CIBSE TM52
OVERHEATING ANALYSIS

PROJECT:
1st Floor, 128 Albert Street, London

PROJECT NUMBER:
P2671

DOCUMENT REF:
P2671-TM52-R01

Revision	Date	Details	Authored	Checked
R1	06.06.2023	Issued for comment	S. Tait	C. Armstrong

KENT (HQ)
Unit 3 Grove Dairy Farm Business Centre I Bobbing Hill I Bobbing I Sittingbourne I Kent I ME9 8NY

LONDON
One Bridge Wharf I 56 Caledonian Road I London I N1 9UU

CONTENTS

1.0 EXECUTIVE SUMMARY

QuinnRoss Energy has carried out a Chartered Institute of Building Services Engineers (CIBSE) Technical Memoranda (TM) 52 thermal comfort assessment of the design for the 1st floor, 128 Albert Street, Camden, to ensure the compliance requirements with respect to overheating are met and advise accordingly if not.

Planning Policies: The following planning policies are applicable for overheating, ventilation, and general inhabitant comfort:

- National Design Guide, Policy H1, paragraph 125.
- London Plan 2021, Policy SI 4, Managing Heat Risk.
- Approved Document Part O, Overheating.

TM52: As mentioned above, the overheating assessment will be undertaken using CIBSE's TM52 thermal comfort criteria and will assess the "occupied" areas of the building only. An "occupied" area is defined as an internal space in the building that has occupants for more than 30 mins at any one time. The assessment will be conducted with internal conditions that have been presented within section 5.0 of this report. The assessment requires that all occupied spaces must pass as "free running" areas. "Free running" is defined by a space having no active cooling systems, such as air conditioning.

Consistent overheating in buildings affects health and well-being of occupants and their productivity. Assessing overheating and thermal comfort is required to ensure free-running buildings do not overheat and the need for comfort cooling is avoided. The thermal comfort criteria for the assessment are defined in CIBSE's TM52. This criteria states that a room or building that fails any two of the following three criteria is classed as overheating:

- Criterion 1 - "The first criterion 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 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September)."
- Criterion 2 - "The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperatures rise and its duration. This criterion sets a daily limit for acceptability."
- Criterion 3 - "The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable."

Weather file: TM52 does not recommend specific weather data, other than to use an "appropriate" weather file. The most commonly used weather data to use for such analyses is CIBSE's Design Summer Year (DSY) weather files. The model will be simulated using the London LWC 01 for the predicted year 2020, high 50th percentile.

Internal gains: TM52 does not define internal gains specifically, therefore, to avoid any ambiguity, the estimated design input data is outlined in this report and has been applied to the dynamic model.

Opening windows: From site surveying it is clear a selection of windows will be openable for natural ventilation. All openable windows have around 70° openings and are top hung.

Mechanical ventilation: A further simulation was undertaken using mechanical ventilation that was assumed to operate at 10 l/s/person.

Simulation software: The DSM software used is the Integrated Environmental Suite (IES) software Virtual Environment (VE) Version 2022.3.0.0. IES is one of the world leaders in developing DSM software and is used internationally for all manner of dynamic simulation calculations, including TM52, Part L2A and ASHRAE 90.1 calculations. The software was used to create a 3-D model based on information provided by the design team as defined in the following section. Hourly simulations for a year were run as part of the overheating thermal analysis using the relevant weather file for the location to produce the hourly results for assessment.

Results: Under a natural ventilation scenario.

Zone	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria Failing	Results
1st - Office 13	21.7	67	10	1 & 2 & 3	FAIL
1st - Office 12	20.7	62	11	1 & 2 & 3	FAIL
1st - Office 05	27.2	69	9	1 & 2 & 3	FAIL
1st - Office 08	30.8	77	10	1 & 2 & 3	FAIL
1st - Office 09	27.3	68	9	1 & 2 & 3	FAIL
1st - Office 11	20	57	9	1 & 2 & 3	FAIL
1st - Office 10	23.8	63	9	1 & 2 & 3	FAIL
1st - Office 14	21.5	70	9	1 & 2 & 3	FAIL
1st - Office 04	23.2	67	9	1 & 2 & 3	FAIL
1st - Office 15	20.2	68	9	1 & 2 & 3	FAIL
1st - Office 03	19.6	56	8	1 & 2 & 3	FAIL
1st - Office 02	17.8	53	7	1 & 2 & 3	FAIL
1st - Office 16	19.3	64	9	1 & 2 & 3	FAIL
1st - Office 01	18.1	60	8	1 & 2 & 3	FAIL
1st - Office 07	36.1	82	10	1 & 2 & 3	FAIL
1st - Office 07	41.5	96	12	1 & 2 & 3	FAIL
1st - Office 07	43.8	95	12	1 & 2 & 3	FAIL
1st - Office 06	33.9	80	10	1 & 2 & 3	FAIL

Table 01: Natural ventilation results summary

Results: Under a mechanical ventilation scenario.

Zone	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria Failing	Results
1st - Office 13	17.1	57	9	1 & 2 & 3	FAIL
1st - Office 12	16.3	50	9	1 & 2 & 3	FAIL
1st - Office 05	21.5	60	8	1 & 2 & 3	FAIL
1st - Office 08	24.2	63	8	1 & 2 & 3	FAIL
1st - Office 09	20.1	57	8	1 & 2 & 3	FAIL
1st - Office 11	14.3	47	8	1 & 2 & 3	FAIL
1st - Office 10	16.7	53	8	1 & 2 & 3	FAIL
1st - Office 14	18.7	60	8	1 & 2 & 3	FAIL
1st - Office 04	19.7	56	8	1 & 2 & 3	FAIL
1st - Office 15	17.6	60	8	1 & 2 & 3	FAIL
1st - Office 03	16.3	50	7	1 & 2 & 3	FAIL
1st - Office 02	14.1	46	6	1 & 2 & 3	FAIL
1st - Office 16	15.8	55	8	1 & 2 & 3	FAIL
1st - Office 01	14.8	52	7	1 & 2 & 3	FAIL
1st - Office 07	29	69	9	1 & 2 & 3	FAIL
1st - Office 07	33.8	82	10	1 & 2 & 3	FAIL
1st - Office 07	35.8	84	11	1 & 2 & 3	FAIL
1st - Office 06	27.8	67	8	1 & 2 & 3	FAIL

Table 02: Mechanical ventilation results summary

Conclusion: As the results above show, compliance is not achieved under a natural and/or a mechanical ventilation scenario. As per the cooling hierarchy there is no alternative other than to install air conditioning is thermal comfort levels are to be maintained.

2.0 INTRODUCTION

QuinnRoss Energy has carried out a Chartered Institute of Building Services Engineers (CIBSE) Technical Memoranda (TM) 52 thermal comfort assessment for the refurbishment works at 1st floor, 128 Albert Street, Camden, development to ensure the compliance requirements with respect to overheating are met.

1st floor, 128 Albert Street is a commercial building located in Camden. The site is an office space under refurbishment.

3.0 PLANNING POLICY

Several planning policies refer to overheating, which are outlined in this section.

3.01 National Design Guide, Policy H1

The National Design Guide, Policy H1, paragraph 125 states *"Well designed homes and buildings are efficient and cost effective to run. They help to reduce greenhouse gas emissions by incorporating features that encourage sustainable lifestyles. They have good ventilation, avoid overheating, minimise sound pollution and have good air quality, while providing comfort and personal control for their users."*

3.02 London Plan 2021, Policy SI4

Policy SI4 seeks to reduce the impact of the urban heat island effect in London and encourages the design of places and spaces to avoid overheating and excessive heat generation, and to reduce overheating due to the impacts of climate change. All developments should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the cooling hierarchy, a visual representation of which is shown below:

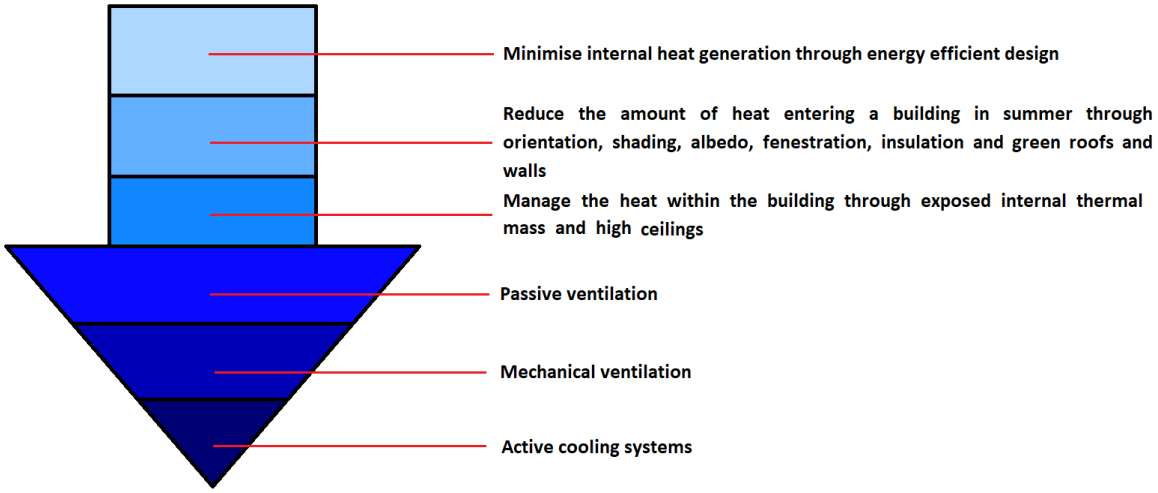

Figure 01: Cooling hierarchy

3.03 Approved Document Part O, Overheating

The Approved Document Part O states an aim *"to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures."*

It also states that a dynamic thermal modelling tool must be used along with the guidance and targets as set out in the Chartered Institute of Building Services Engineers (CIBSE) Technical Memorandum (TM) 52.

4.0 CRITERIA FOR COMPLIANCE

4.01 Target Overheating Hours

As mentioned above, the overheating assessment will be undertaken using CIBSE's TM52 thermal comfort criteria and will assess all occupied areas of the development. An "occupied" area is defined as an internal space in the building that has occupants for more than 30 mins at any one time, in this case office spaces. The assessment requires that all occupied spaces must pass as "free running" areas. "Free running" is defined by a space having no active cooling systems, such as air conditioning.

Consistent overheating in buildings affects health and well-being of occupants and their productivity. Assessing overheating and thermal comfort is required to ensure free-running buildings do not overheat and the need for comfort cooling is avoided. The TM52 criteria states that for predominantly mechanically ventilated spaces or spaces with limited window openings, which this building falls under, a room that fails the following criteria is classed as overheating:

TM52 requires compliance by passing the following criteria:

- (a) All office areas must have ΔT greater than or equal to one degree (K) during the period May to September.
- (b) Spaces must allow for the severity of overheating the weighted exceedance (W_e) shall be less than or equal to 6 in any one day.
- (c) To sets an absolute maximum value for the indoor operative temperature the value of ΔT shall not exceed 4K.

5.0 DYNAMIC SIMULATION MODELLING (DSM) SOFTWARE

The DSM software used is the Integrated Environmental Suite (IES) software Virtual Environment (VE) Version 2022.3.0.0. IES is one of the world leaders in developing DSM software and is used internationally for all manner of dynamic simulation calculations, including TM52, Part L2A and ASHRAE 90.1 calculations. The software was used to create a 3-D model based on information provided by the design team as defined in the following section. Hourly simulations for a year were run as part of the overheating thermal analysis using the relevant weather file for the location to produce the hourly results for assessment.

6.0 BUILDING INPUT DATA

The following section highlights the key inputs that were used to model the 1st floor of 128 Albert Street.

6.01 Drawings

The 3D model of the building used was created using the drawings from Spratley & Partners delivered to Quinn Ross Consultants in May 2023. Figure 2 below shows the 3D geometry of the development:

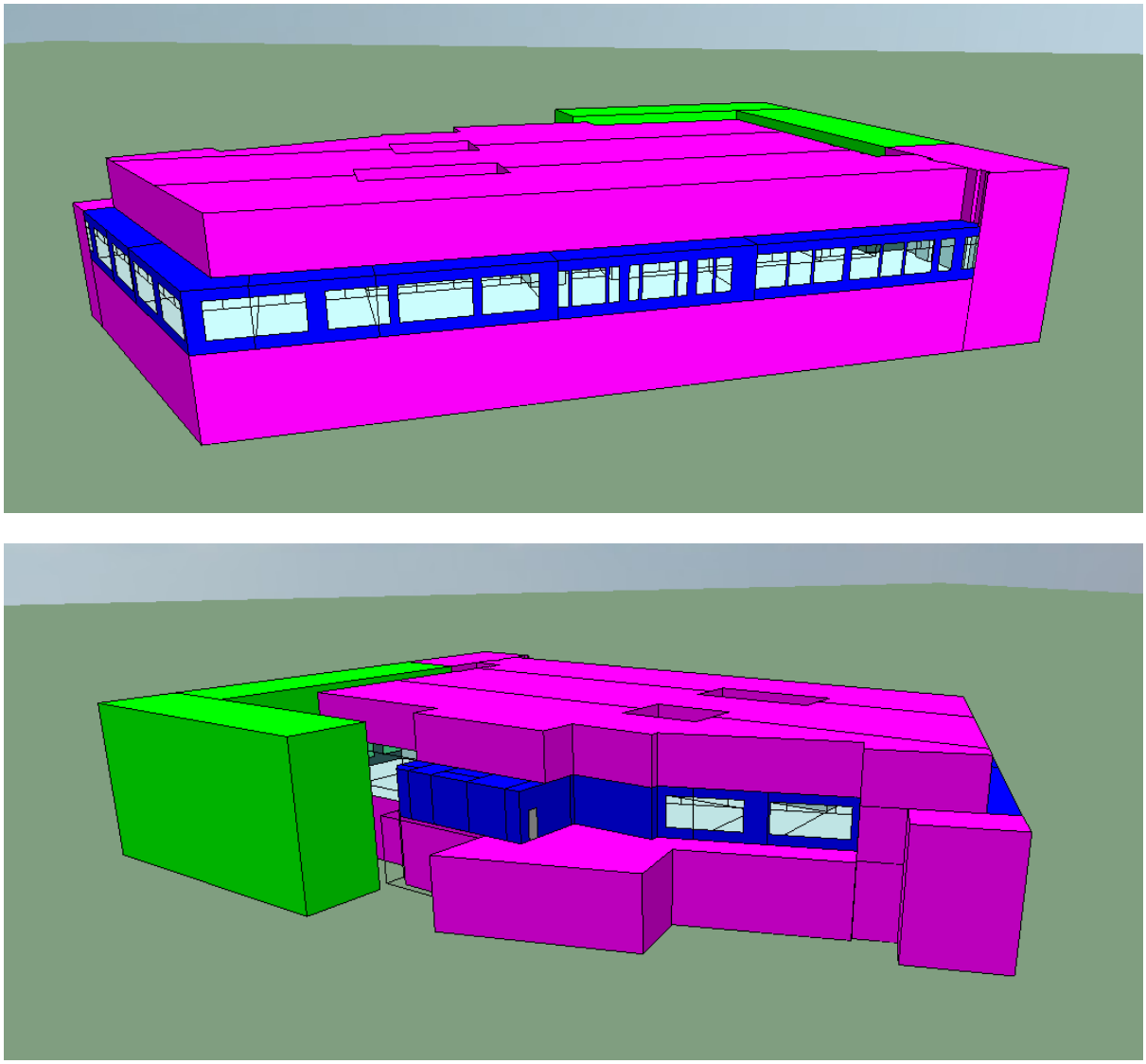

Figure 02: 3D model images as modelled in IES

6.02 Construction U-values

Construction U-values W/m².K	
External Wall	1.26
Roof	2.44

Table 03: Construction U-values

6.03 Glazing Parameters

The following glazing U-values were used within the overheating simulation which were derived from assumed age of the existing double-glazed windows (2002+):

Glazing Parameters	
Overall U-value (including frame)	2.00 W/m².K
g-value	0.68

Table 04: Glazing parameters

6.04 Window Openings

The thermal model's window dimensions are in line with architect's drawings and match on site evidence.

Figure 03: On Site Evidence

Site surveying showed that on most glazed units the corner windows were openable, all other areas are permanently shut. These are assumed to have an opening/free area 30% of the glazed unit area with a top hung 70° opening angle.

6.05 Mechanical Ventilation

It is assumed mechanical ventilation in the office spaces operate at 10 l/s/person of external air.

6.06 Internal Gains

The following internal gains are applied to the spaces. As stated above, all gains and their hours of use are taken from CIBSE's TM52:

Room Group	Temp Set-Point (°C)		Occupancy	Lighting Gains	Miscelaneous		Mech	Infiltration
	Heating	Cooling		W/m²	Sens	Latent	Vent	n ach
Offices	20.00	Off	10 m²/person	10.00	25.00	-	10.00	0.25
WC's	18.00	Off	-	10.00	-	-	0.50	0.25
Circulation	18.00	Off	-	10.00	-	-	-	0.25
Plant	18.00	Off	-	10.00	-	-	-	0.25
Kitchen	18.00	Off	-	10.00	-	-	0.50	0.25
Cupboard	-	Off	-	10.00	-	-	-	0.25

Table 05: Internal gains

All occupancy gains are based on 75 W/person sensible and 55 W/person latent.

6.07 Air Conditioning

The simulations were calculated without air conditioning.

7.0 WEATHER FILES

Design Summer Year (DSY) weather files contain a whole year's weather variables for various locations throughout the UK designed for use in dynamic thermal simulation. The thermal model will be simulated using the London *LWC DSY1 2020High50.*

8.0 RESULTS

Using the input data outlined above the DSM calculations were performed, and the following results were produced:

Results: Under a Natural Ventilation Scenario.

Zone	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria Failing	Results
1st - Office 13	21.7	67	10	1 & 2 & 3	FAIL
1st - Office 12	20.7	62	11	1 & 2 & 3	FAIL
1st - Office 05	27.2	69	9	1 & 2 & 3	FAIL
1st - Office 08	30.8	77	10	1 & 2 & 3	FAIL
1st - Office 09	27.3	68	9	1 & 2 & 3	FAIL
1st - Office 11	20.0	57	9	1 & 2 & 3	FAIL
1st - Office 10	23.8	63	9	1 & 2 & 3	FAIL
1st - Office 14	21.5	70	9	1 & 2 & 3	FAIL
1st - Office 04	23.2	67	9	1 & 2 & 3	FAIL
1st - Office 15	20.2	68	9	1 & 2 & 3	FAIL
1st - Office 03	19.6	56	8	1 & 2 & 3	FAIL
1st - Office 02	17.8	53	7	1 & 2 & 3	FAIL
1st - Office 16	19.3	64	9	1 & 2 & 3	FAIL
1st - Office 01	18.1	60	8	1 & 2 & 3	FAIL
1st - Office 07	36.1	82	10	1 & 2 & 3	FAIL
1st - Office 07	41.5	96	12	1 & 2 & 3	FAIL
1st - Office 07	43.8	95	12	1 & 2 & 3	FAIL
1st - Office 06	33.9	80	10	1 & 2 & 3	FAIL

Table 06: Natural ventilation results summary

Results: Under a Mechanical Ventilation Scenario.

Zone	Criteria 1 (%Hrs Top-Tmax>=1K)	Criteria 2 (Max. Daily Deg.Hrs)	Criteria 3 (Max. DeltaT)	Criteria Failing	Results
1st - Office 13	17.1	57	9	1 & 2 & 3	FAIL
1st - Office 12	16.3	50	9	1 & 2 & 3	FAIL
1st - Office 05	21.5	60	8	1 & 2 & 3	FAIL
1st - Office 08	24.2	63	8	1 & 2 & 3	FAIL
1st - Office 09	20.1	57	8	1 & 2 & 3	FAIL
1st - Office 11	14.3	47	8	1 & 2 & 3	FAIL
1st - Office 10	16.7	53	8	1 & 2 & 3	FAIL
1st - Office 14	18.7	60	8	1 & 2 & 3	FAIL
1st - Office 04	19.7	56	8	1 & 2 & 3	FAIL
1st - Office 15	17.6	60	8	1 & 2 & 3	FAIL
1st - Office 03	16.3	50	7	1 & 2 & 3	FAIL
1st - Office 02	14.1	46	6	1 & 2 & 3	FAIL
1st - Office 16	15.8	55	8	1 & 2 & 3	FAIL
1st - Office 01	14.8	52	7	1 & 2 & 3	FAIL
1st - Office 07	29	69	9	1 & 2 & 3	FAIL
1st - Office 07	33.8	82	10	1 & 2 & 3	FAIL
1st - Office 07	35.8	84	11	1 & 2 & 3	FAIL
1st - Office 06	27.8	67	8	1 & 2 & 3	FAIL

Table 07: Mechanical ventilation results summary

As the results above show the office spaces are not compliant with the TM52 criteria under a natural or mechanical ventilation scenario. It is likely air conditioning is needed to maintain internal temperatures.

9.0 CONCLUSION

The analysis found the following conclusions:

Planning policy	Has compliance been achieved
National Design Guide, Policy H1	The results show the spaces will overheat despite the ventilation strategy. It is recommended that an active cooling system be installed to meet compliance.
London Plan 2021, Policy SI 4	The spaces are not compliant with the overheating criteria using natural or mechanical ventilation. It is recommended that an active cooling system be installed to meet compliance.
Approved Document Part O	Non-compliance with CIBSE TM52 also shows non-compliance with Part O. It is recommended that an active cooling system be installed to meet compliance.

Table 08: Compliance with planning policy conclusion

- The results show that the first-floor office space does not comply with the TM52 criteria taking into account the input data outlined in section 6.04 and under a natural and mechanical ventilation scenario.

- This shows that the proposed design measures and ventilation arrangement outlined in this report are not sufficient and occupants are likely to experience discomfort during the summer months.

- The cooling hierarchy has been followed and it can be concluded that the development cannot maintain comfortable working conditions for its inhabitants under a natural or mechanical ventilation scenario. Air conditioning is likely the only alternative to ensure thermally comfortable