JOSTEC

BUILDING REGULATIONS COMPLIANCE SERVICES

TM59 Thermal Analysis

Proposed Development at 175 Arlington Road, London, NW1 7EY

JosTec Ref: 24660
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Prepared for: Novispace

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1. Introduction

JosTec has been instructed to produce a TM59 Thermal Analysis Report to show compliance with Approved Document Part O of the building regulations for a proposed residential new build development at 175 Arlington Road, London NW1 7EY.

Design builder Energy Plus, a CIBSE AM11-compliant dynamic simulation modelling software, has been used to conduct dynamic thermal simulations for all habitable areas on the plot. These simulations accurately predict internal environments and temperatures to identify areas at risk of overheating. The resulting data is then utilised to evaluate compliance with the criteria specified in CIBSE TM59 and relevant criteria from Approved Document Part O. Below are the results achieved by using AC Cooling set at an SEER of 7.00, as provided by the client.

1.1. Results

Criteria for predominantly naturally ventilated homes				
Block	Zone	Criterion A (hr)	Criterion B (hr)	Pass / Fail
01	STAIRS	0.01	N/A	Pass
02	BEDROOM1	0.96	7.50	Pass
02	KITCHEN-LIVING	0.83	N/A	Pass
02	HALL	0.60	N/A	Pass
02	STAIRS	0.49	N/A	Pass
03	BEDROOM2	0.33	4.67	Pass
03	STUDY	0.79	N/A	Pass
03	STAIRS	1.02	N/A	Pass

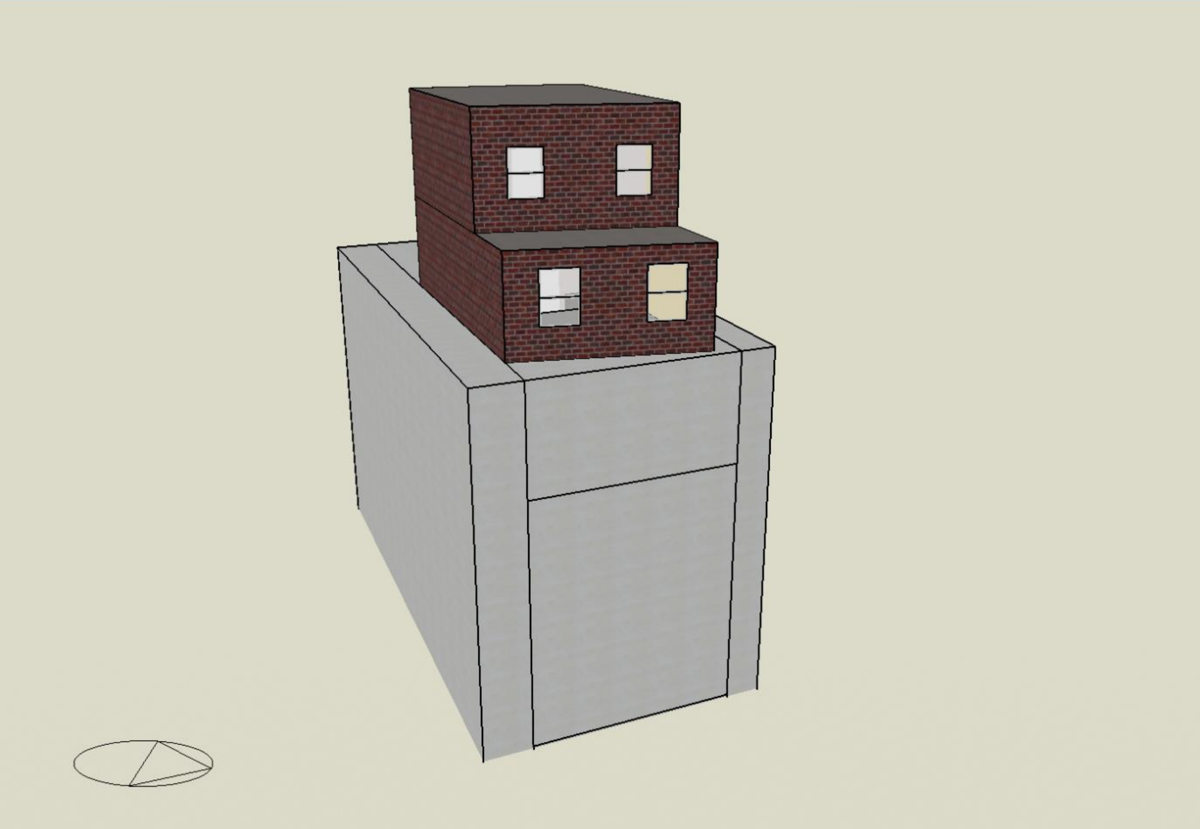
Contents

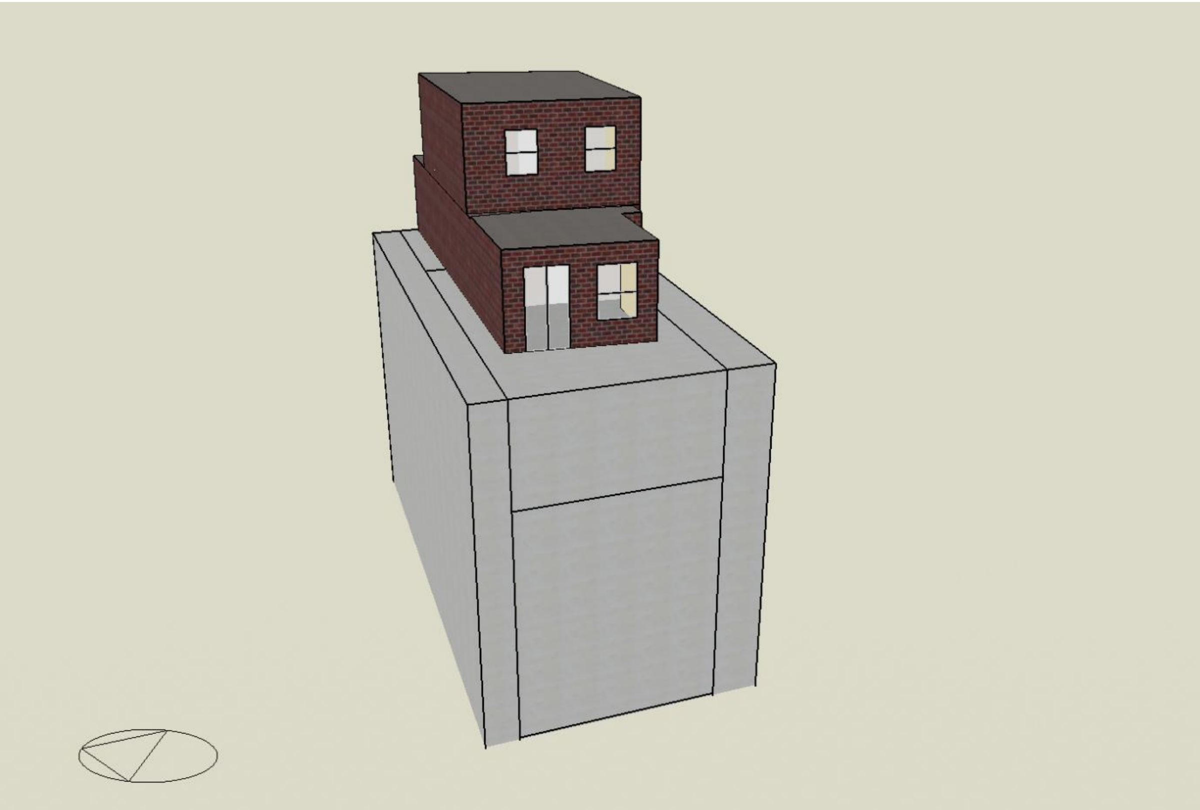
2. Quality Management

Prepared by		Checked by
Mohamed Egal		
Senior Energy Consultant		
Date: 03/01/2025		**Date:**
File reference:	24660 - Arlington Road – TA2	

Version	Status	Date	Amendments
TA1	First Issue	20/01/2025	-
TA2	Second Issue	03/01/2025	Options explored within cooling hierarchy

3. Design Builder Model





2.1. Software Details

This TM59 Dynamic thermal model simulation was carried out using the Designbuilder Energy Plus package.
Calculation Engine/Version: Design Builder Energy Plus Version 7.2.0.32

2.2. Weather File

In accordance with CIBSE Technical Memorandum 59, the development is required to pass the overheating criteria using the DSY1 weather file for the most appropriate location nearest to the development.

The DSY represents warmer than typical year and is used to evaluate overheating risk within buildings.

In London 3 options are available for weather data.
London Gatwick (LGW) – for rural parts of London
London Heathrow (LHR) – for suburban areas of London
London Weather Centre (LWC) – for inner urban (central) areas of London

The specific weather location chosen for this assessment was London Weather Centre DSY1.

4. TM59 Methodology For Approved Document Part O

CIBSE TM59 is an overheating methodology used specifically for residential developments. TM59 provides a methodology for how to construct an overheating assessment and draws upon guidance previously given in TM52 and CIBSE Guide A.

The assessment for the residential development at proposed development at 175 Arlington Road, London, NW1 7EY has been run using the defined profiles and gains as described in Section 6 of this report.

The criteria for TM59 are determined by the type of ventilation the space receives, either predominantly naturally ventilated or predominantly mechanically ventilated. Homes that are predominantly naturally ventilated including homes that have mechanical ventilation with heat recovery (MVHR), with good opportunities for natural ventilation in the summer should assess overheating using the adaptive method based on CIBSE TM52 (2013), as described in "Criteria for Predominantly naturally ventilated homes" below.

In order to allow the occupants to 'adapt', each habitable room needs operable windows with a minimum free area that satisfies the purge ventilation criteria set in Part F of the Building Regulations for England, and equivalent regulations in other countries, i.e. the window opening area should be at least 1/20th of the floor area of the room (different conditions exist for windows with restricted openings, and the same requirement applies for external doors). Control of overheating may require accessible, secure, quiet ventilation with a significant openable area.

Homes that are predominantly mechanically ventilated because they have either no opportunity or extremely limited opportunities for opening windows (e.g. due to noise levels or air quality) should be assessed for overheating used the fixed temperature method based on CIBSE Guide A (2015a), as described in "Criteria for Predominantly mechanically ventilated homes" on the following page.

3.1. Criteria for Predominantly naturally ventilated homes;

5.1.1. Criterion One: Hours of Exceedance for Living Rooms, Kitchens & 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% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).

5.1.2. Criterion Two: Night time comfort in bedrooms only:
To guarantee comfort during the sleeping hours the operative temperature in the bedroom shall not exceed 26°C for than 1% of the occupied hours, defined as 10pm to 7am.
1% of annual hours between 10pm to 7am is 32 hours, failure of Criterion 2 occurs when the space experiences 33 hours or more when the above conditions are met.

3.2. Criteria for Predominantly mechanically ventilated homes;

For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 °C for more than 3% of the annual occupied hours (CIBSE Guide A (2015a).

3.3. Approved Document Part O Deviations from TM59 Methodology

CIBSE's TM59 method requires the modeller to make choices. The dynamic thermal modelling method Part-O applies limits to these choices, which are detailed in paragraph 2.6 below. These limits should be applied when following the guidance in CIBSE's TM59.

All the following limits on CIBSE's TM59, section 3.3, apply.

5.3.1. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following.

a. Start to open when the internal temperature exceeds 22ºC.

b. Be fully open when the internal temperature exceeds 26ºC.

c. Start to close when the internal temperature falls below 26ºC.

d. Be fully closed when the internal temperature falls below 22ºC.

5.3.2. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply.

a. The opening is on the first floor or above and not easily accessible.

b. The internal temperature exceeds 23ºC at 11pm.

5.3.3. When a ground floor or easily accessible room is unoccupied, both of the following apply.

a. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely, following the guidance in paragraph 3.7 below.

b. At night, windows, patio doors and balcony doors should be modelled as closed.

5.3.4. An entrance door should be included, which should be shut all the time.

5. TM59 Model Inputs

4.1. Heat Gain Parameters & Occupancy Profiles

Table 2 and Figure 1 in CIBSE TM59 provide details on occupant densities and heat gain parameters for the rooms that require assessment. This reference material has been utilised to perform thermal comfort calculations for the rooms evaluated under the TM59 criteria.

In some cases, rooms may be labelled in a manner that differs from the terminology used in CIBSE TM59 but may exhibit similar usage and occupancy patterns. In such instances, the consultant in charge of the overheating analysis will determine the most relevant room type based on their perception of usage, occupancy, and heat gain patterns. For instance, a snug may be evaluated under the criteria for living rooms. If a dwelling has more than the standard 3 bedrooms specified in CIBSE TM59, occupancy levels in the relevant areas will be adjusted accordingly. For instance, a 3-bedroom dwelling assumes an occupancy of 3 people within a living space. However, if a dwelling is determined to have 4 bedrooms, the occupancy will be modified to 4 people within that space, but only if the room is primarily identifiable within the CIBSE TM59 profiles.

Figure 1 Heat gain profile

Number of people	Description	Peak load (W) Sensible	Latent	Period 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 cccupancy	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	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
1	1-bedroom 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-bedroom 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-bedroom 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-bedroom 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-bedroom 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-bedroom 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-bedroom 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-bedroom 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-bedroom 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/litchen 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

Table 2 Occupancy and equipment gain descriptions

Unit/ room type	Occupancy	Equipment load
Studio	2 people at 70% gains from 11 pm to 8 am 2 people at 100% gains from 8 am to 11 pm	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 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
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 gains 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

6. Building Specification

The tables below detail the inputs for the fabric and the HVAC used when running the simulation in Design Builder.

6.1.Fabric Specifications

Construction	**U-Value**	
External Walls	0.16	W/m2K
Roof	0.16 average	W/m2K
Ground Floor	0.15	W/m2K
Glazing	1.4/0.55	W/m2K
HVAC	**Specification**	
Heating	Boiler	
Ventilation	System 1 ventilation (Natural Ventilation)	
Air Tightness	The property has been simulated with a design score of 5.0	

7. Overheating Strategy

7.1. Noise

Approved Document O specifies that during sleeping hours (11 pm to 7 am), internal noise levels in bedrooms should not exceed:

- Averaged over 40 dB over 8 hours: This is the equivalent continuous sound level over an 8-hour period.
- Exceeds 55 dB more than 10 times at night: This is the maximum sound level not to be exceeded more than ten times per night.

If these noise levels are likely to be exceeded, relying solely on opening windows for cooling may not be appropriate. In such cases, alternative ventilation or cooling methods should be considered to maintain acceptable indoor noise levels.

7.2. Pollution

When ventilating a building, it's important to minimise the entry of outdoor pollutants to prevent overheating. Ventilation openings should be strategically placed away from pollution sources like busy roads or industrial areas. Incorporating filters or using mechanical ventilation with heat recovery can help improve indoor air quality by reducing the ingress of pollutants such as particulate matter and nitrogen dioxide.

7.3. Security

When designing for overheating mitigation through natural ventilation, it is crucial to ensure that openable windows and ventilation openings do not compromise the security of the property, especially for easily accessible areas. Approved Document O outlines specific requirements:

7.1.1. Easily Accessible Areas:

Windows and openings are considered easily accessible if they are:

- On the ground floor or basement levels.
- On any other level where the external sill height is less than 2 meters above the ground or adjacent surfaces (such as a flat roof or balcony).

7.1.2. Limitations on Openable Windows:

In these easily accessible areas, any openable parts of windows or ventilation openings must be designed to prevent unauthorized access. Acceptable solutions include:

- Lockable Openings: Windows should have lockable mechanisms that allow partial opening for ventilation but restrict full access from the outside.
- Secure Bars or Grilles: These can be installed to permit ventilation while physically barring entry.

- Louvered Panels or Shutters: These can provide ventilation without compromising security, especially if designed to resist forced entry.

These measures ensure that while providing effective natural ventilation for overheating mitigation, the building remains secure, safeguarding occupants and property.

7.4. Protection from Falling

Ventilation openings, particularly those located at higher levels, should be designed to prevent the risk of falls. This is crucial for windows that might be opened wide for cooling purposes. Safety features such as window restrictors, guardrails, or balustrades can be installed to ensure that openings cannot be used in a way that poses a falling hazard to occupants, especially children. The requirement for guarding states that window sills below 1100mm would need guarding to be in place; otherwise, these need to be excluded from the overheating strategy. Windows with guarding that open less than 100mm cannot be included in the mitigation strategy. Where guarding is present, this would need to meet the 1100mm standard. Where horizontal bars are used, they need to be sized to prevent passage of a 100mm sphere.

7.5. Protection from Entrapment

Design elements like louvres, shutters, or railings associated with ventilation openings should not pose a risk of entrapment. Openings should be designed to prevent fingers, limbs, or clothing from becoming caught. Adhering to safety standards regarding gap sizes and avoiding mechanisms that could trap or injure occupants is essential.

By carefully considering these factors, the overheating mitigation strategy will not only be effective in maintaining comfortable indoor temperatures but also ensure the safety, health, and well-being of building occupants.

7.6. Strategy adopted

The free areas presented within this section are calculated based on the degree of the open portion of the window. The equivalent free area (or effective opening) considers the openable area, angle of opening and associated aerodynamic effects (coefficient of discharge).

The window design has been re-created within the thermal model and is based on the planning drawings. Windows are usually modelled to open as follows:

1. Designed: to the design of an opening schedule of windows if provided.
2. Standard: to 60 degrees', which is assumed if an opening schedule is not provided.
3. Restricted: to a maximum of 100mm, which aligns with restricted window openings.
4. Unrestricted: to fully open, which is a fully opened window for full free flow air allowance, where allowed.

For this project, we utilised unrestricted openings (see above) on the second and third floors and simulated the windows in Bedrooms 1 and 2 being open during the night. While we did consider the risks associated with security and guarding, appropriate measures are in place since this property is situated on a terrace. Consequently, the dwelling will be primarily evaluated based on its naturally ventilated criteria.

After the initial assessment, we found that Bedrooms 1 and 2 did not meet the required standards and needed additional measures to improve ventilation. To address this, various options within the cooling hierarchy are explored in the next pages.

However, of those solutions, the majority have not sufficiently mitigated the overheating risk. Therefore, it is recommended to install air conditioning (AC) for those two rooms or for the entire house, depending on the M&E engineer's evaluation.

7.1. Cooling Hierarchy

The cooling hierarchy set out within the London Plan and its guidance has a clear strategy and approach to tackle overheating. Below are the relevant segments from the energy assessment guidance:

8.2.
Applicants should apply the cooling hierarchy in Policy SI 4 of the London Plan to the development. Whilst the cooling hierarchy applies to major developments, the principles can also be applied to minor developments. Measures that are proposed to reduce the demand for cooling should be set out under the following categories:

1. Reduce the amount of heat entering the building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure. It is also expected that external shading will form part of major proposals.

2. Minimise internal heat generation through energy efficient design: For example, heat distribution infrastructure within buildings should be designed to minimise pipe lengths, particularly lateral pipework in corridors of apartment blocks, and adopting pipe configurations which minimise heat loss e.g. twin pipes.

3. Manage the heat within the building through exposed internal thermal mass and high ceilings: Increasing the amount of exposed thermal mass can help to absorb excess heat within the building. Efficient thermal mass should be coupled with nighttime purge ventilation.

4. Provide passive ventilation: For example, through the use of openable windows, shallow floorplates, dual aspect units24 or designing in the 'stack effect' where possible.

5. Provide mechanical ventilation: Mechanical ventilation can be used to make use of 'free cooling' where the outside air temperature is below that in the building during summer months. This will require a by-pass on the heat recovery system for summer mode operation.

6. Provide active cooling systems: The increased use of air conditioning systems is generally not supported, as these have significant energy requirements and, under conventional operation, expel hot air, thereby adding to the urban heat island effect. However, once passive measures have been prioritised if there is still a need for active cooling systems, such as air conditioning systems, these should be designed in a very efficient way and should aim to reuse the waste heat they produce.

Active Cooling

8.20.

'Active cooling' should not be specified in developments where it has been demonstrated that the passive or other measures proposed have successfully addressed the risk of overheating; to avoid unnecessarily increasing a development's energy demand and carbon emissions. In addition, it is not expected that 'active cooling' will be proposed for any residential developments.

8.21

It will be expected that applicants can fully demonstrate that all passive design measures have been thoroughly investigated before considering 'active cooling', this should include technical and cost feasibility assessments of the following fixed shading devices; external shutters, external blinds, awnings and ventilated louvres. Where design measures and the use of natural and/or mechanical ventilation are not enough to guarantee the occupants' comfort (in line with the cooling hierarchy set out in London Plan Policy SI 4), the developer should identify the cooling requirement of the different elements of the development in the energy assessment. Please note that this is the space cooling requirement, not the energy used by the equipment providing the cooling, i.e. it is not the electricity used by the electric chiller plant but the cooling energy supplied by the chiller.

7.2. Results – All Scenarios

Block	Zone	Natural Ventilation (NV)		NV + Louvres		NV + Overhangs (0.5m)		NV + Overhangs (1.0m)		NV + MVHR		MVHR Only (Windows Shut)	NV + MVHR Overhangs (1.0m)		NV + MVHR Louvres (0.5m)		AC/ Cooling	
		Crit A	Crit B	Crit A	Crit B	Crit A	Crit B	Crit A	Crit B	Crit A	Crit B	% Hours Exceeded	Crit A	Crit B	Crit A	Crit B	Crit A	Crit B
01	STAIRS	0.97	N/A	0.88	N/A	0.85	N/A	0.80	N/A	0.95	N/A	34.75	0.74	N/A	0.82	N/A	0.08	N/A
02	BEDROOM1	1.47	135	1.02	113	0.88	106	0.70	92.3	1.40	128	37.09	0.65	69.5	0.90	80.8	0.67	11.3
02	KITCHEN-LIVING	0.86	N/A	0.70	N/A	0.65	N/A	0.61	N/A	0.86	N/A	39.08	0.59	N/A	0.65	N/A	0.53	N/A
02	HALL	0.74	N/A	0.65	N/A	0.62	N/A	0.59	N/A	0.70	N/A	31.69	0.56	N/A	0.61	N/A	0.45	N/A
02	STAIRS	0.75	N/A	0.65	N/A	0.61	N/A	0.58	N/A	0.72	N/A	32.61	0.55	N/A	0.60	N/A	0.35	N/A
03	BEDROOM2	0.59	94.8	0.51	85.5	0.44	81.8	0.43	76.0	0.59	92.2	36.44	0.42	60.8	0.47	70.2	0.24	6.00
03	STUDY	1.04	N/A	0.91	N/A	0.85	N/A	0.80	N/A	1.00	N/A	37.38	0.78	N/A	0.89	N/A	0.99	N/A
03	STAIRS	1.12	N/A	0.88	N/A	0.80	N/A	0.72	N/A	1.10	N/A	30.07	0.66	N/A	0.81	N/A	0.62	N/A

The results presented above outline all possible scenarios for this project. As for orientation, building fabric, and window performance; these parameters were maintained as fixed variables. It is evident from the results that some of the solutions proposed before applying air conditioning were not viable, even when some of these solutions were combined (for example, NV + MVHR + Louvres). The issue of overheating is primarily observed in the bedrooms according to Criterion B, and the severity of this overheating is quite significant. The results for AC Cooling are presented below once more.

7.3. Results – without AC

Criteria for predominantly naturally ventilated homes				
Block	Zone	Criterion A (hr)	Criterion B (hr)	Pass / Fail
01	STAIRS	0.95	N/A	Pass
02	BEDROOM1	1.37	113.17	Fail
02	KITCHEN-LIVING	0.85	N/A	Pass
02	HALL	0.71	N/A	Pass
02	STAIRS	0.71	N/A	Pass
03	BEDROOM2	0.55	87.33	Fail
03	STUDY	0.99	N/A	Pass
03	STAIRS	1.07	N/A	Pass

7.4. Results – with AC

Criteria for predominantly naturally ventilated homes				
Block	Zone	Criterion A (hr)	Criterion B (hr)	Pass / Fail
01	STAIRS	0.08	N/A	Pass
02	BEDROOM1	0.67	11.33	Pass
02	KITCHEN-LIVING	0.53	N/A	Pass
02	HALL	0.45	N/A	Pass
02	STAIRS	0.35	N/A	Pass
03	BEDROOM2	0.24	6.00	Pass
03	STUDY	0.99	N/A	Pass
03	STAIRS	0.62	N/A	Pass

7.5. AC Cooling Design

A default figure for the Cooling efficiency of (SEER) 4.50 was applied to achieve the above results to the bedrooms only. The model used within this project, as supplied by the client, is as follows:

Construction	U-Value
Brand	Mitsubishi
Model	SRK50ZS-WF
SEER	7.00
SCOP	4.60

If the above system efficiencies are applied, the following results are achieved, which still meet compliance:

Criteria for predominantly naturally ventilated homes				
Block	Zone	Criterion A (hr)	Criterion B (hr)	Pass / Fail
01	STAIRS	0.01	N/A	Pass
02	BEDROOM1	0.96	7.50	Pass
02	KITCHEN-LIVING	0.83	N/A	Pass
02	HALL	0.60	N/A	Pass
02	STAIRS	0.49	N/A	Pass
03	BEDROOM2	0.33	4.67	Pass
03	STUDY	0.79	N/A	Pass
03	STAIRS	1.02	N/A	Pass

8. Conclusion

Under the predominantly naturally ventilated criteria of the CIBSE TM59 methodology, allowing for the deviations in methodology for Approved Document Part O compliance, the assessed rooms within the development pass the overheating assessment for all scenarios calculated, subject to the appropriate use of air conditioning (AC).

According to the TM59 methodology, these areas would not overheat. They may experience short periods of elevated temperatures; however, this is a low enough occurrence not to be considered overheating.

It should be noted that any changes to the design and openable areas of windows or the fabric thermal parameters will affect the results, and further assessment will be required.

Lastly, a number of options have been considered from the cooling hierarchy set out within the London Plan. The results above indicate that AC cooling yielded compliance.