



WILMSLOW ROAD

TM59 OVERHEATING STUDY



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1 Executive Summary

- 1.1 This TM59 study presents the overheating potential for the proposed scheme at Wilmslow Road, Manchester.
- 1.2 The proposed scheme includes a student accommodation development comprising two distinct blocks (Blocks A & B).
- 1.3 The dynamic thermal model is represented by a sample of habitable rooms across the lower, mid and upper floors. The sample selection is based upon a preliminary study of the elevation, solar exposure, glazing area, window openings and local shading of a room, all of which can contribute to overheating.
- 1.4 The chosen TM59 samples for the Wilmslow Road site is:
 - All habitable rooms on floors 2, 11 & 12 of block A totalling 66 rooms
 - Communal corridors on floors 0,1, 2, 11 & 12 of block A totalling 5 zones
- 1.5 The corridor temperature is included in the results and will consider heat losses through a centralised hot water system.
- 1.6 Block B has been deemed similar to the rest of the site therefore can be represented by block A.
- 1.7 The standard TM59 'Design methodology for the assessment of overheating risk in homes' has been used, this guideline identifies the potential for overheating, specifically within habitable rooms, for example kitchens and bedrooms. The calculation uses the Design Summer Year 1 (DSY1) dataset for the Manchester area to estimate the annual meteorological conditions for the site location.
- 1.8 Results of the simulation are as follows:
 - All rooms with unit pass TM59 criteria 1, as designed.
 - All sampled bedrooms pass TM59 criteria 2 (CIBSE guide A, fixed temperature threshold), as designed.
 - All sampled corridors are well within limits and are classed as a low risk of overheating.
 - The perforated panel in front of the opening should provide at least 40% free area to the opening to maintain sufficient ventilation.

2 Introduction

- 2.1 Quality Engineering Design Ltd was commissioned by Watkin Jones Group to produce a TM59 Overheating report for the proposed development at Wilmslow Road, Manchester

Site & Surroundings

- 2.2 The site is located in Manchester and is situated within an urban, built up area.
- 2.3 No surrounding building provide any significant shading potential.



Figure 2.1 - Indicative site Location (sourced from google maps)

3 Assessment Methodology

Dynamic simulation

- 3.1 An accurate dynamic simulation was conducted using the thermal modelling software Integrated Energy Solutions virtual environment (IES). Microsoft Excel has also been used where necessary to collate and display the results. All occupied rooms were simulated with pre-set TM59 occupancy profiles applied.
- 3.2 Information on geometry has been gathered from Tim Groom Architects received on 11/12/2020. Information on the buildings thermal properties has been taken from the proposed SAP specification from QED and email correspondence with the architect.

3D Model Allocations

- 3.3 IES VE model geometry showing window openings on Block A.

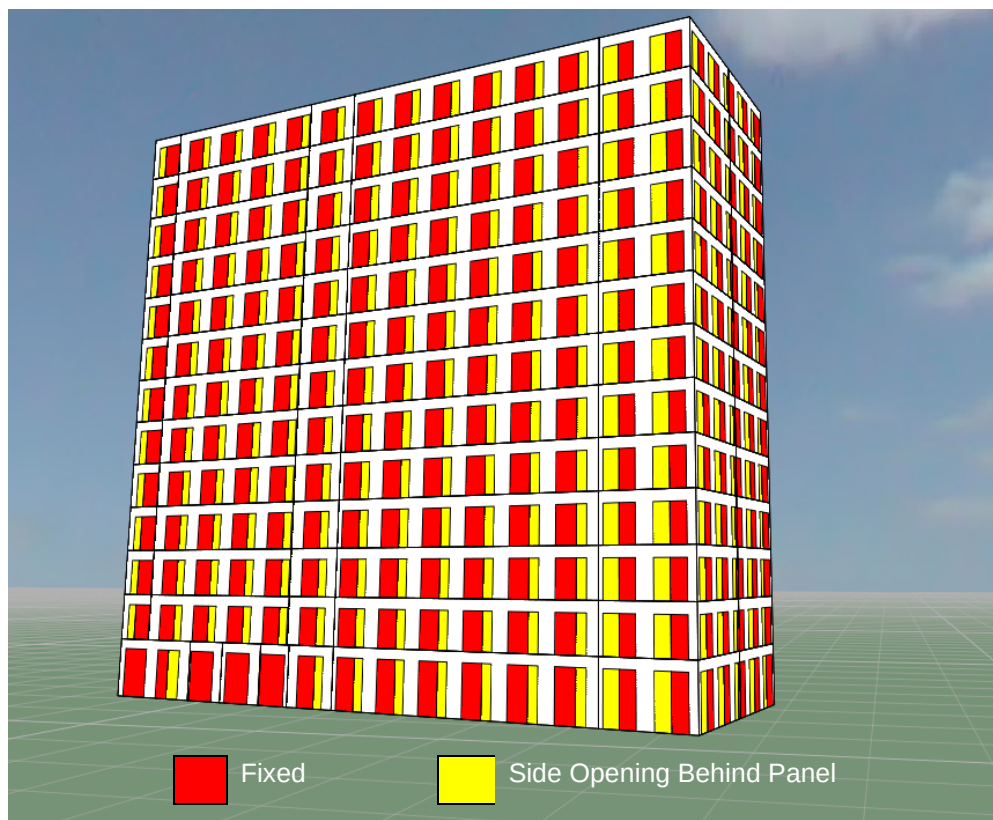


Figure 3.1 – Axonometric view of window opening types

Report Objective

- 3.4 The objectives of the report are as follows:
- Run TM59 criteria 1 for the sampled rooms and identify which fail.
 - Review TM59 Criteria 2 (CIBSE guide A 'fixed temperature threshold') for the sampled bedrooms to determine any night time temperature exceedance.
 - Review the sampled corridors for the number of hours exceeding 28°C.
 - If any rooms fail, review the thermal properties and run iterations until a pass is attained.
 - The guidance to achieve TM59 compliance will consider passive cooling strategies first and then low energy systems; this approach minimizes any impact on the buildings operational CO₂ footprint.

CIBSE Guidance

- 3.5 The CIBSE TM52 standard is a guideline with the purpose of mitigating overheating in buildings. The calculation is derived from a 3D dynamic thermal model, modelling air flow through opening windows, heat loss through the construction fabric as well as tracking internal gains.
- 3.6 The TM59 Standard is an updated guideline for use in residential buildings only; the guideline applies the TM52 criteria 1 for all occupied spaces e.g. kitchens & living rooms, with an additional criterion examining bedroom night time temperatures for any exceedance of 26°C, over which sleep quality can be impacted.
- 3.7 TM59 assessment criteria:
- For living rooms, kitchens and bedrooms, this criterion, taken from TM52 criteria 1, sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1K or more during a typical non-heating season (1 May to 30 September) equating to 3% of occupied hours.
 - Specifically, for bedrooms (equivalent to CIBSE guide A 'fixed temperature threshold') the operative temperature from 10pm to 7am shall not exceed 26°C for more than 1% of annual night hours (32 hours).
 - If the standards on two of these criteria are met, the room passes.
 - The guidance for corridors is that the zone should not exceed 28°C for more than 3% of annual hours.

- 3.8 Table 3.1 below indicates the temperature buffer which the temperature is allowed to exceed the stated criteria depending on the building type. This project falls under category II.

Table 3.1- CIBSE TM52 building temperature variation allowance for a given building category

Category	Explanation	Suggested acceptable range (K)	Suggested acceptable limits (PMV)
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2	± 0.2
II	Normal expectation (for new buildings and renovations)	± 3	± 0.5
III	A moderate expectation (existing buildings)	± 4	± 0.7

4 Model Inputs

Table 4.1 - Construction thermal properties

Element	U value	G Value
External wall	0.20	-
Exposed Floor	0.20	-
Roof	0.14	-
Glazing 1	1.60	0.63
Glazing 2 (Perforated panelling)	1.60	0.10 (Transmission through perforated panel)

Table 4.2 - Internal thermal gain (source: TM59 IES template)

Element	Gain	Profile
Persons	Sensible = 75 Watts/ Person Latent = 55 Watts/ Person	Dependant on room type
Lighting	2 Watts/m ²	18:00 - 23:00
Equipment/ cooking	450 Watts Maximum	Equipment - 09:00-22:00, Cooking - 18:00- 20:00

Table 4.3 – Ventilation

Type	Air Flow
Natural	Dependant on external wind speed
Infiltration	0.25 ACH normal
Toilet Extract	8 l/s continuous
Kitchen Extract	13 l/s continuous

5 Results

Assessment criteria

Table 5.1 TM59 criteria 1 overall result (all sampled rooms shown in section 7.0 appendix)

Block A	
Sampled Rooms	66
Passed	66
Failed	0

Table 5.2 TM59 criteria 2

Block A	
Sampled Bedrooms	57
Passed	57
Failed	0

- 5.1 The external temperature peaks on the 19th of August reaching 29°C at 15:30, the majority of rooms peak temperature occurs at 17:30 on the 19th of August, this is due to the temperature build-up throughout the day.
- 5.2 Mitigation of overheating can be achieved through natural ventilation through the glazing openings shown on the architects' drawings.

Table 5.3 Corridor hours of exceedance

Location	Annual Hours above 28°C	Percentage of annual hours above 28 °C	Peak temperature (°C)
A000 - Corridor	0	0.0	27.67
A100 - Corridor	0	0.0	27.12
A200 - Corridor	0	0.0	27.16
A1100 - Corridor	0	0.0	27.17
A1200 - Corridor	0	0.0	27.08

- 5.3 All corridor temperatures are well within limits therefore are categorised as low risk of overheating.

6 Conclusion

6.1 Results of the TM59 study are as follows:

- All simulated rooms are shown to pass the TM59 guidelines without further mitigation strategies.
- Sufficient natural ventilation is achieved through the glazing when they can open as shown on the architects' drawings.
- All corridors are well within limits and are categorised as low risk of overheating.
- The perforated panel in front of the opening should be designed to provide at least 40% free area to maintain sufficient ventilation, the 40% is a sum of the perimeter gap and the perforations.

7 Appendix

Table 7.1 – Block A TM59 criteria 1 & 2 sampled room results

Room Name	Criteria 1	Criteria 2	Pass/ Fail
A201 - Cluster Kitchen	0.8		PASS
A201a - ACC Bedroom	0	0	PASS
A201b - Bedroom	0	0	PASS
A201c - Bedroom	0	0	PASS
A201d - Bedroom	0.6	3	PASS
A201e - Bedroom	0.7	4	PASS
A201f - Bedroom	0.7	4	PASS
A201g - Bedroom	0.5	3	PASS
A202 - Cluster Kitchen	0		PASS
A202a - Bedroom	0	0	PASS
A202b - Bedroom	0	2	PASS
A202c - Bedroom	0	3	PASS
A202d - Bedroom	0	3	PASS
A202e - Bedroom	0	3	PASS
A202f - Bedroom	0	0	PASS
A203 - Cluster Kitchen	0.1		PASS
A203a - Bedroom	0.5	3	PASS
A203b - Bedroom	0.7	4	PASS
A203c - Bedroom	0.7	4	PASS
A203d - Bedroom	0.7	4	PASS
A203e - Bedroom	0.7	4	PASS
A203f - Bedroom	0.5	2	PASS
A1101 - Cluster Kitchen	0.8		PASS
A1101a - ACC Bedroom	0	0	PASS
A1101b - Bedroom	0	1	PASS
A1101c - Bedroom	0	0	PASS
A1101d - Bedroom	0.6	3	PASS
A1101e - Bedroom	0.7	4	PASS
A1101f - Bedroom	0.7	4	PASS
A1101g - Bedroom	0.5	3	PASS
A1102 - Cluster Kitchen	0		PASS
A1102a - Bedroom	0	0	PASS
A1102b - Bedroom	0	2	PASS
A1102c - Bedroom	0	3	PASS
A1102d - Bedroom	0	3	PASS
A1102e - Bedroom	0	3	PASS
A1102f - Bedroom	0	0	PASS

A1103 - Cluster Kitchen	0.1		PASS
A1103a - Bedroom	0.5	3	PASS
A1103b - Bedroom	0.7	4	PASS
A1103c - Bedroom	0.7	4	PASS
A1103d - Bedroom	0.7	4	PASS
A1103e - Bedroom	0.7	4	PASS
A1103f - Bedroom	0.5	2	PASS
A1201 - Cluster Kitchen	0.7		PASS
A1201a - ACC Bedroom	0	0	PASS
A1201b - Bedroom	0	0	PASS
A1201c - Bedroom	0	0	PASS
A1201d - Bedroom	0.6	2	PASS
A1201e - Bedroom	0.6	4	PASS
A1201f - Bedroom	0.6	3	PASS
A1201g - Bedroom	0.5	2	PASS
A1202 - Cluster Kitchen	0		PASS
A1202a - Bedroom	0	0	PASS
A1202b - Bedroom	0	1	PASS
A1202c - Bedroom	0	1	PASS
A1202d - Bedroom	0	1	PASS
A1202e - Bedroom	0	1	PASS
A1202f - Bedroom	0	0	PASS
A1203 - Cluster Kitchen	0		PASS
A1203a - Bedroom	0.5	3	PASS
A1203b - Bedroom	0.6	4	PASS
A1203c - Bedroom	0.6	4	PASS
A1203d - Bedroom	0.6	4	PASS
A1203e - Bedroom	0.6	3	PASS
A1203f - Bedroom	0.4	2	PASS