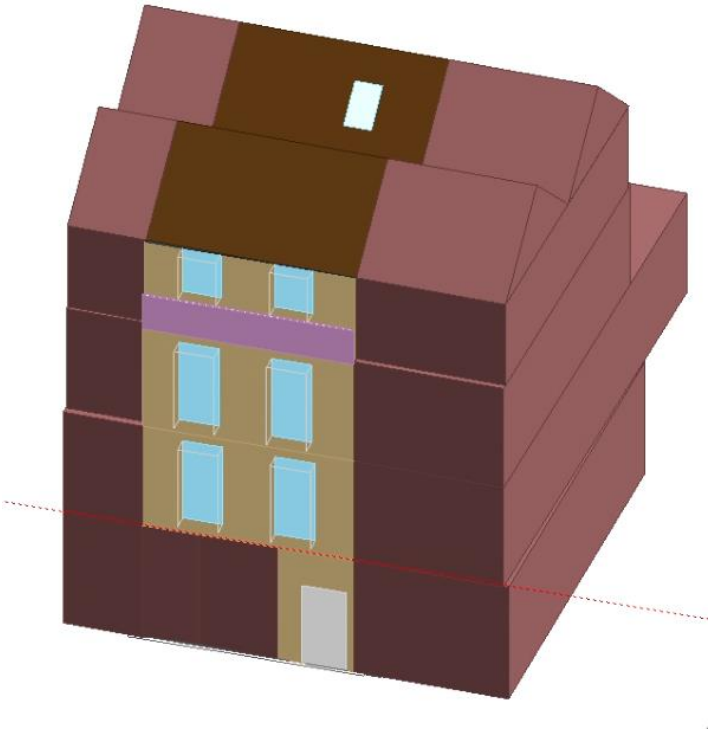
Modelling Inputs

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 Weather Central, 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/m2K)
External walls (existing)	0.83
Ground floors (existing)	1.10
Pitched Roof (refurbished)	0.17
Openings (new)	1.40 (g-value 0.5)

Internal Gains
Typical hours based, according to CIBSE 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 (Appendix A).

Space	Number of people	Lighting W/m^2	Absolute Small power
Double Bedroom	2	2	80
Reception	3	2	150
3 Bed- Kitchen living	3	2	300

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Passive Design

Cooling Hierarchy
Design 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).

Given this is an existing listed property, it is not feasible to incorporate all stages of the 'cooling hierarchy' due to constraints on modifications that are permissible and feasible.

Cooling Strategy
The cooling strategy is to implement energy efficient lighting and appliances to reduce internal heat gains; 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 every glazed area.

Shading
No shading has been specified on the model since this is an existing listed building and external modification using shading devices will not be permissible.

Thermal Mass
The development has timber intermediate floors and solid walls 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
Mechanical extract ventilation (only to Bathroom and Kitchen) has been specified.

Natural Ventilation Rates
a noise survey carried out by Noico Limited (Nov, 2024) has found that windows will need to be closed to achieve satisfactory internal noise levels for sleeping. Moreover, it is recommended that windows will need to be closed during the day to ensure the property owners are not adversely impacted by noise *(BS 8233:2014 Guidance on sound insulation and noise reduction for buildings) and (World Health Organisation (WHO) Environmental Noise Guidelines for the European Region)*.

Therefore, windows are assumed to be closed during the day and at night, owing to acoustics restrictions.

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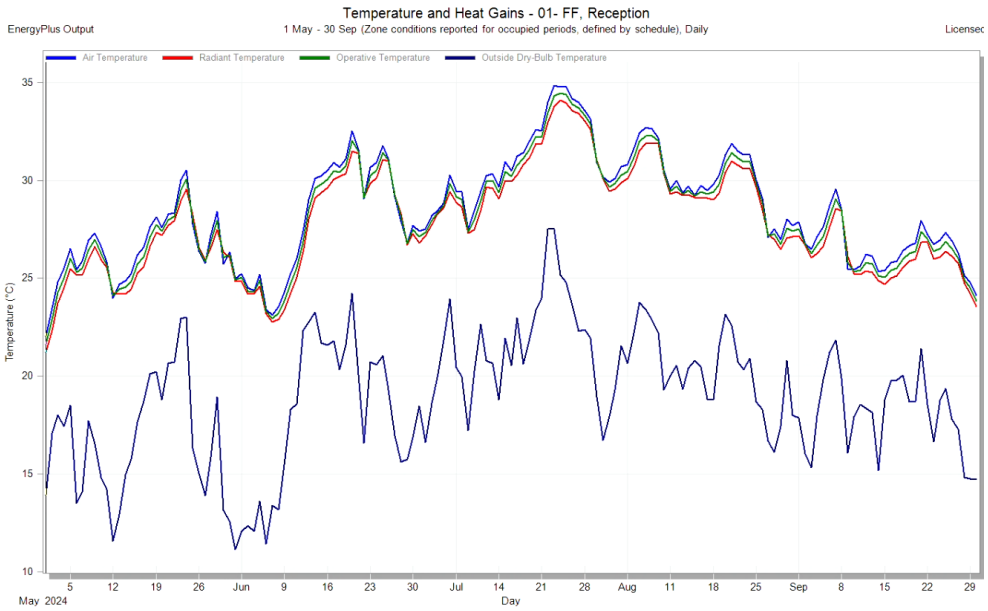
Summary of Results

Results

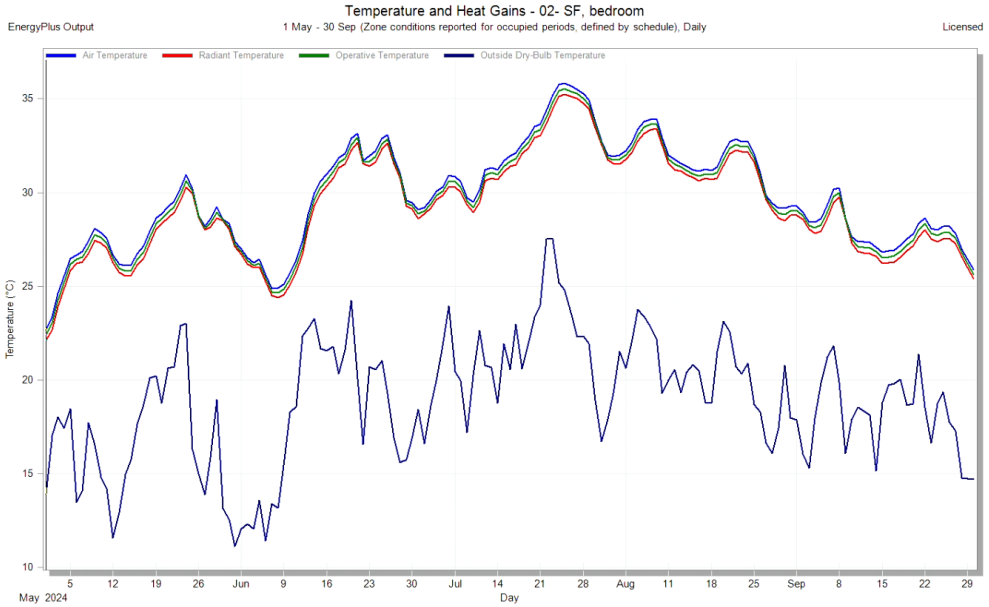
The graphs below present the outdoor, indoor mean air, indoor mean radiant and operative temperature for a sample of the worst performing rooms. A table confirming the results for all rooms is shown in Appendix C.

In summary, all rooms meet and TM59 requirements for DSY1.

First floor - Reception



Second floor- Bedroom



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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

The proposal comprises a residential fit-out within a listed building. Owing to the heritage value of the property it is not feasible to upgrade the thermal elements to increase fabric performance. Moreover, a noise survey carried out by Noico Limited (Nov, 2024) has found that windows will need to be closed to achieve satisfactory internal noise levels for sleeping. Moreover, it is recommended that windows will need to be closed during the day to ensure the property owners are not adversely impacted by noise *(BS 8233:2014 Guidance on sound insulation and noise reduction for buildings) and (World Health Organisation (WHO) Environmental Noise Guidelines for the European Region)*.
The proposal maximises passive design measures as far as feasible by responding to the local context in the following ways:

- Energy efficient lighting and appliances have been recommended to reduce internal heat gains
- Reduced solar gains from a glazing solar factor of 0.50 will help to keep heat out of the building
- Mechanical extract ventilation (only to Bathroom and Kitchen)

In summary:

- All of the modelled rooms fail to meet TM 59 requirements for DSY1. (Kitchen and living room spaces fail the overheating requirement criterion 1, and all bedrooms fail both criterion 1 & 2).

The analysis finds that none of the bedrooms or the reception room are able to meet the criteria through passive design, predominantly because windows are expected to remain closed to meet satisfactory internal noise levels. The average external sound pressure level (SPL) recorded during the 16-hour daytime period (07:00–23:00) was 54.2 dB LAeq,16hr. After applying a façade correction of 3 dBA and subtracting 10 dBA for an open window, the predicted internal SPL is approximately 47 dB LAeq,16hr. This value exceeds the recommended noise limits for living and dining areas, as specified in *BS 8233:2014*.

Therefore, windows must remain closed during the day to achieve acceptable internal noise levels for resting and dining.

The equivalent L_{den} value for the site was calculated at 57 dB, which exceeds the WHO's threshold for adverse health effects. The L_{den} metric incorporates penalties of +5 dB for evening noise and +10 dB for nighttime noise (in reference to World Health Organisation (WHO) Environmental Noise Guidelines for the European Region), further emphasizing the potential risks to residents wellbeing- thus windows need to be remained closed at night

To achieve satisfactory internal noise levels while maintaining ventilation, the use of mechanical cooling is recommended to allow windows to remain closed during the day.

In relation to part '3.3 a' of Part O, the standard specifies an internal nighttime sound level $L_{Aeq,T}$ averaged over 8 hours (23:00 to 07:00). Noico Limited's data was recorded externally in free field conditions. To estimate the internal sound level with open windows, when we add a 3 dB façade correction and then subtract 10 dB loss through an open window (ref. BS 8233), the recorded average of 48.9 dB $L_{Aeq,8hr}$ results in an internal level to be approximately 42 dBA which exceeds the criterion (40 dB $L_{Aeq,8hr}$) by 2 dBA.

For reference BS 8233 offers guidelines for noise levels in dwellings and defines a limit for bedrooms of 30 dB $L_{Aeq,8hr}$. This further solidifies the conclusion that windows will need to be closed to achieve satisfactory internal noise levels for sleeping.

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Appendix A

Appendix A
Appendix A - Heat gain profile

Number of people	Description	Peak load (W)		Period																					
		Sensible	Latent	00–01	01–02	02–03	03–04	04–05	05–06	06–07	07–08	08–09	09–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21–22	22–23	23–24
				Hour-ending																							
				1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00	20.00	21.00	22.00	23.00	24.00
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.7
2	Studio occupancy	150	110	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1-bed: living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
1	1-bed: living occupancy	75	55	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
1	1-bed: kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
2	2-bed: living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
2	2-bed: living occupancy	150	110	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
2	2-bed: kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
3	3-bed: living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
3	3-bed: living occupancy	225	165	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0	0
3	3-bed: kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0	0
	Single bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Double bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Studio equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living/kitchen equipment	450		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	1	1	0.44	0.44	0.24	0.24
	Living equipment	150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	1	1	1	1	0.4	0.4
	Kitchen equipment	300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	1	1	0.17	0.17	0.17	0.17
	Lighting profile	2 (W/m2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0

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Appendix B

Appendix B
Appendix C – Results tables

Floor	Block / Room / Unit	DSY-1				DSY-2				DSY-3			
		Criterion 1 (%)	Criterion 2 (hr)	Criterion 3 (%)	Compliance	Criterion 1 (%)	Criterion 2 (hr)	Criterion 3 (%)	Compliance	Criterion 1 (%)	Criterion 2 (hr)	Criterion 3 (%)	Compliance
01 First Floor	KITCHEN	62.55	N/A	N/A	Fail	66.04	N/A	N/A	Fail	54.91	N/A	N/A	Fail
01 First Floor	RECEPTION	59.13	N/A	N/A	Fail	66.7	N/A	N/A	Fail	53.69	N/A	N/A	Fail
02 Second Floor	BEDROOM	82.39	1223.5	N/A	Fail	81.22	1122.5	N/A	Fail	66.13	937.5	N/A	Fail
03 Third Floor	BEDROOM	93.64	1312.5	N/A	Fail	85.17	1151.5	N/A	Fail	76.64	1129	N/A	Fail
03 Third Floor	BEDROOM1	95.37	1331	N/A	Fail	86.5	1175.5	N/A	Fail	80.26	1177.5	N/A	Fail
Total Rooms	Total Rooms	5				5				5			
Pass	Pass	0		0.0%		0		0.0%		0		0.0%	
Fail	Fail	5		100.0%		5		100.0%		5		100.0%	

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Appendix C

Appendix C
Window operation and free aperture assumptions