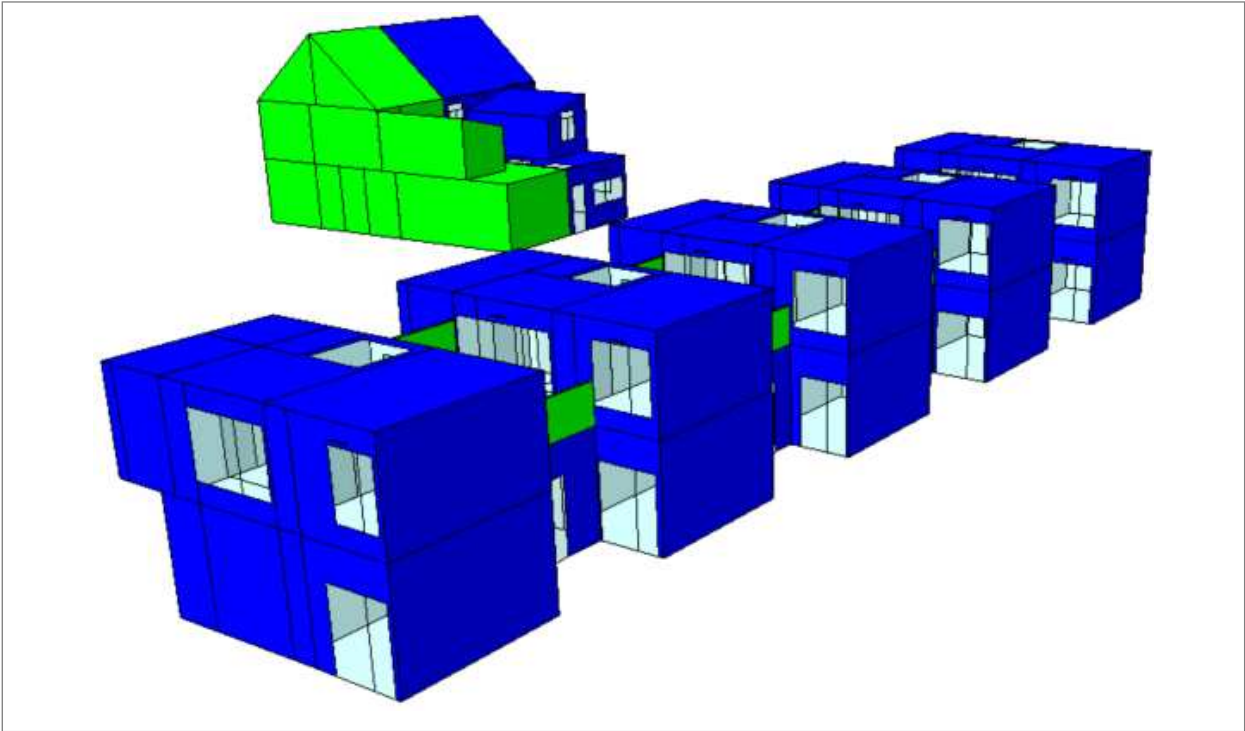




Overheating Planning Report

Dynamic Thermal Modelling

CIBSE TM49 / TM59

Rev 1

18 Denmark Street
Tottenham
London
N17 OJL

05/02/2024

Document Status

Client: Atlas Property London

Site: 18 Denmark Street London N17 0JL

Proposals: The construction of 6 new terrace houses over two storeys.

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Appendix J: Detailed Occupancy Schedules – CIBSE TM 59 Heat gain Profile.

Document Control Record:

Prepared by	Checked by	Date	Job	Revision
PK	JR	06.07.2023	11818	2.0-
PK	JR	01.02.2024	10920	1.0

1 Scope

This report has been prepared in support of the planning application only for the construction of Denmark Mews, a development consisting of five contemporary houses and apartment dwellings on the land between the rear gardens of Denmark Street and Chalgrove Road, Tottenham. Additionally, two refurbished/extended apartments at the site of 18 Denmark Street have been assessed.

This report assesses the overheating risk of all seven units. The intention is that this study helps inform and verify the design proposals, thereby providing the basis for mitigating overheating risk and producing a building that provides comfortable environmental conditions for occupants.

It is important to note that with any modelling exercise there are assumptions and approximations that have to be made. As far as possible, details of all assumptions and approximations are supplied within the report. These were predominantly informed by information provided by Hill Patru Architects and should be reviewed carefully.

All results are based on the output from computer modelling software and should be taken as an indication of the likely final situation, but these conditions cannot be guaranteed.

Moreover, this Overheating Assessment across the development supports the Planning Application and demonstrate that the proposed development complies with the relevant current guidance CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes (2017) and the requirements of the Dynamic Simulation of the building regulation in England setting standards for overheating in new residential buildings: Overheating: Approved Part O.



Figure 01.- Artist illustration Image of proposed development (source: Hill Patru Architects)

2 Executive Summary

An overheating assessment has been undertaken for the five proposed new dwellings at the site of Denmark Mews (land between Denmark Street and Chalgrove Road) in Tottenham, in addition to two refurbished/extended apartments at the site of 18 Denmark Street to demonstrate the potential conditions and risk of overheating. The house types being assessed are:

- Plot 1 – New 3 bed, 4 person end of terrace dwelling
- Plot 2 – New 3 bed, 4 person mid-terrace dwelling
- Plot 3 - New 3 bed, 4 person mid-terrace dwelling
- Plot 4 - New 3 bed, 4 person mid-terrace dwelling
- Plot 5 – New 2 bed, 3 person end of terrace dwelling
- Plot 6 – Refurbished/extended 1 bed, 2 person ground floor apartment
- Plot 7 - Refurbished/extended 3 bed, 4 person first floor apartment

This report details the route to compliance under AD Part O in accordance with the Cooling Hierarchy. The weather file required to pass against under TM59 is CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario – using a central London weather file more accurately represent the urban heat island effect.

The assessed plots have also been modelled against more extreme and future weather files CIBSE Design Summer Years (DSY 1) 2050s & 2080's scenarios, in addition to 2020's DSY 2 & 3, where any remaining overheating risk should inform the future retrofit plan. This is in line with the guidance and data sets in CIBSE TM49.

A summary of results detailing the route to TM59 (in accordance with AD Part O) compliance against the CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario is shown below. Full set of results can be found in appendix to the foot of the report.

Baseline

- No natural ventilation (windows closed)
- Glazing g value 0.63
- No mechanical ventilation
- No active cooling

Number of assessed dwellings	Overheating Strategy	Number of assessed dwellings achieving TM59/Part O Compliance
7	Baseline	0 / 7

Baseline + Mitigation Measure 1

- No natural ventilation (windows closed)
- Glazing g value 0.40, external shading (including terrace retractable shade) and external blinds
- No mechanical ventilation
- No active cooling

Number of assessed dwellings	Overheating Strategy	Number of assessed dwellings achieving TM59/Part O Compliance
7	Baseline + Mitigation Measure 1	0 / 7

Baseline + Mitigation Measure 1 + Mitigation Measure 2

- Natural ventilation via openable windows
- Glazing g value 0.40, external shading (including terrace retractable shade) and external blinds
- Mechanical ventilation heat recovery (free cooling from outdoor air)
- No active cooling

Number of assessed dwellings	Overheating Strategy	Number of assessed dwellings achieving TM59/Part O Compliance
7	Baseline + Mitigation Measure 1 + 2	0 / 7

Baseline + Mitigation Measure 1 + Mitigation Measure 2 + Mitigation Measure 3

- Natural ventilation via openable windows
- Glazing g value 0.40, external shading (including terrace retractable shade) and external blinds
- Mechanical ventilation heat recovery (free cooling from outdoor air)
- No active cooling

Number of assessed dwellings	Overheating Strategy	Number of assessed dwellings achieving TM59/Part O Compliance
7	Baseline + Mitigation Measure 1 + 2 + 3	0 / 7

Baseline + Mitigation Measure 1 + Mitigation Measure 2 + Mitigation Measure 3 + Mitigation Measure 4

- Natural ventilation via openable windows
- Glazing g value 0.40, external shading (including terrace retractable shade) and external blinds
- Mechanical ventilation heat recovery (free cooling from outdoor air)
- Active cooling via Hybrid Cooling Unit

Number of assessed dwellings	Overheating Strategy	Number of assessed dwellings achieving TM59/Part O Compliance
7	Baseline + Mitigation Measure 1 + 2 + 3 + 4	7 / 7

See appendices A-I for detailed results breakdown of all proposed iterations.

The results show that the Cooling Hierarchy has been followed and can be concluded that for all of the assessed spaces, compliance with CIBSE TM59 / Part O can only be achieved through active cooling means. A hybrid cooling MVHR unit such as Nuair MRXBOX or equivalent should be considered over traditional cooling methods due to reduced operational running costs and carbon emission savings.

This strategy may need to be revised for the future retrofit plan in a future warmer climate as represented by the future and extreme weather files by increasing the flow rates delivered by the unit beyond that designed for compliance with CIBSE TM59/Part O.

3 Part O: Dynamic Thermal Modelling Method

CIBSE TM59:2017 - Design Methodology for Assessment of Overheating Risk in Homes, sets a standardised approach to predicting overheating risk for residential building designs (new-build or major refurbishment) using dynamic thermal analysis.

This document provides a set of profiles that represent reasonable usage patterns for a home suitable for evaluating overheating risk. Where possible the magnitude of gains is taken from CIBSE guidance. Profiles are developed to test the building design, not to cover all usage modes. Where possible assumptions for heat and solar gains are taken from established CIBSE guidance.

Profiles are developed to test the building design, not to cover all or unusual usage modes, albeit different profiles exist for different groups of occupants.

The TM59 methodology:

- allows different designs to be compared with a common approach, based on set assumptions for occupancy and internal gains
- supports design decisions that improve comfort without cooling
- provides consistency across the industry as all consultants will be using the same methodology for overheating risk prediction

This methodology will not:

- guarantee that people will always be comfortable in compliant spaces, however they act
- take into account unusual use.

In order to demonstrate compliance with the requirements settled by the requirement O1 of the Approved document Part O, the present report has used the Dynamic thermal modelling method approved by the aforementioned document.

To demonstrate compliance using the dynamic thermal modelling method, all of the following have been followed:

- a) CIBSE TM59 methodology for predicting overheating risk
- b) The limits on the use of CIBSE TM59 methodology set out below
- c) The acceptable strategies for reducing overheating risk

Limits on CIBSE's TM59 modelling

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

- a) When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following:
 - i. Start to open when the internal temperature exceeds 22°C
 - ii. Be fully open when the internal temperature exceeds 26°C
 - iii. Start to close when internal temperature falls below 26°C
 - iv. Be fully closed when the internal temperature falls below 22°C
- b) At night (11pm to 8am), openings should be modelled as fully open if both of the following apply:
 - i. The opening is on the first floor or above and not easily accessible
 - ii. The internal temperature exceeds 23°C at 11pm.
- c) When a ground floor of easily accessible room is unoccupied, both of the following apply:

- i. 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.
- ii. At night, windows, patio doors and balcony doors should be modelled as closed.

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

Acceptable strategies for reducing overheating risk

Limiting solar gains

Solar gains in summer should be limited by any of the following means:

- a) Fixed shading devices, comprising any of the following.
 - i. Shutters
 - ii. External blinds
 - iii. Overhangs
 - iv. Awnings
- b) Glazing design, involving any of the following solutions
 - v. Size
 - vi. Orientation
 - vii. g-value
 - viii. Depth of the window reveal
- c) Building design – for example, the placement of balconies
- d) Shading provided by adjacent permanent buildings, structures, or landscaping.

Removing excess heat

Excess heat should be removed from the residential building by any of the following means.

- a) Opening windows (the effectiveness of this method is improved by cross-ventilation)
- b) Ventilation louvres in external walls
- c) A mechanical ventilation system
- d) A mechanical cooling system

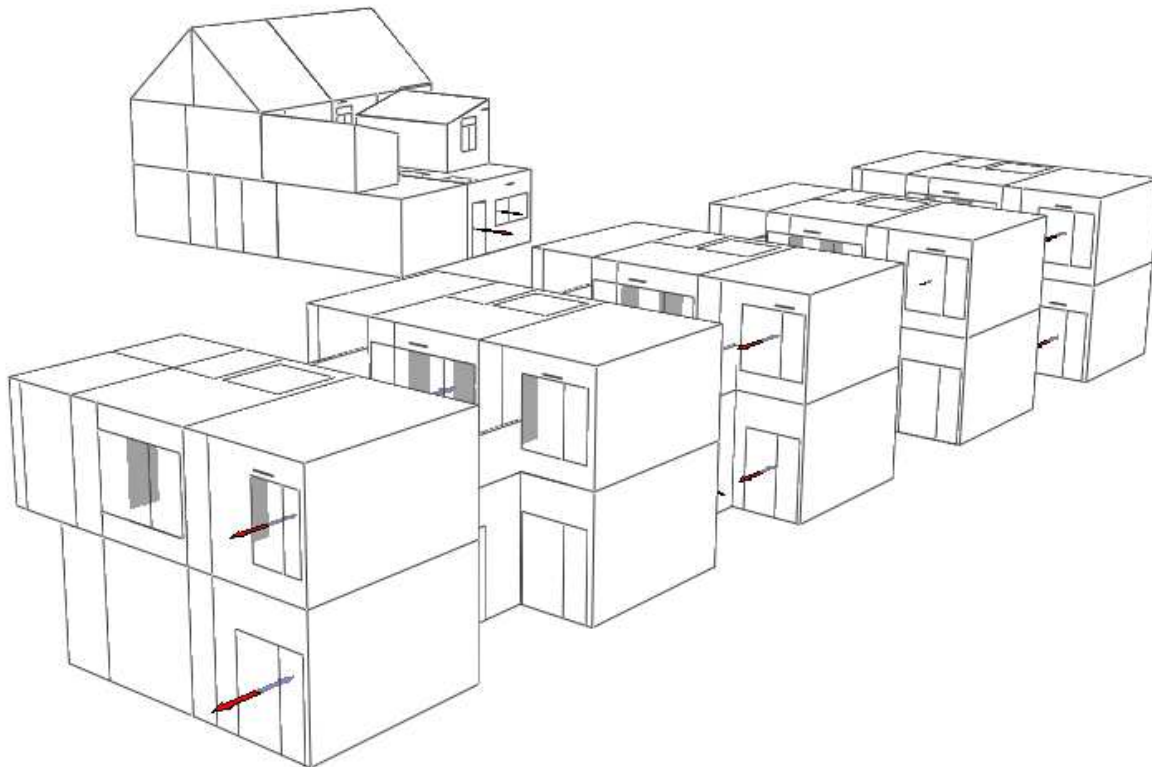


Figure 02.- Airflow depiction of Thermal Models

4 CIBSE TM59 Assessment Criteria

See Summary of Results.

5 The Model

The building was modelled using Design Builder software (DSB) which is based on the Energy Plus engine. The software complies with CIBSE Application Manual AM11: 1998 Building Energy and Environmental Modelling and provides a full dynamic simulation of thermal conditions in the building.

Geometry

A three-dimensional analysis model has been generated for the proposed scheme. The model was developed using drawn information supplied by Hill Patru Architects.

As with any modelling exercise, some approximations have been made, but care has been taken to ensure the scale and internal dimensions of the model are as close as practicable to the design drawings, and that glazing areas are as accurately represented as the provided information allows.

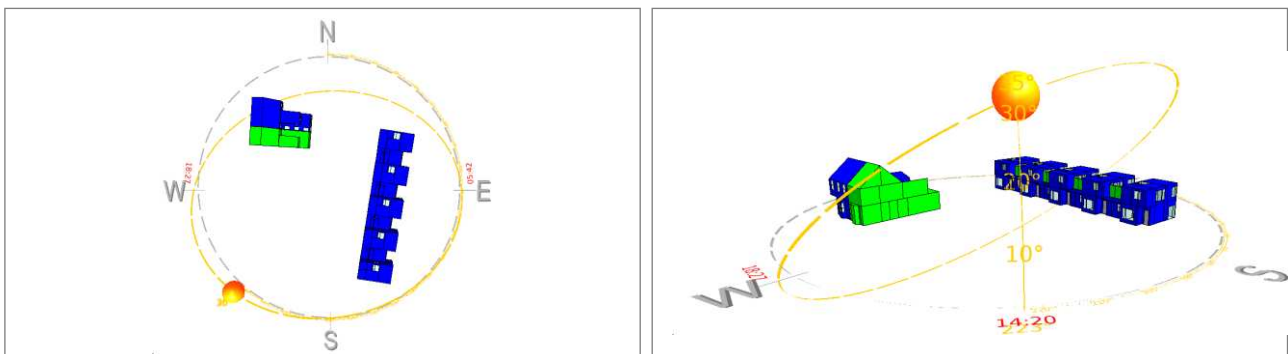


Figure 02.- Thermal Model: Solar Path & Isometric view

Table 01: Units Analysed at the proposed development

Unit Reference	Level	Description
Plot 1	Ground and First	3 bed, 5 person end of terrace
Plot 2	Ground and First	3 bed, 5 person mid-terrace
Plot 3	Ground and First	3 bed, 5 person mid-terrace
Plot 4	Ground and First	3 bed, 5 person mid-terrace
Plot 5	Ground and First	2 bed, 3 person end of terrace
Plot 6	Ground	1 bed, 2 person ground floor apartment
Plot 7	First	2 bed, 3 person first floor apartment

Site Location and Climate Data

The CIBSE DSY weather file for Heathrow is most appropriate as this best represents the urban/peri-urban location of the proposed site.

The weather file contains hourly data for air temperatures (wet bulb and dry bulb), wind speed and direction, atmospheric pressure, solar irradiation and cloud cover.

DSY (Design Summer Year) is the industry standard weather file for use in overheating assessments. It should be noted that the current DSY was used, and future weather

files based on various predicted climate change scenarios are available. Usage of these future weather files would result in higher predicted internal temperatures than reported here as the climate is predicted to encounter more prolonged warm spells and higher peak temperatures as time progresses.

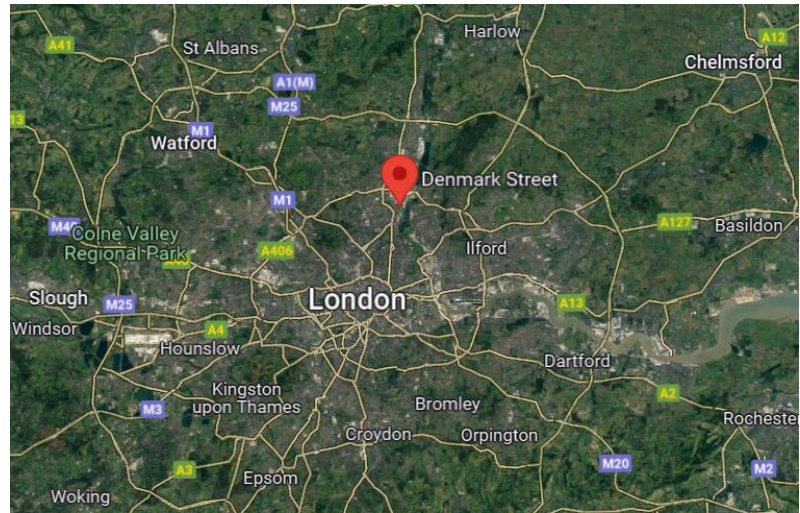


Figure 03.- Site location

Building Construction and U-Values

Hill Patru Architects have provided work-in-progress drawings which were used to create the thermal models.

Table 1 shows the construction U-values and air infiltration used in the thermal model. These figures have been assumed for the proposed development.

The overheating assessment indicates that the proposed building envelope with low thermal mass will generally be sufficient to maintain acceptable indoor temperature within the units.

Table 02: U Values applied to the Dynamic Simulation Model

Element	Modelled U Value (W/m ² K)	Thermal Mass Value kJ/(m ² .K)
External Wall	0.15	21.95 (Very Lightweight)
Roof	0.12	98.75 (Lightweight)
Ground Floor	0.10	85.0 (Very Lightweight)
Glazing	1.20	-
Rooflights	1.20	-
Doors	1.00	-
Internal Walls	0.00	8.75 (Very Lightweight)
Internal Floors	0.00	95.00 (Lightweight)
Air Leakage (m ³ (h.m ²) @ 50Pa	3	-
Infiltration Equivalent (air changes per hour)	0.20	
Glazing g Value	40%	

Internal Gains

The internal heat gains and operating profiles that are applied to each occupied space have been taken from the prescriptive templates outlined in CIBSE TM59 (Design methodology for the assessment of overheating risk in homes). A detailed occupancy schedule is shown to the foot of this report.

Unit/Room type	Occupancy	Equipment gain
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day Sensible gain 75 W/, latent gain 55 W from 10 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 110W 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/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day Sensible gain 150 W, latent gain 110 W from 10 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 110W 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/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day Sensible gain 225 W, latent gain 165 W from 10 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 110W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
Double bedroom	2 people at 105 W sensible gains, 77 W latent gains from 11 pm to 8 am and 150 W sensible gains, 110 W latent gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at 75 W sensible gains, 55 W latent gains in the bedroom from 9 am to 10 pm	Peak load of 80W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom	1 person at 52.5 W sensible gains, 38.5 W latent gains from 11 pm to 8 am and 75 W sensible gains, 55 W latent gains from 8 am to 11 pm	Peak load of 80W from 8 am to 11 pm Base load of 10W during sleeping hours
HIU Cupboards	Assumed to be zero	Sensible gain of 50 W all day and night

External Shading

Garden screens have been modelled despite the primary purpose being privacy. The image below shows that the kitchen, hall and living areas of the first floor may benefit from these devices.

Retractable awnings on the garden terrace have also been considered which will enable occupants to control the amount of solar radiation entering the glazed terrace.

Internal Shading

Though the regulations do not permit the use of **internal** blinds and curtains in the calculations, external blinds controlled by the occupants have been considered on all glazing which is South-facing. This allows the space users to control the amount of sunlight entering the dwelling through these glazed areas, without severely restricting the air pathway for natural ventilation to occur through the window openings.

It should be noted that if the sun shines directly into a living space, the occupant should consider closing the curtains or blinds to limit solar gains and try and keep rooms as cool as possible.

Heat comes into the house in two ways: solar radiation from the sun, and hot air. We need to limit both to prevent overheating, which may require closing both the windows and curtains on the warmest days.

Natural Ventilation

Natural ventilation through opening windows has been considered as part of the overheating mitigation strategy. Windows as shown on architectural drawings have been modelled to open as per Part O restrictions.

Opening of the rooflight atop the stairway allows for increased levels of ventilation as cross-ventilation is achieved. This creates a pathway through the dwelling allowing greater air movement within the dwelling and less chance of warm, stagnant air forming and leading to high temperatures.

However, if it's cooler inside than outside, it is advised that occupants should keep their windows closed, to prevent bringing warm air in. In combination with preventing solar gains by closing curtains/blinds, this reduces the reliance on the proposed ventilation system to maintain comfortable internal conditions.

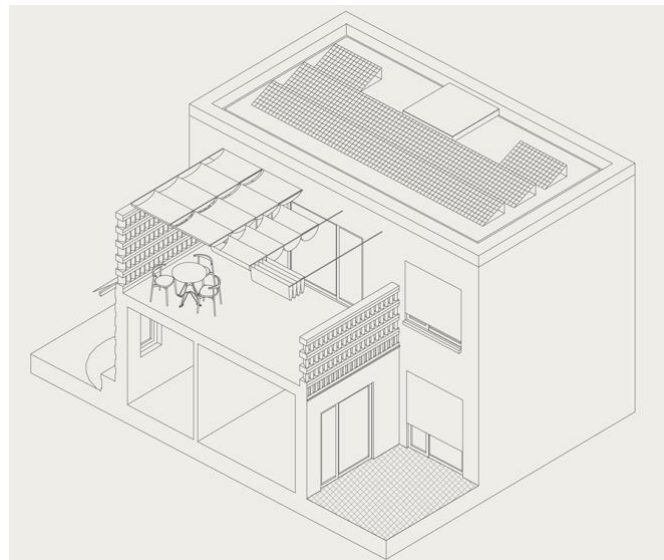
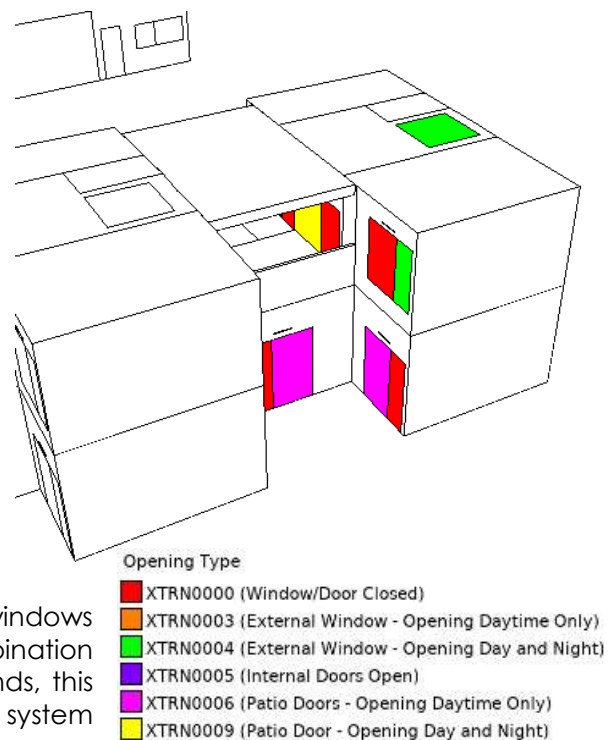


Figure 04.- External shading (awnings and external blinds depicted) on first floor garden areas



Mechanical Ventilation

It is proposed that MVHR hybrid cooling ventilation units will provide the necessary ventilation and cooling requirements to each dwelling. A unit such as Nuaire MRXBOX which is capable of delivering enhanced flow rates of 90 l/s or more (to the total dwelling) is required to overcome the overheating risk and satisfy the TM59 assessment criteria.

During the heating season, the Nuaire MRXBOX (or equivalent) acts as conventional MVHR unit, supplying air to habitable rooms (such as bedrooms and living spaces), while extracting from kitchen, WC and bathroom spaces at the minimum requirements as per Approved Document F, and recovering as much as 90% of the heat from the extracted air.

During summer months and periods of warm external conditions, a summer bypass allows the incoming air to avoid the heat exchanger and supply air at external conditions to the dwellings, taking advantage of the 'cooler' outdoor air (free cooling) to maintain comfortable internal conditions.

However, when external temperatures exceed internal, the cooling coil will become active and begin to temper the incoming air – offsetting the incoming external condition supply air by between 10°C-15°C (dependant on external air temperature and desired flow rates). During cooling mode, air has been modelled at supply rates of 20l/s for bedrooms and 30l/s for living areas.

During this operation, in Plot 1 for example, the units are capable of providing 2.1kW of cooling, at a total flow rate of 90 l/s (30 l/s to Living area, 20 l/s to bedrooms).



Mechanical Ventilation Layout - Plots 1-5 Dwellings GF



Mechanical Ventilation Layout - Plots 1-5 Dwellings FF

-  MVHR 20l/s Supply (Bedrooms)
-  MVHR 30l/s Supply (Living Areas)
-  MVHR Extract (WC/Kitchen Areas)



Mechanical Ventilation Layout - Apartments 6 GF (Left) and Apartment 7 FF (Right)

5 Additional Information

Cooling Load

The peak active cooling loads (kW), annual cooling load (MWh), area-weighted average (MJ/m², based on actively cooled floor area only) and annual cooling demand (MJ) provided by the modelled Nuair MRXBOX for compliance with TM59 are as follows:

- Plot 1: 1.52 kW / 4.44MWh annually (15,984 MJ annually or 347 MJ/m²)
- Plot 2: 1.71 kW / 4.47MWh annually (16,092MJ or 350 MJ/m²)
- Plot 3: 1.74 kW / 4.49MWh annually (16,164MJ or 351 MJ/m²)
- Plot 4: 1.62 kW / 4.52MWh annually (16,272MJ or 354 MJ/m²)
- Plot 5: 1.34 kW / 3.75MWh annually (13,500 MJ or 375 MJ/m²)
- Plot 6: 1.11 kW / 2.39MWh annually (8,604 MJ or 204 MJ/m²)
- Plot 7: 1.21 kW / 2.79MWh annually (10,044 MJ or 233 MJ/m²)

Retrofit Plan

A retrofit plan for more extreme and higher frequency warm weather (as represented in the 2050 and 2080 future weather files) should include increasing the ventilation rates beyond what is currently required to gain TM59 compliance. Increased flow rates and/or greater tempered air rates of future predicted technologies would ensure the internal conditions remain comfortable for the room occupants. An MVHR units' typical lifespan is 15 years.

Heatwave Plan

This development should have a heatwave plan / building user guide to mitigate overheating risk for occupants.

As part of the building user guide, which will be developed ready for when tenants move in, a heatwave plan will be included. As a minimum this will include:

- Impacts of Heat Waves on Human Health
- Heat Wave Early preparation / early warning systems
- Building design and infrastructure
- Building Insulation and Ventilation
- Shading and Solar Control Measures
- Energy Efficiency and Renewable Energy Systems
- Heat wave monitoring
- Plan review for continuous improvement.

Communal Spaces to Cool Down

In the event of flats / houses overheating, seeking areas where residents can cool down should be advised.

Shaded external areas such as the under the drawn awnings in the garden should be proposed. This would allow residents to be in an outdoor area out of direct sunlight.

However, with the proposed hybrid cooling strategy, the internal conditions in bedrooms and living spaces (those which receive tempered supply air) are more likely to be cooler than outside, therefore it is recommended that residents close the external blinds and stay indoors with external openings shut as the preferred method of staying cool.

Modelling Evidence

The following requirements have been met due to the whole site being modelled and not sampled plots assessed:

- All single-aspect rooms facing west, east, and south;
- At least 50% of rooms on the top floor;
- 75% of all modelled rooms facing South or South/West;
- Rooms closest to any significant noise and / or air pollution source, with windows closed at all times (with cross reference to the Noise and the Air Quality Assessments to demonstrate the most sensitive receptors and the AVO Residential Design Guide).

Renewables

It is proposed that each dwelling will site Photovoltaic panels onsite, each array will be sized to generate a 2.4kWp yield.

The PV system will work in combination with the proposed overheating mitigation strategy as the highest internal and external temperatures required to offset through the hybrid cooling unit will coincide with the peak generation yield. This enables on-site generation to directly feed into the cooling strategy, resulting in little to no export of electricity as the peak house load and peak PV generation patterns will be similar.

6 Summary of Results

TM59 sets different overheating compliance criteria for homes that are predominantly naturally ventilated and for homes that are predominantly mechanically ventilated.

For homes that are predominantly naturally ventilated, the method with two criteria should be used to assess overheating. The first overheating criteria, which applies to both living rooms/kitchens and bedrooms, is an adaptive criteria. The second overheating criterion is a fixed temperature criteria which applies only to bedrooms. Both criteria must be met for all spaces within a home to demonstrate compliance.

For mechanically ventilated homes, the fixed temperature method with a single criterion should be used to assess overheating. This single criterion must be met for all spaces (living rooms/kitchens and bedrooms) within a mechanically ventilated home to demonstrate compliance.

The TM59 criteria for naturally and mechanically ventilated homes are summarised in the following table. All criteria must be met for all spaces within a home to demonstrate full compliance.

Table 04: TM59 Overheating Assessment Criteria

Assessment Type	Assessment Criteria	Applicable Rooms	Occupied Hours	Naturally Ventilated Homes (open windows)	Mechanically Ventilated Homes (closed windows)
Predominantly Natural Ventilation	Criterion 1	Living rooms, kitchens and bedrooms	Living / Kitchen / Dining rooms – 9am to 10pm (13 hours/day) Bedrooms – 24-hour occupancy	The number of hours during which external and internal temperature difference 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.	Not Applicable
	Criterion 2	Bedrooms only	Bedrooms – 24-hour occupancy	The operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of annual hours. 33 or more hours above 26°C will be a fail	Not Applicable
Predominantly Mechanical Ventilation	Criterion 3	Living rooms, kitchens and bedrooms	Living / Kitchen / Dining rooms – 9am to 10pm (13 hours/day) Bedrooms – 24-hour occupancy	Not applicable	The operative temperature in occupied all occupied rooms should not exceed 26°C for more than 3% of the annual occupied annual hours. 143 or more hours above 26°C for living rooms and kitchens will be a fail. 263 or more hours above 26 °C for bedrooms will be a fail

All of the proposed options fall under the requirements of 'predominantly natural ventilation' assessment criteria until the final *Baseline + Mitigation Measure 1 + 2 + 3 + 4* which proposes windows are closed and therefore must be assessed against 'predominantly Mechanical Ventilation' criteria.

Run 0: Baseline - CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario –
 See Appendix A for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 1	Number of Assessed Rooms Passing Criterion 2	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	0	0	0
Kitchen/Dining/Living	13	0	-	0

Run 1: Baseline + Mitigation Measure 1 - CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario - See Appendix B for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 1	Number of Assessed Rooms Passing Criterion 2	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	0	0	0
Kitchen/Dining/Living	13	0	-	0

Run 2: Baseline + Mitigation Measure 1 + 2 - CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario - See Appendix C for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 1	Number of Assessed Rooms Passing Criterion 2	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	17	5	5
Kitchen/Dining/Living	13	13	-	13

Run 3: Baseline + Mitigation Measure 1 + 2 + 3 - CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario - See Appendix D for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 1	Number of Assessed Rooms Passing Criterion 2	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	17	5	5
Kitchen/Dining/Living	13	13	-	13

Run 4: Baseline + Mitigation Measure 1 + 2 + 3 + 4 - CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario - See Appendix E for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 3	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	17	17
Kitchen/Dining/Living	13	13	13

Run 5: Baseline + Mitigation Measure 1 + 2 + 3 + 4 - CIBSE Design Summer Year (DSY 1) 2050s, high emissions, 50 percentile scenario - See Appendix F for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 3	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	8	8
Kitchen/Dining/Living	13	11	11

Run 6: Baseline + Mitigation Measure 1 + 2 + 3 + 4 - CIBSE Design Summer Year (DSY 1) 2080s, high emissions, 50 percentile scenario - See Appendix G for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 3	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	0	0
Kitchen/Dining/Living	13	1	1

Run 7: Baseline + Mitigation Measure 1 + 2 + 3 + 4 - CIBSE Design Summer Year (DSY 2) 2020s, high emissions, 50 percentile scenario - See Appendix H for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 3	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	1	1
Kitchen/Dining/Living	13	9	9

Run 8: Baseline + Mitigation Measure 1 + 2 + 3 + 4 - CIBSE Design Summer Year (DSY 3) 2020s, high emissions, 50 percentile scenario - See Appendix I for detailed results

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 3	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	13	13
Kitchen/Dining/Living	13	10	10

A summary of results for each of the assessed dwellings can be seen below:

Table 05: *TM59 compliance results summary*

Dwelling Type	Overheating Strategy	TM59 / Part O Compliance	Notes
Plot 1	MVHR Hybrid Cooling + g value 0.40	☒	MVHR Hybrid Cooling based on Nuair MRXBOX
Plot 2		☒	
Plot 3		☒	
Plot 4		☒	
Plot 5		☒	
Plot 6		☒	
Plot 7		☒	

7 Conclusions

The overheating analysis within this report was undertaken using design proposals and TM59 standards to assess the risk of overheating within all apartments and communal corridors.

The assessment has shown that the proposed residential dwellings at the Denmark Mews site present a high chance of overheating through natural measures, even with the addition of high levels of external shading such as awnings, external blinds and mechanical ventilation, and to satisfy the TM59 overheating criteria the inclusion of a form of mechanical cooling must be considered.

The overheating modelling results of the assessed spaces with the proposed overheating mitigation strategy demonstrate that the proposed measures are adequate to achieve compliance against the DSY1 weather data file. As the results show below;

Table 06: Run 4: Baseline + Mitigation Measure 1 + 2 + 3 + 4 - CIBSE Design Summer Year (DSY 1) 2020s, high emissions, 50 percentile scenario

	Total Number of Rooms Assessed	Number of Assessed Rooms Passing Criterion 3	Number of Rooms Satisfying TM59 Compliance
Bedrooms	17	17	17
Kitchen/Dining/Living	13	13	13

The Cooling Hierarchy as stated in the London Plan has been followed, as summarised in the table below;

Table 07: Cooling Hierarchy Demonstration

#	Cooling Hierarchy measure	Implementation of measure	Measure effect
1	Reduce the amount of heat entering a building through orientation, shading, high albedo materials, fenestration, insulation and the provision of green infrastructure	Solar control glazing to limit solar gains and modelling of garden/patio privacy screens satisfy the above.	Reduction in solar gains entering the dwellings
2	Minimise internal heat generation through energy efficient design	This can be achieved by measures such as fully insulated pipework.	N/A
3	Manage the heat within the building through exposed internal thermal mass and high ceilings	At the jurisdiction of the site architect	N/A
4	Provide passive ventilation	Passive ventilation via unrestricted opening windows and patio doors (as permitted by ADO and ADK)	Limited impact on internal temperatures.
5	Provide mechanical ventilation	Mechanical ventilation via MVHR in combination with natural ventilation via opening windows	Limited impact on internal temperatures
6	Provide active cooling systems	MVHR hybrid cooling unit modelled	All assessed rooms satisfy TM59 criteria and are Part L compliant

Appendix J: Detailed Occupancy Schedules – CIBSE TM 59 Heat gain Profile

Number of People	Description /Occupancy	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	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	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	0.5	0.7
2	Studio	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	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	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	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	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	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	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	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	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	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