

Remington Road

**Overheating
Assessment**

April 2024

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CONTENTS

1	EXECUTIVE SUMMARY	4
2	INTRODUCTION	5
2.1	Background	5
2.2	Assessment Criteria	5
2.3	Weather Data and Climate Change	5
3	COOLING HIERARCHY	6
3.1	Active Cooling	6
4	GLA DOMESTIC OVERHEATING CHECKLIST	7
5	GOOD HOME ALLIANCE OVERHEATING RISK TOOL	8
6	OVERHEATING RISK GUIDANCE	10
6.1	Operative Temperature	10
6.2	CIBSE Guide A: 2015 and BS EN 15251:2007	10
6.3	Naturally Ventilated buildings	10
6.4	Testing by simulation	10
6.5	CIBSE TM59: 2017	11
6.6	Approved Document Part O – Dynamic thermal modelling	11
7	METHODOLOGY APPLIED	12
7.1	Dwellings	12
7.2	Basis for Model	12
7.3	Occupancy Patterns and Behaviour	12
7.4	Fabric	13
7.5	Windows Operation & Ventilation	13
8	RESULTS	16

1 EXECUTIVE SUMMARY

NRG Consulting have been commissioned to undertake an Overheating Assessment on a proposed development consisting of part 3, 5 and 6 storey apartment buildings (31 homes) and 1, 2 and 3 storey houses and maisonettes (15 homes) at Remington Road & Pulford Road London N15.

The following guidelines have been followed to assess the proposed development:

- CIBSE TM59: 2017 – Design methodology for the assessment of overheating risk in homes.
- Approved Document Part O of the Building Regulations – 2021 edition

These calculations have been performed based on the assumptions contained within the report with regard to lighting, occupancy, building operation, construction thermal properties and windows openings. The ventilation strategy for the building shall be primarily via natural ventilation. Although mechanical ventilation will be used, windows will still be openable for summer purge ventilation.

Based on the information and statement made within this report, we have constructed and simulated a dynamic thermal model of proposed occupied rooms for the residential development in order to comply with CIBSE TM59. Based on the results obtained, compliance has been achieved with these requirements.

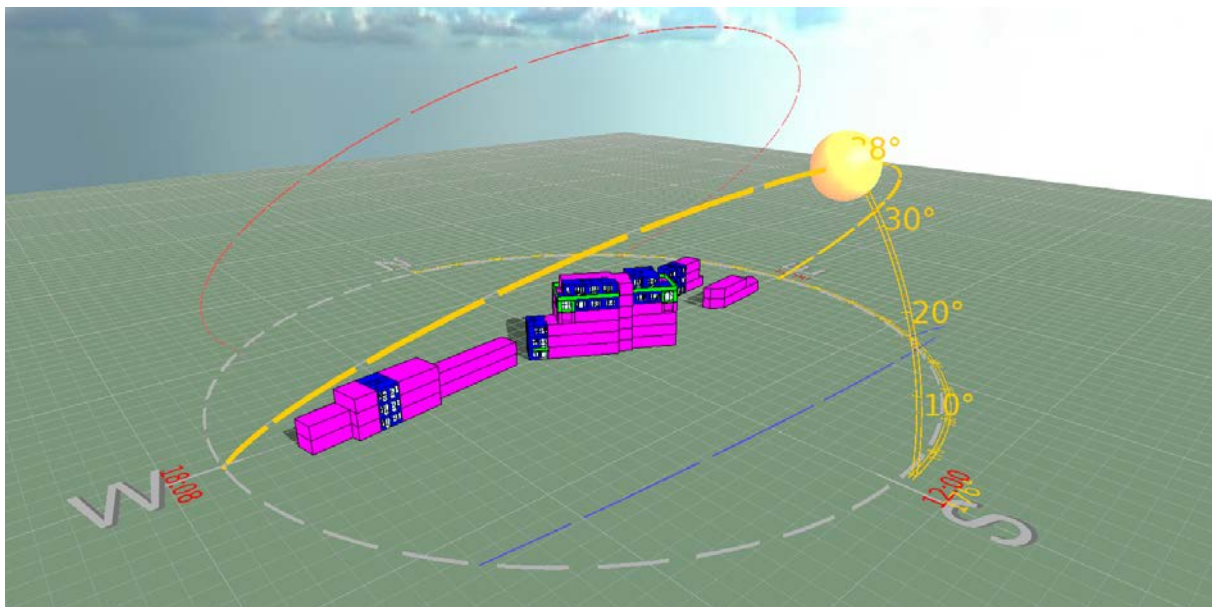


Figure 1: 3D model of proposed buildings.

2 INTRODUCTION

2.1 Background

CIBSE TM59 is a standardised approach to predicting overheating risk for residential building using dynamic thermal analysis. It 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.

The Approved Document Part O applies to new residential buildings only. It does not apply to work subject to a building notice, full plans application or initial notice submitted before that date, provided the work for each building is started before 15 June 2023. The Requirements of O1 Overheating mitigation are to (a) limit unwanted solar gains in summer; (b) provide an adequate means to remove heat from the indoor environment.

2.2 Assessment Criteria

The performance of the spaces has been assessed in accordance with the hierarchy noted in the London Plan Policy 5.9: Overheating and Cooling, the guidance published by the Chartered Institute of Building Services Engineers (CIBSE) guidance “Design Methodology for the Assessment of Overheating Risk in Homes CIBSE TM59: 2017.”

This report verifies compliance against the criteria set out by the following standards:

- **CIBSE Guide A:** Environmental Design - Overheating Criteria
- **CIBSE TM59:** Methodology for the Assessment of Overheating in Homes
- **CIBSE TM49:** Design Summer Years for London
- **ADO:** Approved Document Part O

This report shows the result of the analysis carried out under occupied hours for building which is ventilated through intermittent extract fans according with Approved Document Part F of Building regulations. All occupied rooms have been assessed using Dynamic Thermal Simulation, via IES Virtual Environment software. A completed GLA Domestic Overheating Checklist can be found on the following page of this report.

2.3 Weather Data and Climate Change

Simulations were carried out for DSY1 (Design Summer Year 1) High Emission, 50% percentile for 2020s. Weather data is for London Weather Central which provides the best currently available weather station to represent the building site.

3 COOLING HIERARCHY

In line with the latest GLA Energy Assessment Guidance (June 2022) and Policy 5.9 of the London Plan, the following measures under the cooling hierarchy are being proposed to improve internal comfort conditions during summer days and reduce the demand for cooling.

Cooling Hierarchy	Measures Undertaken
Reducing the amount of heat entering the building in summer	- Carefully designed shading measures have been considered, including: - Specification of internal blinds - Improved g-values
Minimising internal heat generation through energy efficient design	- The Mechanical design for the scheme has minimised heating flow and return pipework and domestic hot water pipe work. - Any Communal Pipework has been insulated beyond standard compliance figures as stated in the Non-Domestic Building Services Guide.
Manage the heat within the building through exposed internal thermal mass and high ceilings	- Level of exposed thermal mass has been maximised where possible, but it must be noted that in high buildings the internal partitions are built to minimize its weight so increasing thermal mass of internal partitions is not feasible for this scheme - The Floor to Ceiling Height has been dictated by the Planning Approved scheme but complies with statutory requirements.
Provide Passive Ventilation	Openable Windows
Mechanical ventilation	MVHR is being proposed. The MVHR unit will have a Summer Bypass mode to make use of 'free cooling' (when the outside air temperature is below that in the building during summer months).

Table 1: Cooling Hierarchy

3.1 Active Cooling

There is no active cooling proposed for the development.

4 GLA DOMESTIC OVERHEATING CHECKLIST

Section 1 - Site feature affecting vulnerability to overheating		Yes or No
Site location	Urban – within central London or in a high-density conurbation	Yes
	Peri-urban – in the suburban fringes of London	No
Air quality and /or noise sensitivity – are any of the following in the vicinity of buildings?	Busy roads / A roads	No
	Railways / Overground / DLR	Yes
	Airport / Flight path	Yes
	Industrial uses / waste facility	No
Proposed building use	Will any buildings be occupied by vulnerable people (e.g. elderly, disabled, young children)?	Yes
	Are residents likely to be at home during the day (e.g. students)?	Yes
Dwelling aspect	Are there any single aspect units?	Yes
Glazing ratio	Is the glazing ratio (glazing: internal floor area) greater than 25%?	No
	If yes, is this to allow acceptable levels of daylighting?	N/A
Security - Are there any security issues that could limit opening of windows for ventilation?	Single storey ground floor units	Yes
	Vulnerable areas identified by the Police Architectural Liaison Officer	No
	Other	No

Table 2: GLA Domestic Overheating Checklist – Section 1

Section 2 – Design features implemented to mitigate overhang risk		Please respond
Landscaping	Will deciduous trees be provided for summer shading (to windows and pedestrian routes)?	Yes
	Will green roofs be provided?	Yes
	Will other green or blue infrastructure be provided around buildings for evaporative cooling?	No
Materials	Have high albedo (light colour) materials been specified?	Yes
Dwelling aspect	% of total units that are single aspect	38%
	% single aspect with N / NE / NW orientation	N/A
	% single aspect with E orientation	N/A
	% single aspect with S / SE / SW orientation	100%
	% single aspect with W orientation	N/A
Glazing ratio - What is the glazing ratio (glazing: internal floor area) on each facade?	N / NE / NW	5.8
	E	0
	S / SE / SW	16.5
	W	0
Daylighting	What is the average daylight factor range?	>1.5
Window opening	Are windows openable?	Yes
	What is the average percentage of openable area for the windows?	100%
Window opening – What is the extent of the opening?	Fully openable	Yes
	Limited (e.g. for security, safety, wind loading reasons)	No
Security	Where there are security issues (e.g. ground floor flats) has an alternative night time natural ventilation method been provided (e.g. ventilation grates)?	N/A
Shading	Is there any external shading?	No
	Is there any internal shading?	Yes

Glazing specification	Is there any solar control glazing?	Yes
Ventilation - What is the ventilation strategy?	Natural – background	No
	Natural – purge	Yes
	Mechanical – background (e.g. MVHR)	Yes
	Mechanical – purge	No
	What is the average design air change rate	
Heating system	Is communal heating present?	Yes
	What is the flow/return temperature?	80/60
	Have horizontal pipe runs been minimised?	Yes
	Do the specifications include insulation levels in line with the London Heat Network Manual	Yes

Table 3: GLA Domestic Overheating Checklist – Section 2

5 GOOD HOME ALLIANCE OVERHEATING RISK TOOL

KEY FACTORS INCREASING THE LIKELIHOOD OF OVERHEATING			KEY FACTORS REDUCING THE LIKELIHOOD OF OVERHEATING	
Geographical and local context				
#1 Where is the scheme in the UK?	South East	4	#8 Do the site surrounding feature significant blue/green infrastructure?	4
	Northern England, Scotland & NI	0		
	Rest of England and Wales	2		
#2 Is the site likely to see an Urban Heat Island effect?	Central London	3		
	Grtr London, Manchester, B'ham	2		
	Other cities, towns & dense sub-urban areas	1		
Site characteristics				
#3 Does the site have barriers to windows opening?	Day – reasons to keep all windows closed	8	#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green?	1
	Day – barriers some of the time, or for some windows e.g. on quiet side	4	#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas?	1
	Night – reasons to keep all windows closed	8		
	Night – bedroom windows OK to open but other windows are likely to stay closed	4		
Scheme characteristics and dwelling design				

#4 Are the dwelling flats?	3	#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation?	1																				
#5 Does the scheme have community heating?	3	#12 Do floor-to ceiling heights allow ceiling fans, now or in the future?	<table border="1"> <tr> <td>>2.8m and fan installed</td> <td>2</td> </tr> <tr> <td>>2.8m</td> <td>1</td> </tr> </table>	>2.8m and fan installed	2	>2.8m	1																
>2.8m and fan installed	2																						
>2.8m	1																						
Solar heat gains and ventilation																							
#6 What is the estimated average glazing ratio for the dwellings? Do floor-to ceiling heights allow ceiling fans, now or in the future?	<table border="1"> <tr> <td>>65%</td> <td>12</td> </tr> <tr> <td>>50%</td> <td>7</td> </tr> <tr> <td><35%</td> <td>4</td> </tr> </table>	>65%	12	>50%	7	<35%	4	#13 Is there useful external shading?	<table border="1"> <tr> <td></td> <td>Full</td> <td>Part</td> </tr> <tr> <td>>65%</td> <td>6</td> <td>3</td> </tr> <tr> <td>>50%</td> <td>4</td> <td>2</td> </tr> <tr> <td>>35%</td> <td>2</td> <td>1</td> </tr> </table>		Full	Part	>65%	6	3	>50%	4	2	>35%	2	1		
>65%	12																						
>50%	7																						
<35%	4																						
	Full	Part																					
>65%	6	3																					
>50%	4	2																					
>35%	2	1																					
#7 Are the dwellings single aspect?	<table border="1"> <tr> <td>Single aspect</td> <td>3</td> </tr> <tr> <td>Dual aspect</td> <td>0</td> </tr> </table>	Single aspect	3	Dual aspect	0	#14 Do windows & openings support effective ventilation?	<table border="1"> <tr> <td></td> <td colspan="3">Openings compared to Part F purge rates</td> </tr> <tr> <td></td> <td>= Part F</td> <td>+50%</td> <td>+100%</td> </tr> <tr> <td>Single aspect</td> <td>Minimum required</td> <td>3</td> <td>4</td> </tr> <tr> <td>Dual aspect</td> <td></td> <td>2</td> <td>3</td> </tr> </table>		Openings compared to Part F purge rates				= Part F	+50%	+100%	Single aspect	Minimum required	3	4	Dual aspect		2	3
Single aspect	3																						
Dual aspect	0																						
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	= Part F	+50%	+100%																				
Single aspect	Minimum required	3	4																				
Dual aspect		2	3																				

6 OVERHEATING RISK GUIDANCE

6.1 Operative Temperature

The principal metric for thermal comfort is specified based on operative temperature (t_o), which is an expression of the temperature you experience or feel. The operative temperature can be expressed as a function of air temperature (t_a), radiant temperature (t_r) and air speed (v) and CIBSE suggests the following formula (CIBSE 2015).

$$t_o = \frac{t_a \sqrt{(10v)} + t_r}{1 + \sqrt{(10v)}}$$

6.2 CIBSE Guide A: 2015 and BS EN 15251:2007

For free-running naturally ventilated buildings, BS EN 15251:2007 [Indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics (BSI, 2007)] specifies indoor environmental parameters which have an impact on the energy performance of buildings. The CIBSE Guide A (2015) recommendations for testing for the presence or likelihood of overheating follows the methodology and recommendations of BS EN 15251 (2007).

The method used in the BS to define overheating in buildings sets acceptable temperature ranges for naturally ventilated buildings based on the sensitivity of occupants and their comfort expectation.

Expectation levels are set out in the following categories:

- Category I: High level of expectation (only used for spaces occupied by very sensitive and fragile persons).
- Category II: Normal expectation (for new buildings and renovations).
- Category III: Moderate expectation (used for existing buildings).

This report assesses the proposed development against Category II criteria.

6.3 Naturally Ventilated buildings

For naturally ventilated buildings the designer should aim for an indoor operative temperature close to that calculated from the running mean of the outdoor temperature, in accordance with the following equation:

$$t_{com} = 0.33 t_{rm} + 18.8$$

Where t_{com} is the comfort operative temperature and t_{rm} is the running mean outdoor air temperature. The upper limit conditions for avoiding overheating, t_{max} , in a Category II expectation level is represented by the following formula:

$$t_{max} = t_{com} + 3$$

CIBSE TM59 sets two criteria by which a building can be classed as overheating. It should be noted that, according to BS EN 15251, it is possible to increase comfort temperature upper limits if the operative temperature is higher than 25 °C and internal air speed is higher than 0.1 m/s, by the use of personal fans for example.

6.4 Testing by simulation

Where dynamic thermal modelling is used to assess overheating risk, realistic algorithms for occupant behaviour, the use of windows, boosted operation of continually running ventilation systems, and other adaptive behaviour should be used, and a realistic occupancy schedule is necessary.

6.5 CIBSE TM59: 2017

The TM59: 2017 is a design methodology for the assessment of overheating risk in homes, published by the Chartered Institution of Building Services Engineers (CIBSE), in April 2017. This is a standardised approach to predict overheating risk for residential building designs using a dynamic thermal analysis. It provides a baseline which includes specific weather files, defined internal gains and a set of profiles that represent reasonable usage patterns for a home suitable for evaluating overheating risk. In addition, defined thresholds to provide a pass / fail result are clearly provided as written in the results section on Page 15.

Test	Assessment Criterion	Acceptable Criterion	Investigated Period	Weather File
Criterion a	The frequency of the time when operative temperature is higher than maximum acceptable temperature	3% of occupied hours	May-September	DSY1, 2020s, High Emission, 50% percentile scenario
Criterion b	Number of hours where temperature is above required	32 hours between 22:00 and 7:00	May-September	

Table 4: Assessment criteria for naturally ventilated buildings

6.6 Approved Document Part O – Dynamic thermal modelling

To demonstrate compliance using the dynamic thermal modelling method, all of the following guidance should be followed.

- CIBSE's TM59 methodology for predicting overheating risk.
- The limits on the use of CIBSE's TM59 methodology set out in paragraphs 2.5 and 2.6. of ADO
- The acceptable strategies for reducing overheating risk in paragraphs 2.7 to 2.11 of ADO.

7 METHODOLOGY APPLIED

The TM59 methodology provides a baseline and guidance for a domestic overheating risk assessment. In line with this methodology, this section includes the model inputs used to assess overheating risks to the proposed representative sample dwellings on the proposed development.

7.1 Dwellings

Ten sample dwellings are included within the overheating analysis.

7.2 Basis for Model

The following methodology was applied to the Overheating Analysis to the occupied spaces of the proposed development.

A 3D model was carried out with the entire relevant envelope, including U-values, façade specifications, internal heat gains, occupancy hours and opening details. A series of simulations were then run using Dynamic Thermal Simulation software: IES VE, including the specialist modules SunCast and MacroFlow. The geometry was modelled based on the planning drawings dated May 2022 from Delta Architects.

Dynamic Thermal Modelling (DTM) software tracks the thermal state of the building on an hourly basis using real weather data, resulting in a detailed picture of the building's performance.

DTM combines several mechanisms to calculate the building response:

- Conduction
- Convection
- Long wave radiation
- Short wave radiation – absorbed, reflected and transmitted
- Internal conditions – gains from lights, equipment and occupants along with plant operating hours and natural infiltration rates
- Ventilation and air movement from internal natural convection.

The accredited software IES Virtual Environment version 2017 was used for this assessment. This software tool is fully compliant with the CIBSE Applications Manual 11: Building Energy and Environment Modelling.

7.3 Occupancy Patterns and Behaviour

In line with CIBSE guidance, realistic algorithms for occupant behaviour, the use of windows and other adaptive behaviour were used in the dynamic thermal model, as well as a realistic occupancy schedule. Internal heat gains are based on 'Table 2 Occupancy and equipment gain description' content in CIBSE TM59 (Appendix 1) and on the table below.

Room	People Heat Gain w/person		Light Heat Gain W/m2	Other Small Power W/m2
	Sensible	Latent		
Kitchen/Living Room	75	55	2	450
Bedroom	75	55	2	80

Table 5: Heat Gain Figures – Flats – Modelling & Data Inputs

7.4 Fabric

The proposed design incorporates several passive design measures, to reduce the energy demand and associated CO2 emissions of the development to comply with Building Regulations Part L1a criteria. Note that these measures are primarily focussed on the control of heat loss.

Element	Proposed U-value W/m ² K	G-Value (%)
Ground/Exposed Floor – Houses	0.12	-
Ground/Exposed Floor – Flats	0.13	-
External Wall – Houses	0.19	-
External Wall – Flats	0.23	-
Roof – Houses	0.14	-
Roof – Flats	0.18	-
Windows	1.46	0.44

Table 6: Building Envelope Specification – Modelling & Data Inputs

7.5 Windows Operation & Ventilation

Windows are assumed to be opened during occupied hours when internal temperature is 22°C or more. Internal doors are assumed always open to improve cross ventilation. Windows Openable Area and Maximum Angle Open are assumed as per the table below.

Window Type	Openable Area	Maximum Angle Open	Internal Shading
Fixed	-	-	Blinds Metal Venetian SC 0.0
Side Hung – Glazed door	100%	90°	
Side Hung	100%	15°	
Side Hung A4.01 bedroom 3	100%	20°	

Table 7: Building Window Specification – Modelling & Data Inputs

Room	Flow rate
Kitchen	13 l/s
Bathroom	8 l/s
Bedroom	1.5 ACH
Living room	8 l/s
Infiltration	
3 m ³ /(h·m ²)	

Table 8: Ventilation Specification – Modelling & Data Inputs

Based on the Blind and Window combination, the overall G-Value for the scheme is below 0.36.

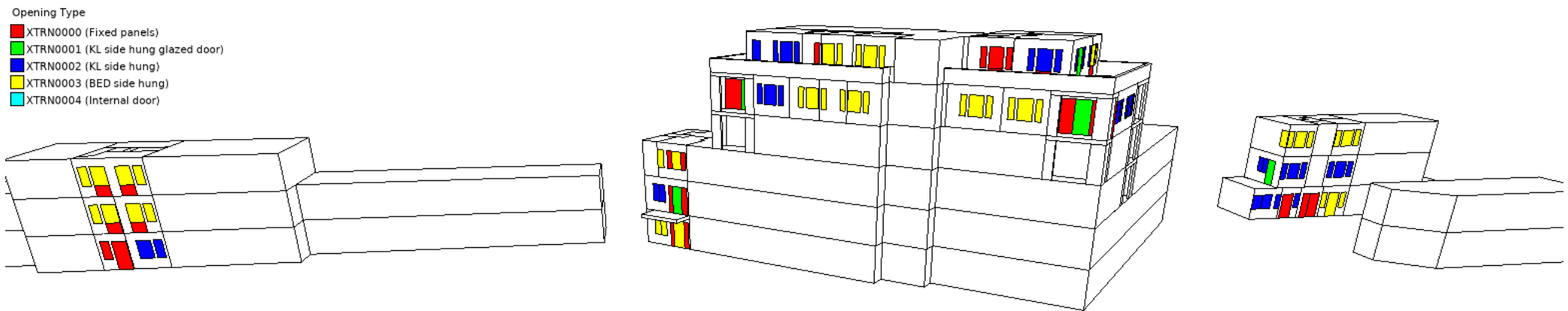


Figure 2: 3D view of the building – Opening types

8 RESULTS

The table below shows the results based on the current design proposals (as outlined in Section 5) for homes that are predominantly naturally ventilated. Compliance for kitchens and living rooms is based on passing Criterion A, bedrooms must pass both criteria.

Room:	CIBSE TM 59 – Predominantly Naturally Ventilated Homes Weather file: London_LWC_DSY1_2020High50.epw		
	Criterion A (%Hrs Top-Tmax>=1K) Pass with value < 3	Criterion B – Bedrooms only (Hrs Top>26 °C) Pass with value < 33	PASS
A2.03 bedroom	0.7	28	Y
A2.03 kitchen/living room	1.2		Y
A4.01 bedroom 1	0.5	32	Y
A4.01 bedroom 2	0.5	25	Y
A4.01 bedroom 3	0.5	30	Y
A4.01 kitchen/living room	1.3		Y
A4.02 bedroom 1	0.6	23	Y
A4.02 bedroom 2	0.7	24	Y
A4.02 kitchen/living room	1.3		Y
A5.01 bedroom 1	0.7	21	Y
A5.01 bedroom 2	0.7	23	Y
A5.01 kitchen/living room	1.4		Y
A5.02 bedroom 1	0.7	29	Y
A5.02 bedroom 2	0.7	22	Y
A5.02 kitchen/living room	1.4		Y
C0.01 bedroom	0.7	30	Y
C0.01 kitchen/living room	1.2		Y
C1.01 bedroom 1	0.7	25	Y
C1.01 bedroom 2	0.7	23	Y
C1.01 kitchen/living room	1.4		Y
E1.0.01 bedroom	0.7	13	Y
E1.0.01 kitchen/living room	1.3		Y
E1.0.03 bedroom 1	0.7	14	Y
E1.0.03 bedroom 2	0.7	20	Y
E1.0.03 bedroom 3	0.7	30	Y
E1.0.03 kitchen	1.3		Y
E1.0.03 living	1.5		Y

W.0.03 bedroom 1	0.7	23	Y
W.0.03 bedroom 2	0.7	17	Y
W.0.03 bedroom 3	0.7	23	Y
W.0.03 bedroom 4	0.7	19	Y
W.0.03 kitchen	1.2		Y
W.0.03 living room	1.3		Y

Table 9: CIBSE TM59 Overheating Results for 2020s

Based on the specification within this report, all units pass TM59 and comply with the requirements of the Planning Condition.

