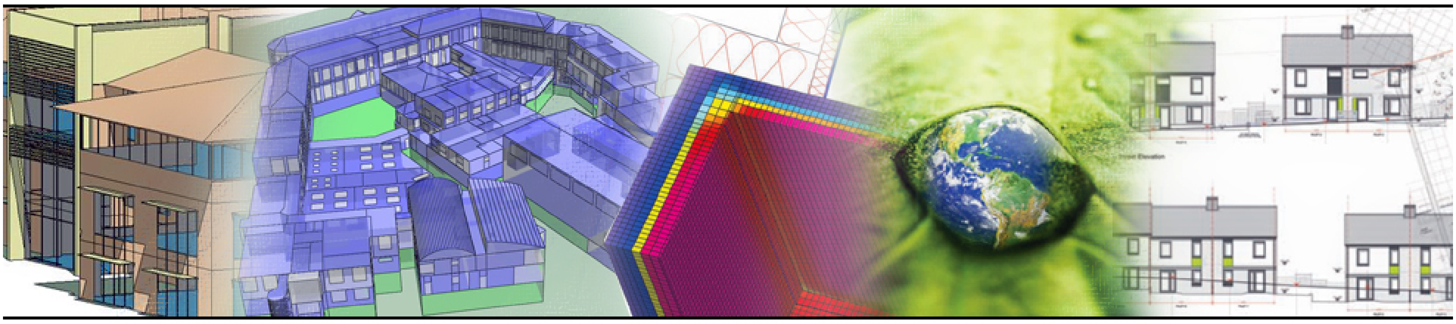

Thermal Comfort Report

Nestle Canteen - Block H, Hayes, London

Stroma Reference: 11-17-66064 TC3
Date: 27/05/2022
Prepared for: Barratt London

1. Executive Summary

Stroma Built Environment Ltd has been commissioned by Barrett London to undertake a TM59 analysis for the proposed New residential building at Nestle Canteen. The assessment was carried out in accordance with CIBSE AM11 – *Building Energy and Environmental Modelling* utilising software by Integrated Environmental Solutions (IES). The Apache module in IES provides a full dynamic thermal analysis and hourly output data for assessment against the relevant thermal comfort criteria. The assessment has been carried out by a trained and accredited energy assessor (Richard de Fleury STRO006005).

Simulation results have been reported with respect to the recommended limits stipulated within CIBSE TM59.

Simulations have been carried out against the 2020 DSY1, DSY2 & DSY3 High50 weather files.

This assessment has found that all the bedrooms and communal corridors have achieved compliance with TM59 but a small number of living rooms have just failed, by at worst 0.7%, against the required DSY1 weather file. It should be noted that the noncompliance demonstrates a slightly higher risk of overheating in these rooms when compared to a compliant space.

These fails are primarily due to excessive solar gain, particularly on the top floor where there is no balcony above the windows offering shade. It is recommended that this be looked at in more detail during the design process.

Software version:	**IES VE - V2021**
Weather file:	**London - Heathrow (LHR)**
Building conditioning strategy:	**Natural ventilation / free running**

Results are expressed against the Time out of Range (TOR) metric for each applicable and occupied building area.

Contents

2. Quality Management

Prepared by		Checked by
Richard de Fleury BEng (hons) MSc		Jonathan Teale BSc (hons)
Principal Sustainability Consultant		Sustainability Consultant
Date: 27/05/2022		**Date:** 27/05/2022
File reference:	11-17-66064 TC3	

Version	Status	Date	Change Summary
TC1	First Issue	09/05/22	-
TC2	Second Issue	09/05/22	Fig 1 updated
TC3	Third Issue	27/05/22	Comments incorporated

3. Development Overview

The development is located in Hayes Village, London on the former Nestle Canteen site and comprises of a new residential block of single bed apartments with a commercial shell space on the ground floor and a separate commercial building. The new block H is located to the northern end of the site.

The residential building consists of 6 floors and is assumed to be a concrete frame build up offering minimal access to thermal mass.

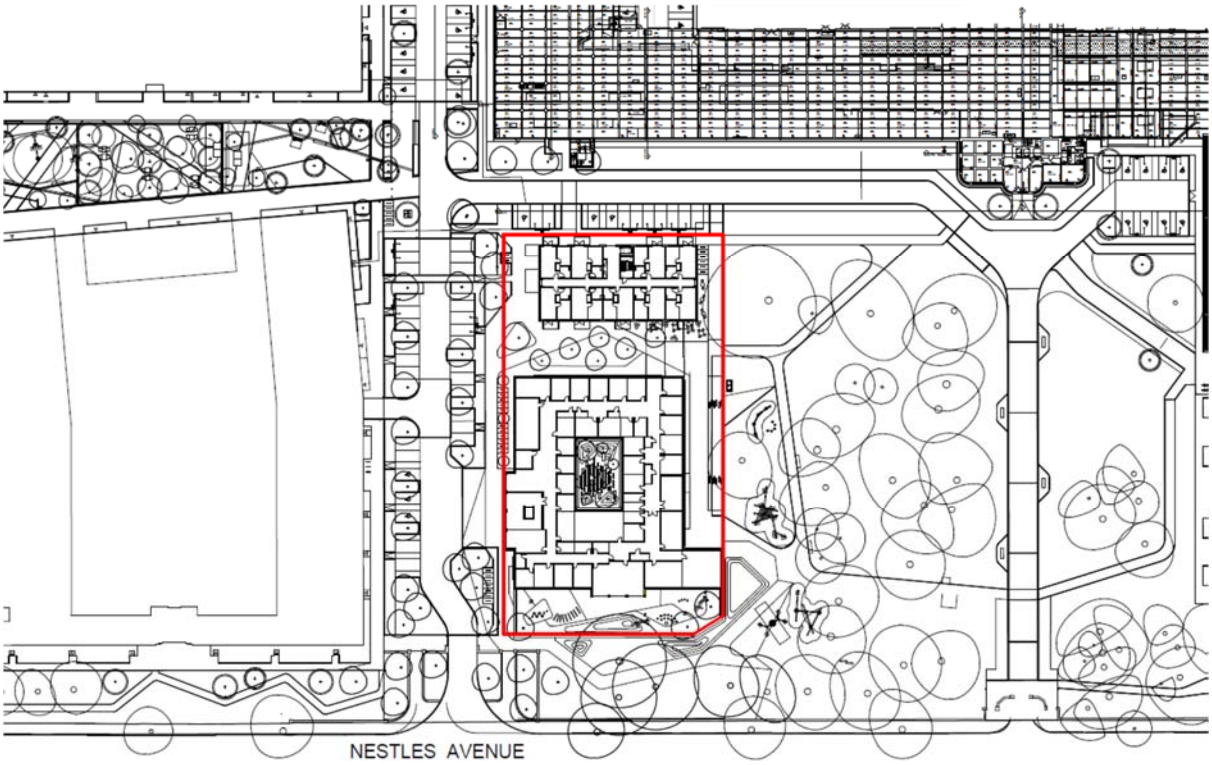

Figure 1. **Development site**

4. Comfort Criteria

4.1. Overheating Risk in Homes – CIBSE TM59: 2017

CIBSE TM59[1]: 2017 provides a methodology and criteria for assessing residential spaces for overheating risk. The criteria are broken down into 2 categories; homes predominantly naturally ventilated and homes predominantly mechanically ventilated. Which category is used depends on the level of opening windows utilised.

Homes classed as predominantly naturally ventilated

For homes classed as predominantly naturally ventilated an adaptive methodology based on TM52 is followed. This consists of 2 Criteria. The first is the same Criteria 1 from TM52 and the second is based on a percentage of hours the operative temperature is over a stipulated limit as detailed below. This assessment approach accounts for adaptive human behaviour; whereby the requirements for thermal comfort are defined as a function of previous environmental conditions.

In order to demonstrate compliance, all Living Rooms, Kitchens and Bedrooms must comply with Criteria 1 and all bedrooms must also comply with Criteria 2.

Predicted operative temperatures are determined through Dynamic Simulation Modelling (DSM) for a full year using the relevant CIBSE Design Summer Year (UKCP09 DSY1) weather file for 2020s, high emissions, 50% percentile scenario. DSY2 and DSY3 results may also be given for information but it is not a requirement to pass these criteria to comply with TM59.

The compliance criteria are defined as follows:

a) **Criteria 1 - Hours of exceedance (He)**
For living rooms, kitchens and bedrooms: the number of hours during which DT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 percent of occupied hours. (CIBSE TM52 Criterion 1:Hours of exceedance - The number of hours (He) that ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3%.)

b) **Criteria 2 – number of annual hours operative temperature exceeded 26°C**
For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26°C will be recorded as a fail).

ΔT is defined as the operative temperature less the maximum acceptable temperature (rounded to the nearest whole degree). The maximum acceptable temperature is a function of the running mean temperature and the building category.

Homes classed as predominantly mechanically ventilated

For homes classed as predominantly mechanically ventilated a more simplified criteria is applied based on CIBSE Guide A (2015a)[2].

a) **Criteria 1 – number of annual hours operative temperature exceeded 26°C**
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)).

[1] CIBSE TM59: April 2017 – Design methodology for the assessment of overheating risk in home
[2] CIBSE Guide A (2015a) – Environmental Design

4.2. Overheating Risk in Communal Corridors – CIBSE TM59: 2017

CIBSE TM59[3]: 2017 provides a methodology and suggested criteria for assessing residential communal corridors for overheating risk.

Predicted operative temperatures are determined through Dynamic Simulation Modelling (DSM) for a full year using the relevant CIBSE Design Summer Year (UKCP09 DSY1) weather file for 2020s, high emissions, 50% percentile scenario. DSY2 and DSY3 results may also be given for information but it is not a requirement to pass these criteria to comply with TM59.

The suggested criteria which, is not mandatory, is as follows:

a) **Criteria 1 – number of hours operative temperature exceeded 28°C**
Whilst there is no mandatory target to meet, if an operative temperature of 28°C is exceeded for more than 3% of the total annual hours, then this should be identified as a significant risk within the report.

[3] CIBSE TM59: April 2017 – Design methodology for the assessment of overheating risk in home

4.3. TM49 Weather Data

This assessment has utilised the TM49[4] weather data which is specific to London assessments and is a requirement of the Greater London Authority (GLA). TM49 has considered suitability of available weather data and has created new data for use in the London area which is designed to simulate the urban heat island effect under three different levels of severity:

- DSY1: a moderately warm summer
- DSY2: a year with a very intense single warm spell
- DSY3: a year with a prolonged period of sustained warmth.

The urban heat island effect is accounted for by the use of three different locations which represent urban, suburban and rural locations:

- Urban - London Weather Centre (LWC) – areas within the London Central Activity Zone (CAZ)
- Suburban – London Heathrow (LHW) – urban and suburban areas outside the CAZ
- Rural – London Gatwick (GTW) – peri-urban and rural areas around London

To meet compliance it is necessary to pass only DSY1 while DSY2 and DSY3 are provided for information to the design team about how the design will perform in more extreme conditions.

For TM59 assessments the current DSY files are replaced with the 2020s, high emissions, 50% percentile scenario as prescribed in TM59 and it is only necessary to comply with DSY1. DSY2 and DSY3 for the same scenario are provided for information to the design team about how the design will perform in more extreme conditions.

This assessment has utilised the following weather data:

- Suburban – London Heathrow (LHW)

[4] TM49: May 2014 - Design Summer Years for London

5. Thermal Model

A thermal model has been produced within IES software from the architectural drawings provided and specification outlined within Section 4 of this report. A dynamic simulation has been carried out for the required duration against the CIBSE DSY1 2020 weather file for London Heathrow. For this assessment a representative sample of 3 floors has been assessed. These are the 1st 3rd and 5th. There are no ground floor apartments.

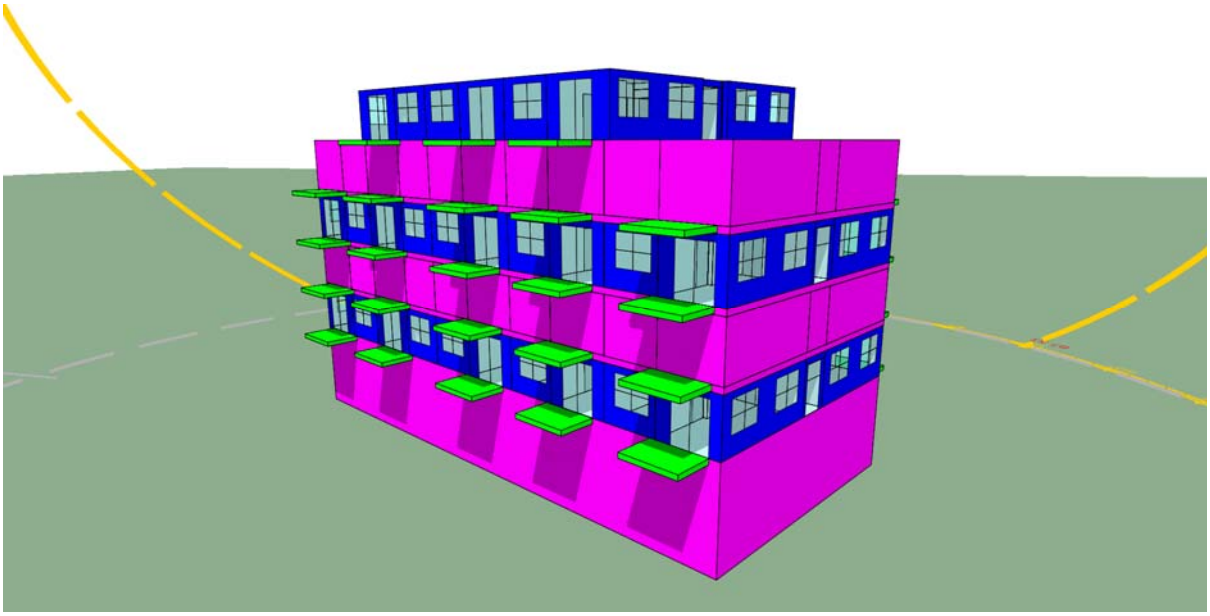

Figure 1. IES thermal model

6. Building Specification

6.1. Thermal Envelope

The following construction information has modelled.

Opaque element	Construction (type and insulation)	U-value (W/m².K)	Thermal Mass Cm (kJ/(m².K)	Assumption
Exposed Wall	Cladding, cavity, insulation, cement board, cavity, plasterboard	0.18	39.95	☐
Party Walls to flats and corridors	Plasterboard, cavity, block, cavity, plasterboard	0.18	39.95	☐
Partition Walls within flats	Plasterboard, insulation, plasterboard	N/A	40.00	☐
Internal floor	Carpet, timber floor, floor void, concrete, c/void, plasterboard	N/A	14.00 below/ 55.60 above	☐
Roof	Insulation, membrane, concrete, c/void, plasterboard	0.12	8.75	☐

Table 1. Opaque building elements

Translucent element	Construction type	Overall U-value (W/m².K)	Solar g-value	Light trans.	Assumption
Windows	Double Glazed	1.40	0.35	0.70	☐

Table 2. Transparent building elements

Air permeability ($m^3/h.m^2$ @ 50 Pa)	Assumption
0.15ACH^{-1}	☐

Table 3. Air infiltration

6.2. Servicing Strategy

The following M&E information has been modelled. Details have only been tabulated for occupied areas, relevant to this thermal comfort assessment.

6.2.1. Space Heating

Heating has been turned off for the overheating simulation.

6.2.2. Space Cooling

No active cooling included in the design.

6.2.3. Mechanical Ventilation

Building Zones/Area Type	Ventilation strategy	Flow Rate	Profile
Bedrooms / living / kitchen / dining	Central supply and extract	0.3l/s/m² external air (assumed summer bypass in operation	On continuously

Table 1. **Summary of mechanical ventilation strategy**

6.2.4.Natural Ventilation

Reference	**Building Zones/Area Type**	**Ventilator Type**	**Openable area (% Gross)**	**Max. Open Angle (°)**	**Equivalent Orifice Area (% of Gross)**	**Operating Conditions**
XTRN001	Balcony Doors Living Areas	Window/door - side hung	95	90	98.065	22°C - 09:00-22:00
XTRN008	Top Hung windows-Bedroom small	Window - top hung	90	30	62.419	22°C – 24/7
XTRN009	Top Hung windows-Living small	Window - top hung	90	35	67.742	22°C - 09:00-22:00
XTRN010	Top Hung windows-corridor small	Window - top hung	90	30	62.419	22°C – 24/7
XTRN006	Internal doors*	Window/door - side hung	90	90	92.903	18°C - 09:00-22:00

Table 2. **Summary of natural ventilation strategy**

**** Note internal doors only included between bedroom and living room***

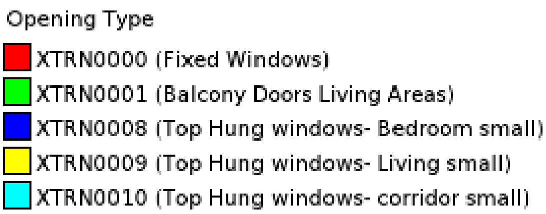

Figure 2.Window opening legend

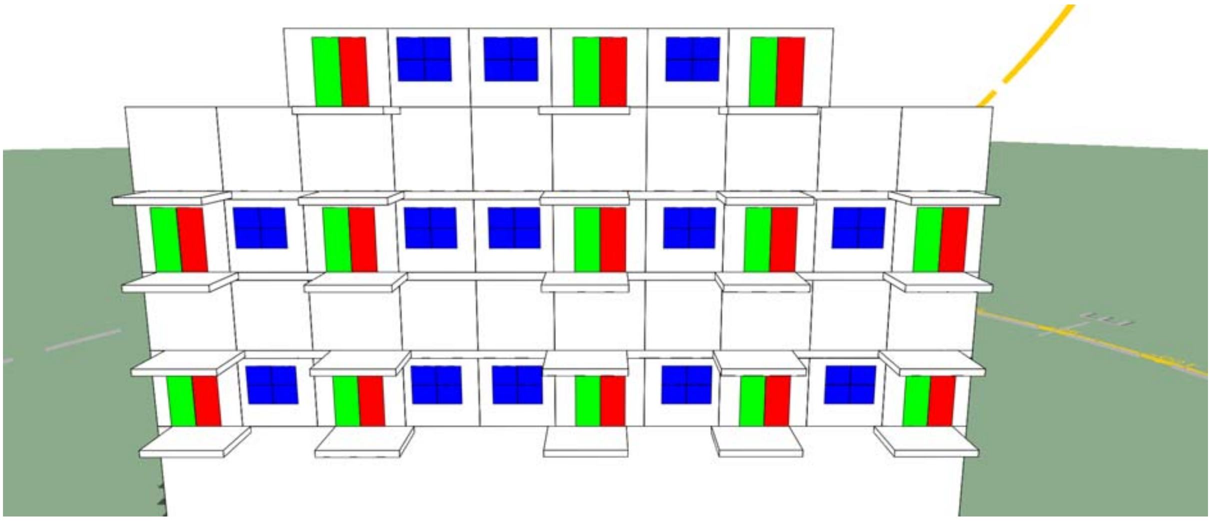

Figure 3.Southern Façade window openings

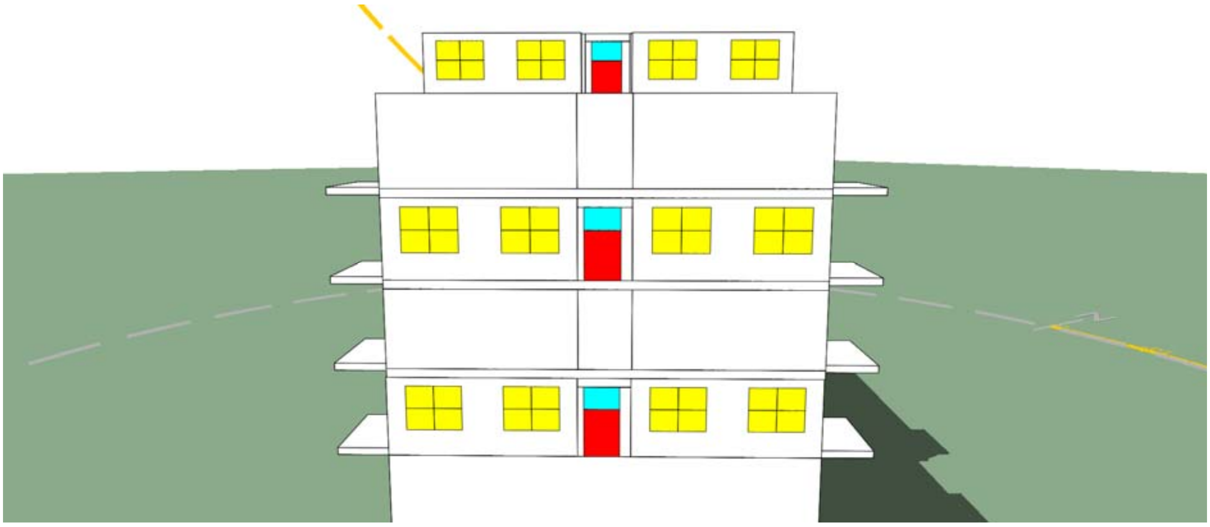

Figure 4.Eastern Façade window openings

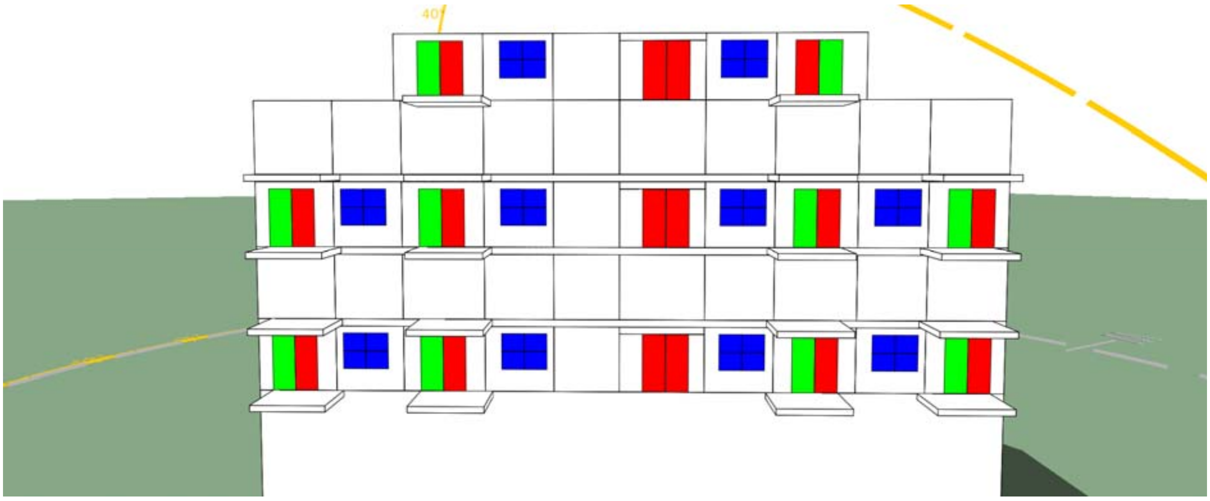

Figure 5.Northern Façade window openings

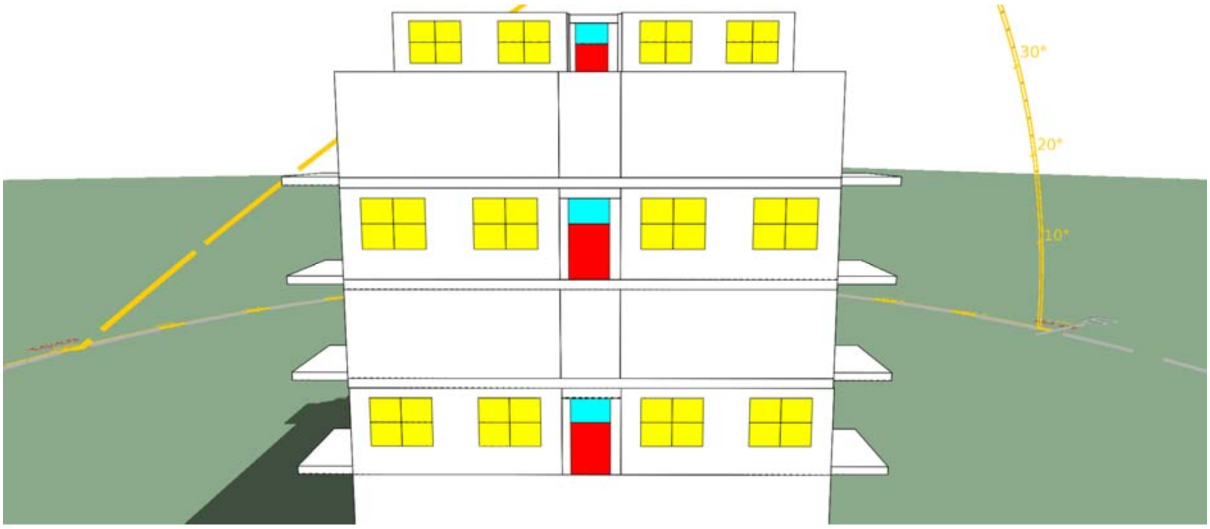

Figure 6.Western Façade window openings

6.3. Blinds

A limited number of internal blinds have been included in the assessment in the living rooms on the southern façade only. These have only been included on the none opening pane of glass so it cannot interfere with the window opening as shown below. A venetian type blind with a Shading Coefficient of 0.61 and a Short Wave Radiant Fraction of 0.3 has been modelled. This starts to close when the direct normal solar flux on the window is 225W/m² and is fully closed at 275W/m².

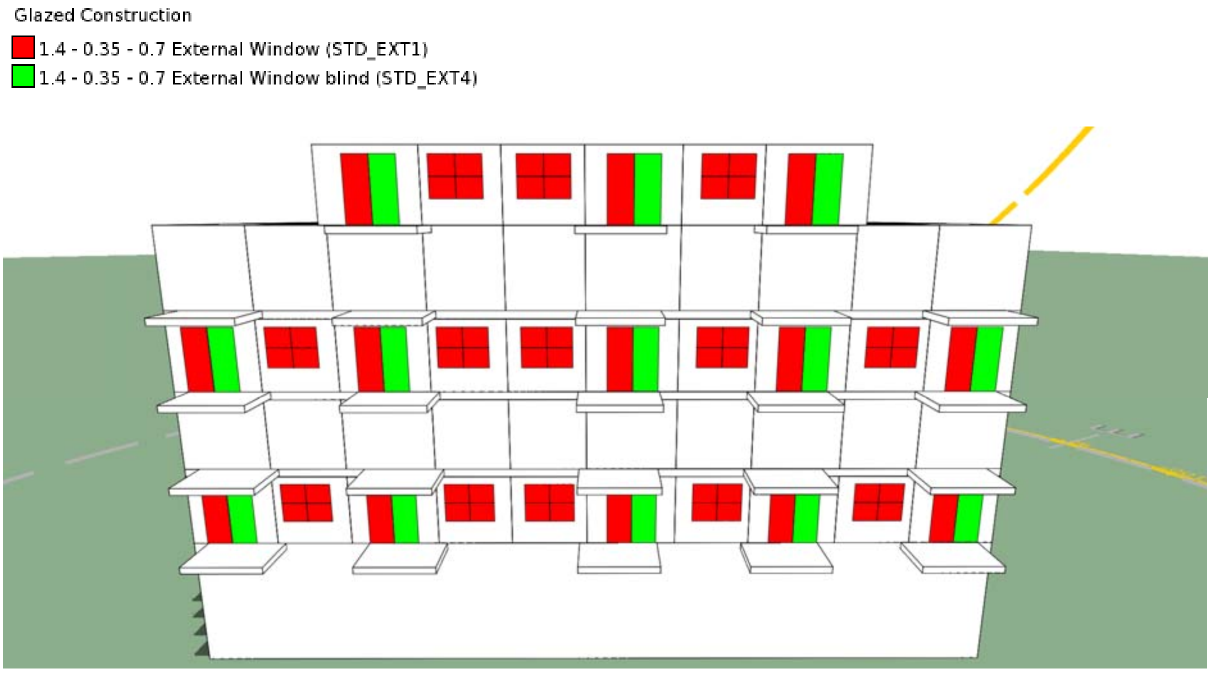

Figure 7.Southern façade showing windows with blinds modelled

6.4. Internal Heat Gains

6.4.1. TM59 Occupancy & Equipment

Refer to Appendix A For details of the occupancy and equipment gains. The values are stipulated in TM59 and have been applied as applicable to the thermal model.

6.4.2. TM59 Lighting

TM59 stipulates that the lighting should be applied to the model for new build projects as follows:

- All spaces should have 2 W/m² from 18:00 to 23:00. This assumes that good daylight levels are available.

- Communal corridors should have 2 W/m² but this can be assumed to be zero if passive infrared (PIR) sensors are present. It has been assumed that PIR sensors will be present

6.4.3. TM59 Pipe gains & HIUs

Pipe gains have been included in the ceiling void of the communal corridors and risers as follows:

- Corridor C/void – 500W
- Riser – 50W

Withing the flats it has been assumed that a Heat Interface Unit (HIU) will be included in the cupboard with a 75W heat gain on continuously.

7. Results

7.1. Time out of Range (TOR)

7.1.1.Apartments TM59 - DSY1 2020High50

Room Name	**TM59 - Criteria 1**	**TM59 - Criteria 2**		**TM59 Pass / Fail**
	Criteria 1 (%Hrs Top-Tmax>=1K)	Annual hours between 22:00 and 07:00 >26°C	% of annual hours between 22:00 and 07:00 >26°C	
Bedroom 101	0	22	0.7%	Pass
Living/ Dining 101	0.4	-	-	Pass
Bedroom 102	0.4	25	0.8%	Pass
Living/ Dining 102	2.2	-	-	Pass
Bedroom 103	0.8	27	0.8%	Pass
Living/ Dining 103	2.7	-	-	Pass
Bedroom 104	0.4	26	0.8%	Pass
Living/ Dining 104	0.6	-	-	Pass
Bedroom 105	0.4	26	0.8%	Pass
Living/ Dining 105	0.6	-	-	Pass
Bedroom 106	0.4	25	0.8%	Pass
Living/ Dining 106	0.7	-	-	Pass
Bedroom 107	0.8	26	0.8%	Pass
Bedroom 108	0.4	25	0.8%	Pass
Living/ Dining 108	2.5	-	-	Pass
Bedroom 109	0.1	23	0.7%	Pass
Living/ Dining 109	0.4	-	-	Pass
Bedroom 301	0	22	0.7%	Pass
Living/ Dining 301	0.4	-	-	Pass
Bedroom 302	0.4	25	0.8%	Pass
Living/ Dining 302	2.2	-	-	Pass
Bedroom 303	0.8	27	0.8%	Pass
Living/ Dining 303	2.7	-	-	Pass
Bedroom 304	0.4	26	0.8%	Pass
Living/ Dining 304	0.6	-	-	Pass
Bedroom 305	0.4	25	0.8%	Pass
Living/ Dining 305	0.6	-	-	Pass
Bedroom 306	0.4	25	0.8%	Pass
Living/ Dining 306	0.7	-	-	Pass
Bedroom 307	0.8	26	0.8%	Pass
Bedroom 308	0.4	25	0.8%	Pass
Living/ Dining 308	2.5	-	-	Pass
Bedroom 309	0.1	23	0.7%	Pass
Living/ Dining 309	0.4	-	-	Pass
Bedroom 501	0.4	24	0.7%	Pass
Bedroom 502	1.4	27	0.8%	Pass
Bedroom 503	1	26	0.8%	Pass
Living/ Dining 503	2.4	-	-	Pass
Bedroom 504	1.3	27	0.8%	Pass
Bedroom 505	0.5	25	0.8%	Pass
Living/ Dining 501	2.3	-	-	Pass
Living/ Dining 505	2.7	-	-	Pass
Living/ Dining 107	3.1	-	-	Fail
Living/ Dining 307	3.1	-	-	Fail
Living/ Dining 502	3.7	-	-	Fail
Living/ Dining 504	3.7	-	-	Fail

Note with no blinds included Living Dining rooms showing a fail get slightly worse.

7.1.2.Communal corridors - DSY1 2020High50

Room Name	TM59 - Communal corridors % of annual hours Operative temperature >28°C	TM59 Pass / Fail
Stairs FF	0	Pass
Corridor First Floor	0.1	Pass
Stairs FF	0	Pass
Stairs FF	0	Pass
Corridor Third Floor	0.1	Pass
Corridor Fifth Floor	0.3	Pass

7.1.3.Apartments TM59 – DSY2 2020High50

Room Name	TM59 - Criteria 1	TM59 - Criteria 2		TM59 Pass / Fail
	Criteria 1 (%Hrs Top-Tmax>=1K)	Annual hours between 22:00 and 07:00 >26°C	% of annual hours between 22:00 and 07:00 >26°C	
Bedroom 101	0.4	35	1.1%	Fail
Living/ Dining 101	1.1	-	-	Pass
Bedroom 102	1.1	39	1.2%	Fail
Bedroom 103	1.7	40	1.2%	Fail
Bedroom 104	1.1	38	1.2%	Fail
Living/ Dining 104	2.1	-	-	Pass
Bedroom 105	1.1	38	1.2%	Fail
Living/ Dining 105	2	-	-	Pass
Bedroom 106	1	38	1.2%	Fail
Living/ Dining 106	2	-	-	Pass
Bedroom 107	1.6	39	1.2%	Fail
Bedroom 108	0.9	39	1.2%	Fail
Bedroom 109	0.5	36	1.1%	Fail
Living/ Dining 109	1.3	-	-	Pass
Bedroom 301	0.4	35	1.1%	Fail
Living/ Dining 301	1.1	-	-	Pass
Bedroom 302	1.1	39	1.2%	Fail
Bedroom 303	1.8	40	1.2%	Fail
Bedroom 304	1.1	38	1.2%	Fail
Living/ Dining 304	2.1	-	-	Pass
Bedroom 305	1.1	38	1.2%	Fail
Living/ Dining 305	2	-	-	Pass
Bedroom 306	1	37	1.1%	Fail
Living/ Dining 306	2	-	-	Pass
Bedroom 307	1.6	39	1.2%	Fail
Bedroom 308	0.9	39	1.2%	Fail
Bedroom 309	0.5	36	1.1%	Fail
Living/ Dining 309	1.3	-	-	Pass
Bedroom 501	1.1	37	1.1%	Fail
Bedroom 503	1.8	41	1.2%	Fail
Bedroom 505	1	40	1.2%	Fail
Living/ Dining 102	4.1	-	-	Fail
Living/ Dining 103	4.5	-	-	Fail
Living/ Dining 107	4	-	-	Fail
Living/ Dining 108	3.4	-	-	Fail
Living/ Dining 302	4.2	-	-	Fail
Living/ Dining 303	4.5	-	-	Fail
Living/ Dining 307	4	-	-	Fail
Living/ Dining 308	3.4	-	-	Fail
Bedroom 502	2.2	43	1.3%	Fail
Living/ Dining 503	3.7	-	-	Fail
Bedroom 504	2	40	1.2%	Fail

Living/ Dining 501	4.2	-	-	Fail
Living/ Dining 502	5.1	-	-	Fail
Living/ Dining 505	3.7	-	-	Fail
Living/ Dining 504	4.8	-	-	Fail

7.1.4.Communal corridors – DSY2 2020High50

Room Name	TM59 - Communal corridors % of annual hours Operative temperature >28°C	TM59 Pass / Fail
Stairs FF	0	Pass
Corridor First Floor	0.5	Pass
Stairs FF	0	Pass
Stairs FF	0.1	Pass
Corridor Third Floor	0.5	Pass
Corridor Fifth Floor	0.7	Pass
Total hours	0.3	Pass

7.1.5.Apartments TM59 – DSY3 2020High50

Room Name	TM59 - Criteria 1	TM59 - Criteria 2		TM59 Pass / Fail
	Criteria 1 (%Hrs Top-Tmax>=1K)	Annual hours between 22:00 and 07:00 >26°C	% of annual hours between 22:00 and 07:00 >26°C	
Bedroom 101	0.6	54	1.6%	Fail
Living/ Dining 101	2.1	-	-	Pass
Bedroom 102	1.8	62	1.9%	Fail
Bedroom 103	2.7	67	2.0%	Fail
Bedroom 104	1.6	64	1.9%	Fail
Living/ Dining 104	2.8	-	-	Pass
Bedroom 105	1.3	60	1.8%	Fail
Living/ Dining 105	2.6	-	-	Pass
Bedroom 106	1.2	59	1.8%	Fail
Living/ Dining 106	2.8	-	-	Pass
Bedroom 107	2.5	65	2.0%	Fail
Bedroom 108	1.6	61	1.9%	Fail
Bedroom 109	0.9	56	1.7%	Fail
Living/ Dining 109	2.3	-	-	Pass
Bedroom 301	0.6	54	1.6%	Fail
Living/ Dining 301	2.2	-	-	Pass
Bedroom 302	1.8	62	1.9%	Fail
Bedroom 303	2.8	66	2.0%	Fail
Bedroom 304	1.6	62	1.9%	Fail
Living/ Dining 304	2.7	-	-	Pass
Bedroom 305	1.3	60	1.8%	Fail
Living/ Dining 305	2.5	-	-	Pass
Bedroom 306	1.2	59	1.8%	Fail
Living/ Dining 306	2.8	-	-	Pass
Bedroom 307	2.5	64	1.9%	Fail
Bedroom 308	1.6	61	1.9%	Fail
Bedroom 309	0.9	56	1.7%	Fail
Living/ Dining 309	2.3	-	-	Pass
Bedroom 501	1.7	60	1.8%	Fail
Bedroom 503	2.7	65	2.0%	Fail
Bedroom 505	1.7	62	1.9%	Fail
Living/ Dining 102	6.2	-	-	Fail
Living/ Dining 103	6.5	-	-	Fail
Living/ Dining 107	6.3	-	-	Fail
Living/ Dining 108	5.8	-	-	Fail
Living/ Dining 302	6.2	-	-	Fail
Living/ Dining 303	6.5	-	-	Fail

Living/ Dining 307	6.3	-	-	Fail
Living/ Dining 308	5.8	-	-	Fail
Bedroom 502	3.2	67	2.0%	Fail
Living/ Dining 503	5.7	-	-	Fail
Bedroom 504	3.1	64	1.9%	Fail
Living/ Dining 501	6.1	-	-	Fail
Living/ Dining 502	7.4	-	-	Fail
Living/ Dining 505	5.9	-	-	Fail
Living/ Dining 504	7	-	-	Fail

7.1.6.Communal corridors – DSY3 2020High50

Room Name	**TM59 - Communal corridors** % of annual hours Operative temperature >28°C	**TM59 Pass / Fail**
Stairs FF	0	Pass
Corridor First Floor	1.2	Pass
Stairs FF	0	Pass
Stairs FF	1.4	Pass
Corridor Third Floor	1.2	Pass
Corridor Fifth Floor	1.6	Pass
Total hours	0.9	Pass

8. Conclusions & Recommendations

This assessment has found that all the bedrooms and communal corridors have achieved compliance with TM59 but a small number of living rooms have just failed, by at worst 0.7%, against the required DSY1 weather file. It should be noted that the noncompliance demonstrates a slightly higher risk of overheating in these rooms when compared to a compliant space.

The reason for this has been identified as excessive solar gain due the lack of balcony above the top floor living room windows and the additional windows in the lower floors. On the lower floors the balcony provides an element of shade reducing the solar gains into the living rooms. During the design process it will be necessary to consider how shading could be added to the design in order to achieve compliance with TM59. Alternatively, it may be necessary to consider reducing the solar gains in a different way such as reducing the glazing area.

The results for DSY2 & 3 have been provided for information to show how the design responds to more extreme weather scenarios. As highlighted in section 4.3 it is not necessary to demonstrate a pass for these.

Appendix A. TM59 Occupancy & Equipment Gains

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 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 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

NOTE: - No differences between weekdays and weekend are considered. Moreover, the overall apartment will be modelled as occupied for 24 hours.

Table 4. CIBSE TM59 Occupancy and Equipment Gains