

2 MILTON ROAD

GRAVESEND
KENT
DA12 2RE

PROJECT NO: P479

REF: OVERHEATING ASSESSMENT REPORT

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1.0 Executive Summary

MNE Building Services Ltd were appointed to build a dynamic thermal model and undertake a thermal comfort analysis of the new proposed development at 2 Milton Road, Gravesend to establish if the habitable zones provide comfort levels in line with CIBSE TM59 and Approved Document Part O.

To achieve compliance, dwellings must pass both below criteria:

- 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).
- 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 twenty-six °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 failure).

The initial results of the study identified a compliance failure to some of the habitable rooms when looking to achieve compliance with the TM59 criteria.

When reviewing all the information provided including the relevant acoustic report, further calculations were conducted and in order to achieve the required internal comfort conditions, the following measures have been proposed:

- Centralised Mechanical Ventilation Heat Recovery (MVHR) to achieve target flow rates to habitable rooms, split as follows:
 - Bedroom 1 – 40 l/s
 - Bedroom 2 – 40 l/s
 - Living Area – 60 l/s
- Solar control glazing to achieve no worse than 0.4g value

Accounting for the above proposals, all assessed zones achieve the required internal thermal comfort conditions to show compliance with both Approved Document O (2021) and CIBSE TM59. The above ventilation rates are denoted on the following MNE design layouts:

- P479(57)01(--)-001-P2
- P479(57)LP(--)-001-P2

2.0 Introduction

The overheating assessment for the residential part of the development has been conducted in accordance with the guidance set out in CIBSE TM59: Design Methodology for the Assessment of Overheating in Homes.

The weather data for Gatwick (representative of lower density urban and suburban areas outside the Central Activity Zone) has been used for all scenarios assessed.

The latest DSY weather files have been used to conduct overheating risk assessments using TM59. It is required to pass the overheating criteria using the DSY1 file most appropriate to the site location, for the 2020s, high emissions, 50% percentile scenario. Other files including the more extreme DSY2 and DSY3 files can be used to further test designs but a pass against these other weather files is not mandatory for TM59.

With the view to mitigate any risk of overheating and reduce any reliance on any mechanical cooling, all new developments should be designed in line with the acceptable strategies for reducing overheating risk in mind, these outlined in the Approved Document O (2021) as detailed below:

2.1 Limiting solar gains

2.1.1 Solar gains in summer should be limited by any of the following means.

- Fixed shading devices, comprising any of the following.
- Shutters
- External blinds
- Overhangs
- Awnings

2.1.2 Glazing design, involving any of the following:

- Size
- Orientation
- G-value
- Depth of the window reveal

2.1.3 Building design – for example, the placement of balconies.

2.1.4 Shading provided by adjacent permanent buildings, structures, or landscaping.

Although internal blinds and curtains provide some reduction in solar gains, they should not be considered when considering whether requirement O1 has been met.

Foliage, such as tree cover, can provide some reduction in solar gains. However, it should not be considered when considering whether requirement O1 has been met.

2.2 Removing Excess Heat

The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air conditioning) is expected to be used only where requirement O1 cannot be met using openings.

3.0 Site Overview

The proposed development is situated in Gravesend, Kent and sees the construction of a new 2 bed dwelling over 2 storeys, built on top of a commercial unit. The site was previously destroyed in a fire and the new dwelling is part of the redevelopment.

3.1 Building Fabric

The following notional design fabric measures have been used assumed the simulation model.

Element	U Value	
Exposed Floors	0.11	W/m ² k
External Cavity Wall	0.18	W/m ² k
External Roof	0.11	W/m ² k
Windows	1.40	W/m ² k
Gg Value	0.40	-
Window Opening Angle	External Doors, Glazing doors & Casement windows - 90°	
Front Door	1.00	W/m ² k
Design Air Pressure	4.00	m ³ /hm ² @ 50 Pa.
Ventilation	MVHR	

3.2 Natural Ventilation

The proposed dwelling is on a busy main road and therefore has restrictions on the use of the openable windows as part of the overheating mitigation strategy. This is detailed in the noise impact assessment carried out by Sonic Element Ltd.

To achieve compliance with this document, the windows throughout the dwelling have been assumed non-openable for the purpose of this assessment.

3.3 Mechanical Ventilation

In order to align with the requirements of the Noise Impact assessment carried out by Sonic Element Ltd, a mechanical ventilation system has been proposed, providing ventilation to the habitable rooms which has been account for within the model.

The ventilation system is assumed to achieve 60 l/s ventilation rate to the living area and 40 l/s to the bedrooms.

3.4 Internal Doors

Internal doors have been modelled and are scheduled to be left open during the daytime (07:00-22:00) but are assumed closed outside of these hours, as per CIBSE TM59.

3.5 Occupancy

The internal occupancy of the dwellings has been modelled in line with CIBSE TM59 – Figure 1, which provides residential occupancy schedules, as detailed in Appendix A of this document.

4.0 Assessment Methodology

CIBSE TM59:2017 - Design Methodology for Assessment of Overheating Risk in Homes, sets a standardised approach to predicting overheating risk for residential building designs (new-build or major refurbishment) using dynamic thermal analysis.

This document 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 evaluate the building design, not to cover all usage modes. Where assumptions for heat and solar gains are taken from established CIBSE guidance. Profiles are developed to evaluate the building design, not to cover all or unusual usage modes, albeit different profiles exist for distinct groups of occupants.

4.1 Methodology Inclusions

- Allows unique designs to be compared with a common approach, based on set assumptions for occupancy and internal gains.
- Supports design decisions that improve comfort without cooling.
- Provides consistency across the industry as all consultants will be using the same methodology for overheating risk prediction.

4.2 Methodology Exclusions

- Guarantee that people will always be comfortable in compliant spaces, however they act.
- Consider unusual or excessive use.

4.3 Modelling Software

DesignBuilder, a fully Dynamic Simulation Modelling (DSM) software has been used to produce overheating assessment. DesignBuilder is a recommended design tool in accordance with CIBSE AM11: Building Energy and Environmental Modelling.

The process for using DSM tools for predicting overheating risk is that a model of the building is created, using a significant amount of data including building geometry, internal layout, location and orientation of the building, construction details, internal gains, ventilation details and weather data.

The house has been assessed as a **Category II** type dwelling, with normal expectations for occupants in residential buildings, in accordance with CIBSE recommendations, as detailed in the following table:

Category	Notation	Suggested Acceptable Range (K)
I	High level of expectation only used for spaces occupied by very sensitive and fragile persons	± 2
II	Normal expectation (for new buildings and renovations)	± 3
III	A moderate expectation	± 4
IV	Values outside the criteria for the above categories (only acceptable for a limited period)	> 4

4.4 Assessment Criteria for Residential Buildings

CIBSE TM59 sets different overheating compliance criteria for homes that are naturally ventilated and for homes that are mechanically ventilated.

For homes that are naturally ventilated, the method with two criteria should be used to assess overheating. The first overheating criteria, which applies to both living rooms/kitchens and bedrooms, is an adaptive criterion.

The second overheating criterion is a fixed temperature criteria which applies only to bedrooms. Both criteria must be met for all spaces within a home to demonstrate compliance.

For mechanically ventilated homes, the fixed temperature method with a single criterion should be used to assess overheating. This single criterion must be met for all spaces (living rooms/kitchens and bedrooms) within a mechanically ventilated home to demonstrate compliance. The TM59 criteria for naturally and mechanically ventilated homes are summarised:

Assessment Criterion	Applicable Rooms	Occupied Hours	Naturally, Ventilated Homes (Openable Windows)	Mechanically Ventilated Homes (Close Windows)
Criterion one	Living rooms, kitchens and bedrooms	Living /Kitchen / Dining rooms – 9am to 10pm (13 hours/day) Bedrooms – 24hour occupancy	The number of hours during which external and internal temperature difference is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.	Not Applicable
Criterion two	Bedrooms Only	Bedrooms 24-hour occupancy	The operative temperature in the bedroom from 10 pm to 7 am shall not exceed twenty-six °C for more than 1% of annual hours. 33 or more hours above 26°C will be a failure	Not Applicable
Criterion three	Living rooms, kitchens and bedrooms	Living / Kitchen / Dining rooms – 9am to 10pm (13 hours/day) Bedrooms – 24hour occupancy	Not applicable	The operative temperature in occupied all occupied rooms should not exceed twenty-six for more than 3% of the annual occupied annual hours. 143 or more hours above 26°C for living rooms and kitchens will be a failure. 263 or more hours above 26°C for bedrooms will be a failure

All criteria must be met for all spaces within a home to demonstrate full compliance.

4.5 Weather Data

The overheating risk assessments are conducted using dynamic thermal simulation models, running under the CIBSE Design Summer Year (DSY) weather data. The DSY is a historical year, selected as the year with the third warmest April–September period from a set of 20 years of historical weather data. The current DSY for London is 2020 and the weather data used is from Gatwick.

4.6 External Shading

There is currently no external shading proposed for the dwelling.

4.7 Internal Shading

Although internal blinds and curtains provide some reduction in solar gains and will be installed, they should not and have not been considered when modelling the dwelling.

4.8 Internal Gains

Occupancy and equipment gain of the modelled residential units have been modelled in accordance with CIBSE TM59: 2017 and are summarised in the table below.

Unit Room Type	Occupancy	Equipment Gain
Studio	Two people at all times Sensible gain 150 W/person, latent gain 110 W/person all day	Peak load of 450 W from 6 pm to 8 pm. 200W from 8 pm to 10 pm 110W 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	One person from 9 am to 10 pm; room is unoccupied for the rest of the day Sensible gain 75 W/, latent gain 55 W from 10 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 110W 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/kitchen	Two people from 9 am to 10 pm; room is unoccupied for the rest of the day Sensible gain 150 W, latent gain 110 W from 10 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 110W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day

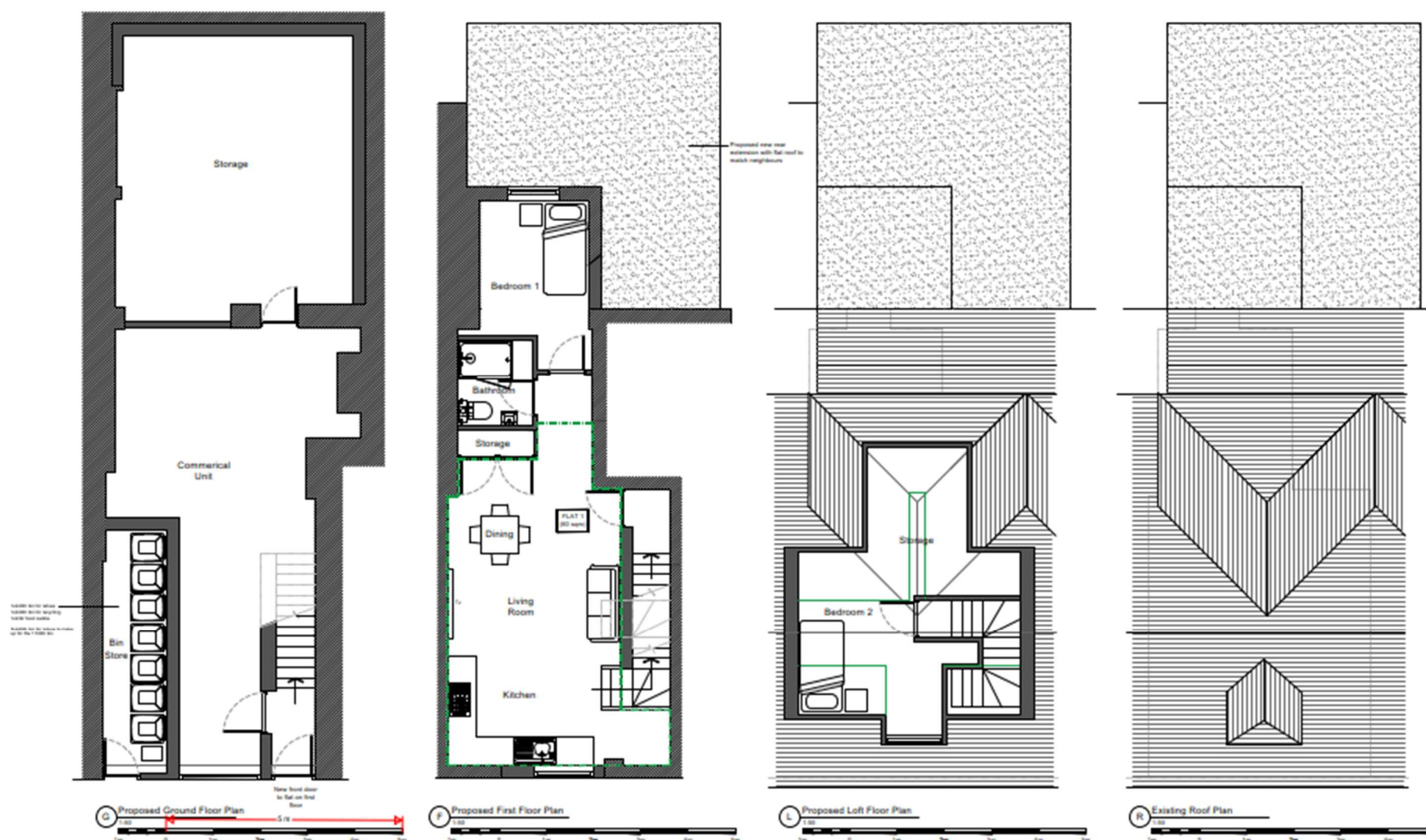
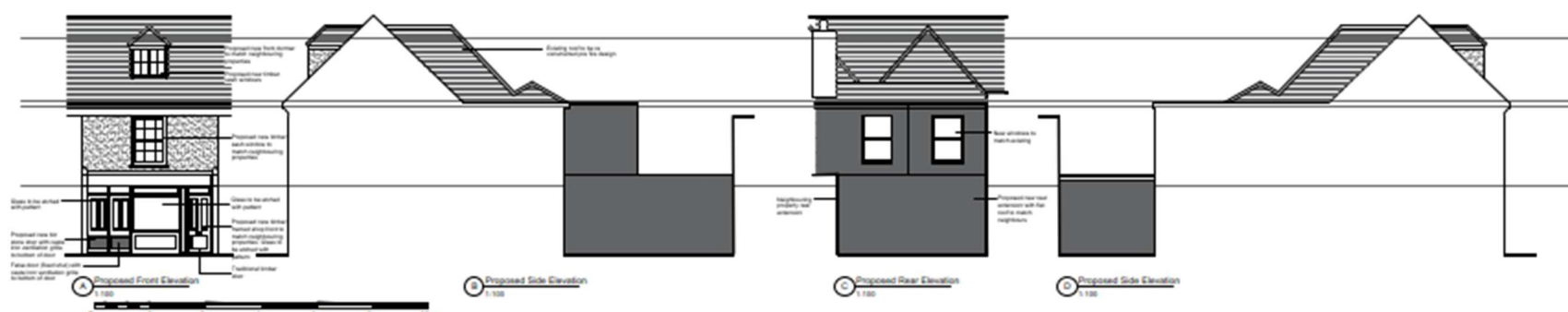
3-bedroom apartment: living room/kitchen	Three people from 9 am to 10 pm; room is unoccupied for the rest of the day Sensible gain 225 W, latent gain 165 W from 10 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
Double bedroom	Two people at 105 W sensible gains, 77 W latent gains from 11 pm to 8 am and 150 W sensible gains, 110 W latent gains from 8 am to 9 am and from ten pm to 11 pm one person at 75 W sensible gains, 55 W latent gains in the bedroom from 9 am to 10 pm	Peak load of 80W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom	One person at 52.5 W sensible gains, 38.5 W latent gains from 11 pm to 8 am and 75 W sensible gains, 55 W latent gains from 8 am to 11 pm	Peak load of 80W from 8 am to 11 pm Base load of 10W during sleeping hours
Communal corridors	Assumed to be zero	Sensible gain of 6 W/m ² all day and night
HIU Cupboards	Assumed to be zero	Sensible gain of 50 W all day and night

Lighting gains have been modelled in accordance with CIBSE TM59: 2017 as follows:

- Maximum sensible gain of 2W/m² from 6 pm to 11 pm is used for energy efficiency lighting.

5.0 Layout and 3D Model Images

Proposed Floor Plans



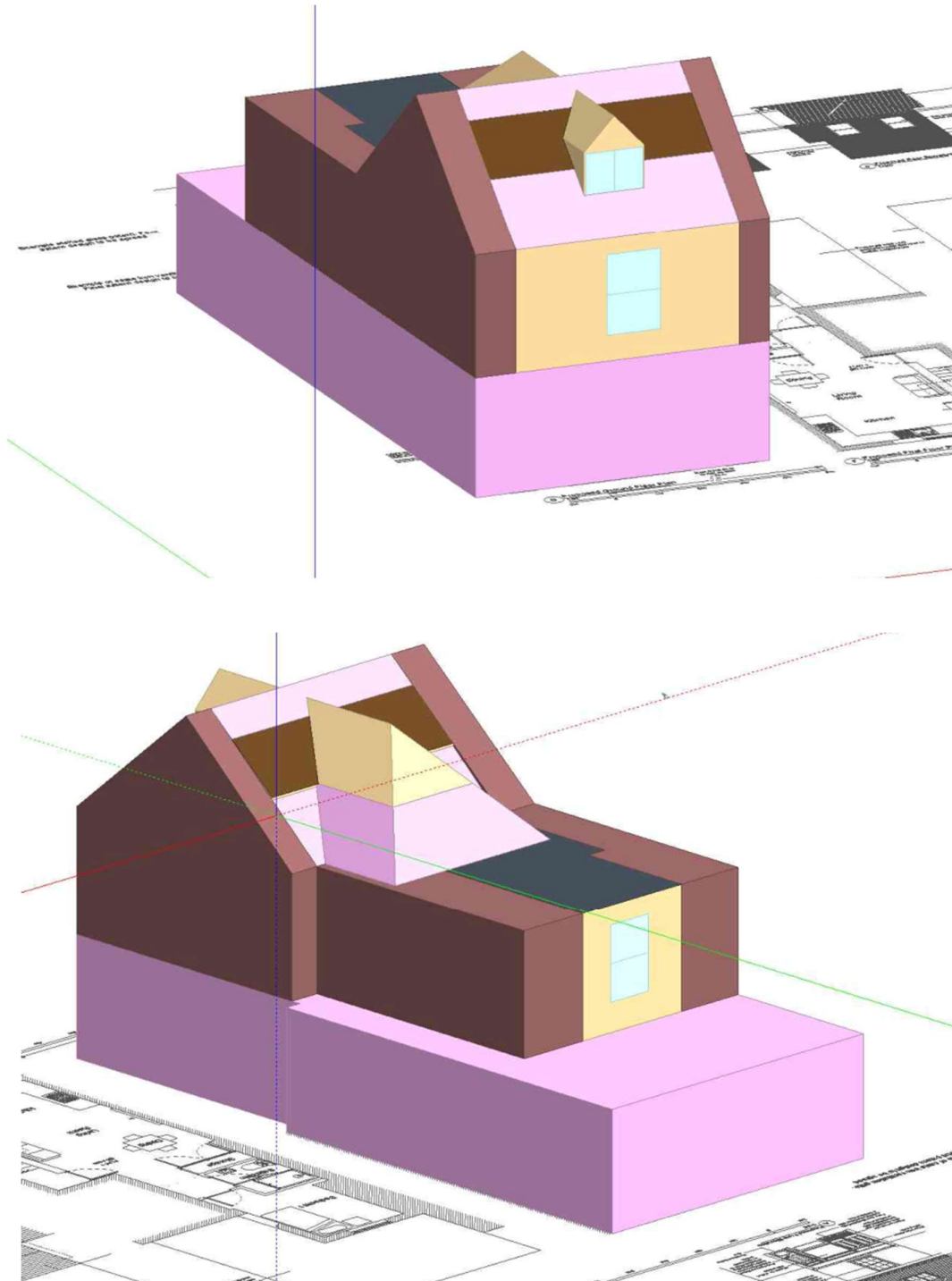
Notwithstanding to whomsoever the drawings are made, the drawings are the property of MNE Building Services Ltd and shall remain the property of MNE Building Services Ltd. The drawings are not to be used for any other purpose without the written consent of MNE Building Services Ltd. The drawings are not to be used for any other purpose without the written consent of MNE Building Services Ltd.



Project	SINCH 2 Milton Road, Chesham, West, SA12 2PB	Boundary	Demolition
Draw Title	Proposed Plans & Elevations	East Walls	Prop Walls
Scale	1:100 (1:100 @ A1)	FTL Height	
Drawn By	AD	Date	06/03/24
Draw No.	(24) 06/04 PL01	Rev.	E

KAD
PLANS

Dynamic Thermal Model Images



6.0 Results and Recommendations

The following results summarise all assessed habitable rooms against the criteria of CIBSE TM59. Initial results assuming a notional specification and using the methodology detailed throughout report, showed a compliance failing in Open Plan Living Room, Bedroom 1 and Bedroom 2 with 0.50 g-value, which can be seen from the below table.

Criteria for predominantly mechanically ventilated homes

Block	Zone	% Hours exceeded	Pass/Fail
00FIRSTFLOOR	BEDROOM1	5.04	Fail
00FIRSTFLOOR	LIVINGDININGKITCHEN	4.84	Fail
01LOFTFLOOR	BEDROOM2	4.63	Fail

6.1 Remedial Works

To mitigate, further calculations were conducted and in order to achieve the required internal comfort conditions within the current design constraints, the following measures have been proposed:

- Mechanical Ventilation Heat Recovery (MVHR) to achieve target flow rates to habitable rooms, split as follows:
 - Bedroom 1 – 40 l/s
 - Bedroom 2 – 40 l/s
 - Living Area – 60 l/s
- Solar control glazing to achieve no worse than 0.4 g-value

6.2 Updated Results

The following compliant results were achieved with remedial works mentioned under section 6.1.

Criteria for predominantly mechanically ventilated homes

Block	Zone	% Hours exceeded	Pass/Fail
00FIRSTFLOOR	BEDROOM1	2.68	Pass
00FIRSTFLOOR	LIVINGDININGKITCHEN	2.97	Pass
01LOFTFLOOR	BEDROOM2	2.54	Pass

7.0 Conclusion

The results of the initial modelling indicated that during peak summertime conditions, the habitable areas failed to maintain acceptable levels of thermal comfort, with many zones failing to meet more than one of the CIBSE TM59 criteria.

To address this, the following measures are recommended:

- Mechanical Ventilation Heat Recovery (MVHR) to achieve target flow rates to habitable rooms, split as follows:
 - Bedroom 1 – 40 l/s
 - Bedroom 2 – 40 l/s
 - Living Area – 60 l/s
- Solar control glazing to achieve no worse than 0.4g value

With the suggested mitigation measures, all zones show compliance with the CIBSE TM59 criterion and align with Approved Document Part O (2021).

8.0 Appendix A – CIBSE TM59 Occupancy Patterns

Figure 1 Heat gain profile

Number of people	Description	Peak load (W)		Period																							
		Sensible	Latent	Hour ending																							
				00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22	22-23	23-24
1	Single bedroom occupancy	75	55	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
2	Double bedroom occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7
2	Studio occupancy	150	110	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.7
1	1-bedroom living/kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
1	1-bedroom living occupancy	75	55	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0
1	1-bedroom kitchen occupancy	75	55	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0
2	2-bedroom living/kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
2	2-bedroom living occupancy	150	110	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0
2	2-bedroom kitchen occupancy	150	110	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0
3	3-bedroom living/kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
3	3-bedroom living occupancy	225	165	0	0	0	0	0	0	0	0	0	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0
3	3-bedroom kitchen occupancy	225	165	0	0	0	0	0	0	0	0	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0
	Single bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Double bedroom equipment	80		0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.13
	Studio equipment	460		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	Living/kitchen equipment	460		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
	Living equipment	150		0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Kitchen equipment	300		0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
	Ug profile		2 (W/m2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0