



56 Montague St, Worthing BN11 3BP

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.

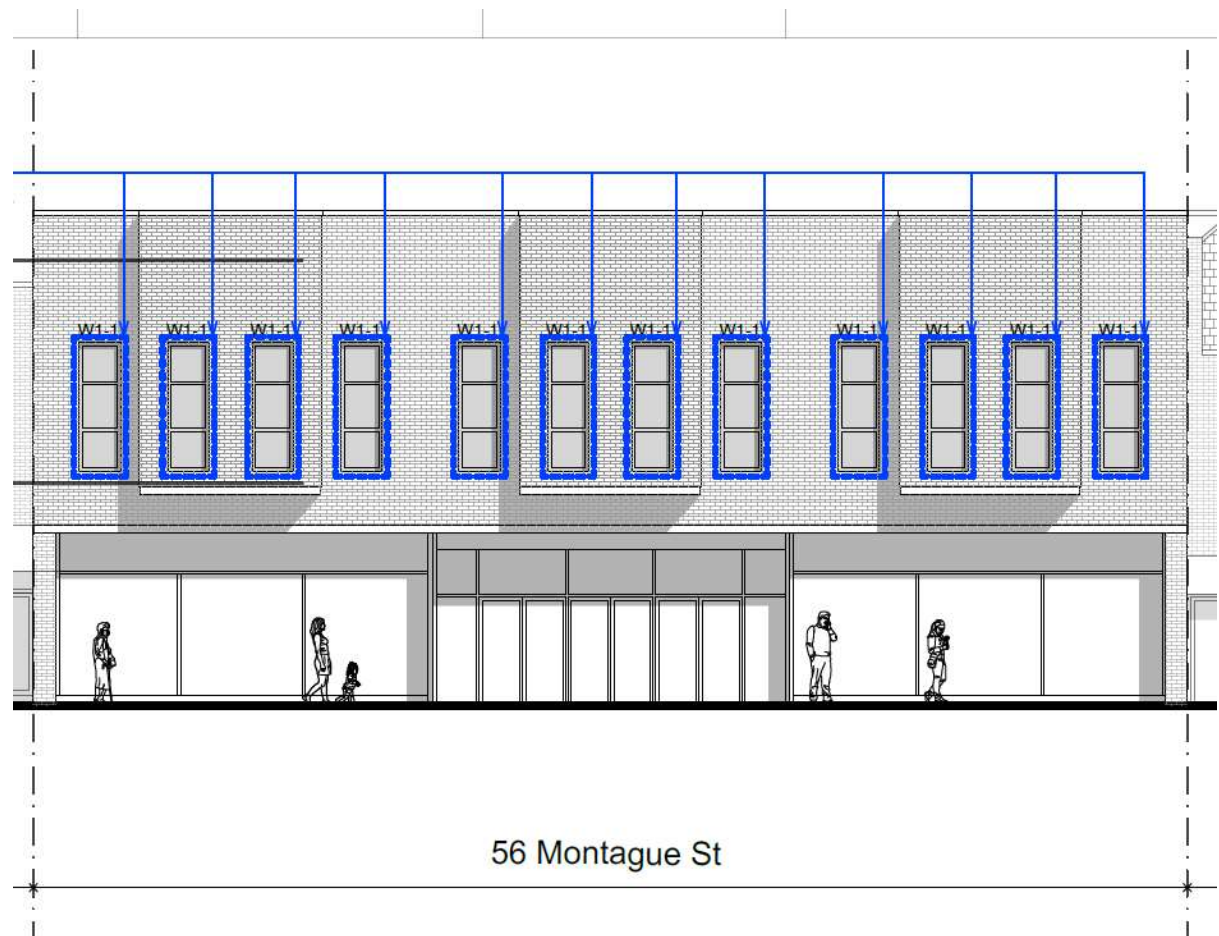
Dynamic simulation software models how heat is transferred within and around a building, including how solar radiation enters through windows, how heat is conducted through walls and roofs, and how ventilation systems affect indoor air temperatures. It also considers the thermal mass of the building,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

Overheating assessment for six flats in a conversion building at **56 Montague Street Worthing** has been carried out to check compliance with CIBSE TM59 overheating criteria.

All habitable rooms in the tested apartments comply with CIBSE TM59 criteria under DSY1 weather data set, with internal blinds and mechanical ventilation rates up to 40 l/s.

2. Project description

The proposal comprises refurbishment and conversion of an existing commercial building to form 32 No apartments.



3. Inputs

The building fabric parameters applied are as follows:

Building Elements	U Values	Thermal mass
External walls	0.30 W/m ² K	Existing masonry walls, insulated internally
Roof	0.16 W/m ² K	Warm roof, concrete slab, suspended ceiling
Internal walls	N/A	Lightweight partitions
Internal floors	N/A	Concrete floor construction
Windows and glazed doors	1.4 W/m ² K	N/A
Glazing g-value	0.5	N/A
Infiltration rate	0.5 AC/hr	N/A

Natural ventilation through openable windows is not included in the overheating simulation, due to external noise constraints as recommended by specialist acoustic report.

Mechanical ventilation is included in all habitable rooms with flow rates up to 40 l/s.

Lighting: 2 W/m² (6pm – 11pm)

Internal window blinds (High reflectance - low transmittance) are included in the model.

Weather data set used for the simulation is CIBSE DSY1 (design summer year) Southampton 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 the following criterion:

Criterion 4.3

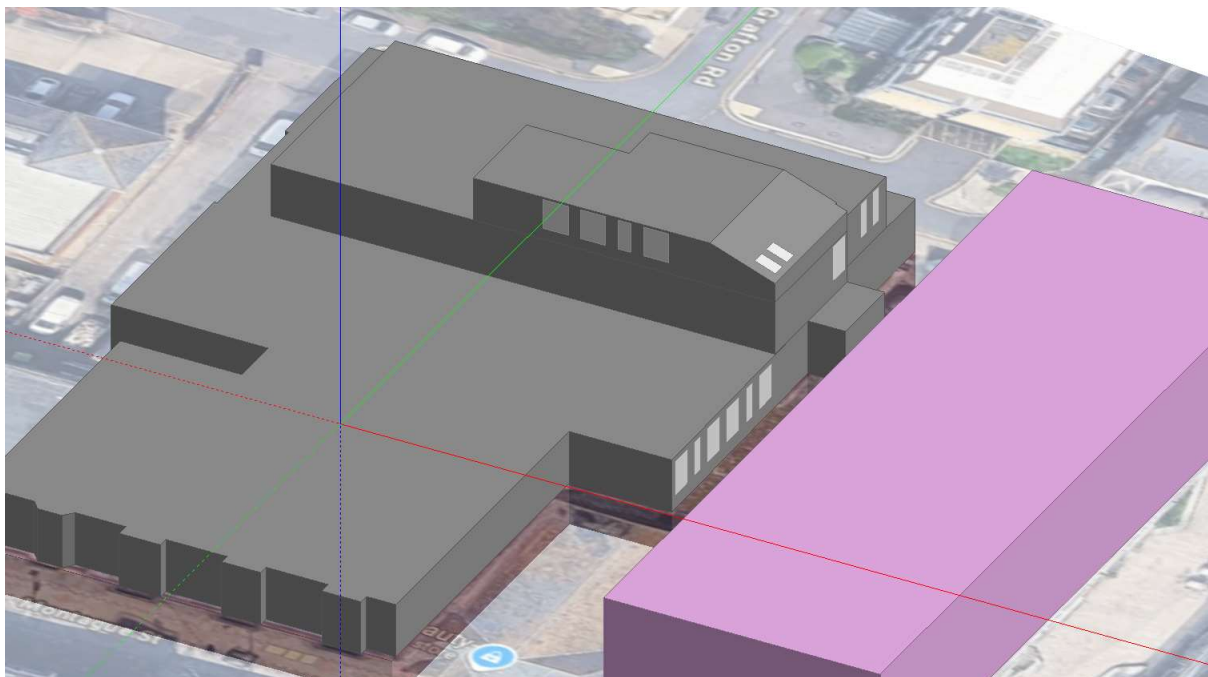
For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 °C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a))

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.

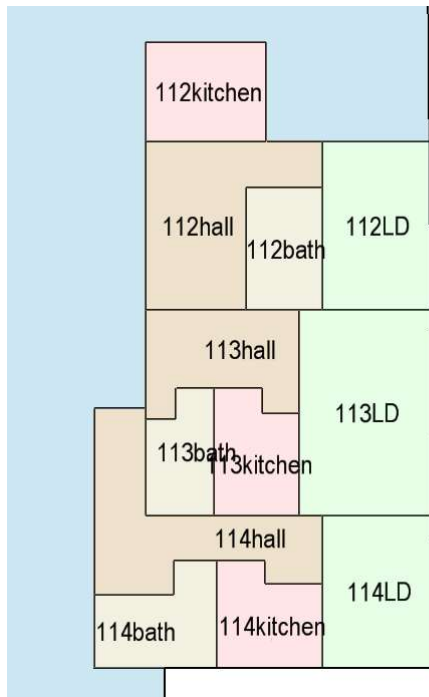
The dynamic thermal simulation has been carried out using DesignBuilder software with EnergyPlus v8.9 engine.

Axonometric View of the modelled building

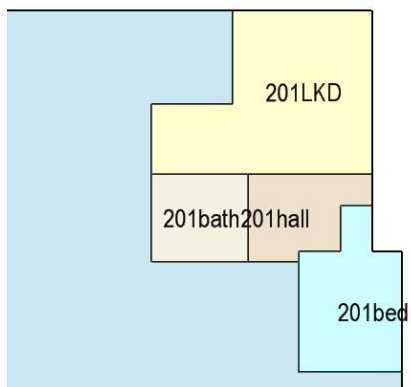


Layouts of the modelled apartments

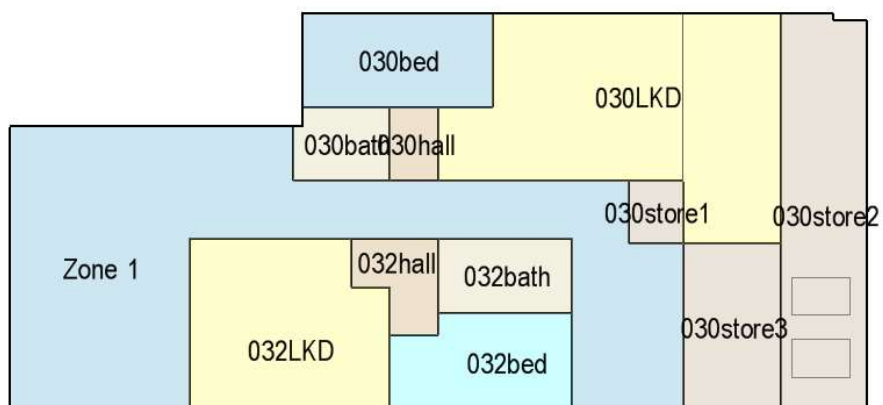
1st floor



2nd floor



3rd floor



5. Results

CIBSE TM59 Results for DSY1

Zone	% hours exceeded	Pass / Fail	Required mechanical ventilation rate l/s
1ST-112KITCHEN	0.51%	Pass	10
1ST-112LD	2.07%	Pass	5
1ST-113KITCHEN	1.81%	Pass	5
1ST-113LD	1.88%	Pass	5
1ST-114KITCHEN	2.47%	Pass	5
1ST-114LD	2.93%	Pass	5
2ND-201BED	2.39%	Pass	20
2ND-201LKD	2.47%	Pass	20
3RD-030BED	2.48%	Pass	40
3RD-030LKD	2.13%	Pass	10
3RD-032BED	1.62%	Pass	20
3RD-032LKD	2.85%	Pass	30

6. Conclusion

All habitable rooms comply with TM59 criteria for rooms with limited window opening. Ventilation rates required in some rooms are beyond capacity of typical whole-house MVHR units, therefore single-room “purge” ventilation units or other means of non-standard ventilation will be required. In case that the ventilation rates are technically not feasible in the development, then the only way to achieve acceptable thermal comfort will be to provide mechanical cooling.

Ondrej Gajdos, Consult JA Ltd, 07/08/2026

