HODKINSON

Overheating Assessment

Dr. D Chowdhury

57 Hillfield Road

Final

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We are able to advise at all stages of projects from planning applications to handover.

Our emphasis is to provide innovative and cost-effective solutions that respond to increasing demands for quality and construction efficiency.

HODKINSON

Executive Summary

The purpose of this report is to outline the level of overheating risk at the existing property at 57 Hillfield Road.

The performance of the property has been assessed against the Chartered Institute of Building Services Engineers (CIBSE) guidance TM59 *Design methodology for the assessment of overheating risk in homes* (2017) and Approved Document O *Overheating* (2021).

Passive measures have been deemed insufficient for mitigating the extent of overheating risk present at the property and are additionally ruled out on the grounds of visual impact to the property and difficulty in retrofitting the property due to its age.

The property does not demonstrate compliance with CIBSE TM59 and AD(O) overheating assessment criteria under the London Heathrow weather file (DSY1 for the 2020s, high emissions, 50% percentile scenario). This demonstrates that the property is subject to significant overheating risk.

A comfort cooling solution is recommended as the most appropriate way to mitigate the overheating risk.

Contents

1. INTRODUCTION

1.1 This document has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, to assess the level of overheating risk within the existing design and operation parameters at 57 Hillfield Road.

Site Location

1.2 57 Hillfield road is an existing residential property located within the West Hampstead area of the London Borough of Camden, as shown in Figure 1 below.

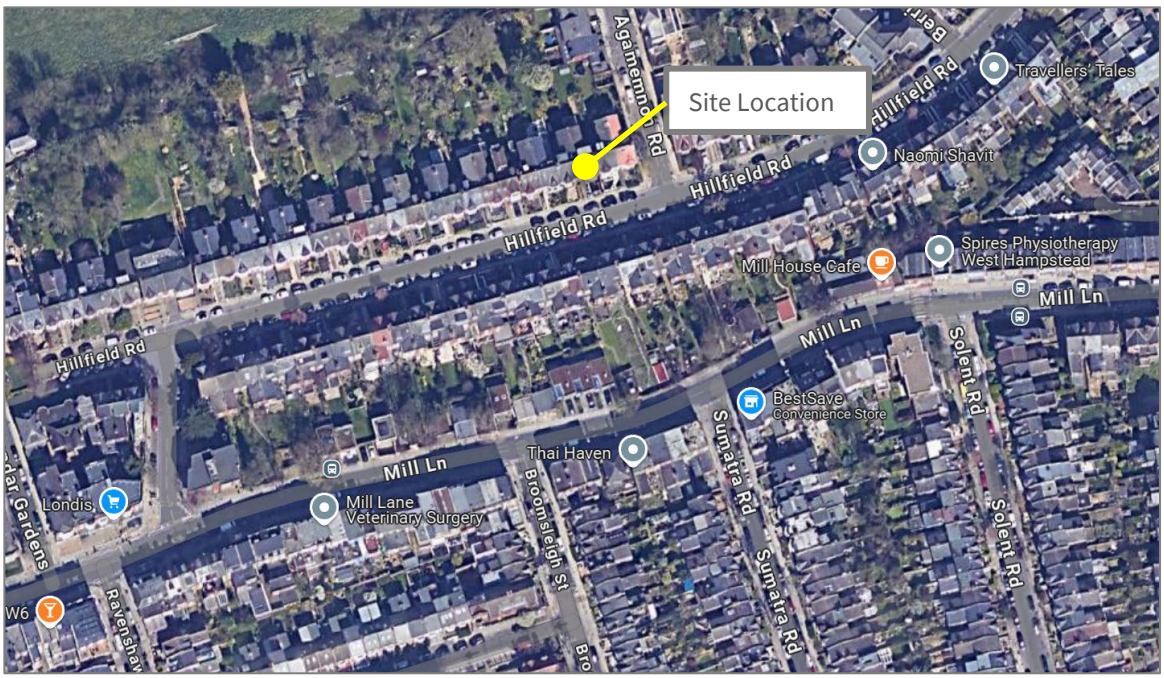


Figure 1: Site Location (Google Maps © 2024)

Overheating and Thermal Comfort

1.3 Maintaining comfortable thermal comfort conditions in the face of climate change and increasing temperatures is one of the greatest challenges currently being addressed by designers. This is particularly challenging for existing buildings where design was not intended to deal with current climate scenarios.

1.4 This assessment has been completed following the CIBSE TM59 methodology and applying modelling parameters set within Approved Document O; the main objective is to achieve thermal comfort and minimise summertime overheating without the use of conventional air conditioning

systems, which typically have associated greenhouse gas emissions and impact on the urban heat island effect.

1.5 The scope for passive measures at the existing building at 57 Hillfield Road is limited due to the external visual impact of these measures and challenges arising in retrofitting due to the property's age; as such passive solutions are not suggested.

2. POLICY AND REQUIREMENTS

2.1 The existing residential property at 57 Hillfield Road experiences overheating during summer periods. The occupant is seeking planning approval to install a comfort cooling solution in the form of air conditioning to the property.

2.2 Camden Council have requested an overheating assessment be completed to demonstrate the extent of overheating at the property.

2.3 The following policy requirements are listed within relevant policy documents and considered relevant to this application:

Camden Local Plan (2017)

2.4 **Policy CC2 Adapting to Climate Change** – requires that development is '*resilient to climate change*'.

2.5 The policy states- *"all developments should adopt appropriate climate change adaptation measures such as: measures to reduce the impact of urban and dwelling overheating, including application of the cooling hierarchy."*

London Plan (2021) & Energy Assessment Guidance (2022)

2.6 Policy within the London Plan and GLA Energy Assessment Guidance is not applicable to the existing property at 57 Hillfield Road, however, this does outline requirements on the methodology used that would normally apply within the borough for larger developments.

2.7 An overheating mitigation strategy should be developed in accordance with the methodology within CIBSE TM59, taking into account the requirements of Approved Document O.

3. OVERHEATING CRITERIA

3.1 The following building regulations and guidance provide a standardised approach to predicting overheating risk in residential dwellings within the UK. They set out the criteria by which the risk of overheating can be assessed or identified.

Approved Document O (2021)

3.2 Compliance with Part O of the Building Regulations, for which requirements are set out within Approved Document O (AD(O)) for Overheating (2021), is based on meeting the following requirements:

> Reasonable provision to limit unwanted solar gains in summer and to provide adequate means to remove excess heat;

> Taking account of safety, noise, pollution, protection of falling and entrapment when developing the strategy. Mechanical cooling should only be considered when feasible passive means are insufficient.

3.3 There are two methods for demonstrating compliance under AD(O):

> **Simplified**: The simplified method requires dwellings to accommodate design limitations on maximum glazed areas, minimum openable areas for natural ventilation and external shading.

> **Dynamic**: The dynamic method requires dwellings to demonstrate compliance with CIBSE TM59 criteria (with a few specific limitations on use of the TM59 methodology) via dynamic thermal modelling.

CIBSE TM59 (2017) Assessment Criteria

3.4 The criteria for the assessment of overheating risk have been specified by the Chartered Institute of Building Services Engineers (CIBSE) in TM59 *Design methodology for the assessment of overheating risk in homes* (2017). CIBSE TM59 provides a standardised approach to predicting overheating risk for both naturally and mechanically ventilated residential buildings.

3.5 The following criteria must be met in order to demonstrate compliance under a predominantly naturally ventilated scenario:

> **Criterion A**: The indoor operative temperature should not exceed the threshold comfort temperature by 1°C or more for more than 3% of occupied hours in living rooms, kitchens and bedrooms.

> **Criterion B**: To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am should not exceed 26°C for more than 1% of annual hours.

3.6 Under a predominantly mechanically ventilated scenario, all occupied rooms should not exceed an operative temperature of 26 ˚C for more than 3% of the annual occupied annual hours. This scenario can be used for homes with restricted window openings.

4. MODELLING APPROACH

4.1 Dynamic thermal modelling has been undertaken using DesignBuilder Software (v.7). The performance of the units has been assessed following CIBSE TM59 and the adaptive thermal comfort method for a primarily natural ventilated scenario. Additional modelling limitations set by AD(O) have also been applied.

4.2 Thermal comfort category II has been used, representing normal expectation (for new buildings and renovations).

Site External Weather Conditions

4.3 External temperatures and incident solar gains are greatest during summer months, coinciding with periods of lower wind speeds. Solar altitude is also highest during summer months, increasing the effects of façade shading from balcony overhangs and window reveals. Such considerations should be accounted for when designing for overheating risk.

4.4 The effects of external conditions are vital in an overheating assessment as they influence:

> Solar heat gains (a function of incident direct and diffuse solar radiation and solar altitude); and

> Calculated natural ventilation rates (a function of external temperature, wind directions and speeds).

4.5 CIBSE design summer year (DSY) weather data for London Heathrow (representative of urban and suburban areas outside of the Central Activity Zone (CAZ)) has been used for the 2020s, high emissions, 50 % percentile scenario as required by CIBSE TM59.

4.6 The assessment of overheating risk has been undertaken using the DSY1 weather file, in accordance with the requirements of TM59 and AD(O). The final mitigation strategy has also been tested under the more extreme DSY2 and DSY3 weather files and the results are presented in Appendix C.

Model Geometry and Local Shading

4.7 Overshadowing from external buildings has been taken into account during the simulation, based on the model geometry and the site orientation.

4.8 The simulation model is shown in Figure 2 & 3 below.

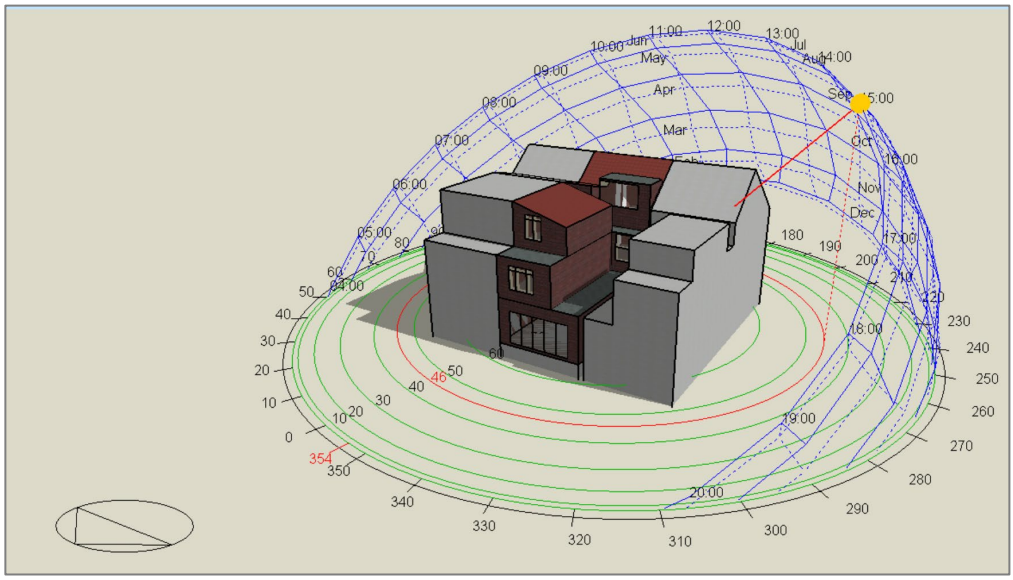


Figure 2: Simulation model from DesignBuilder (21st June @15:00)

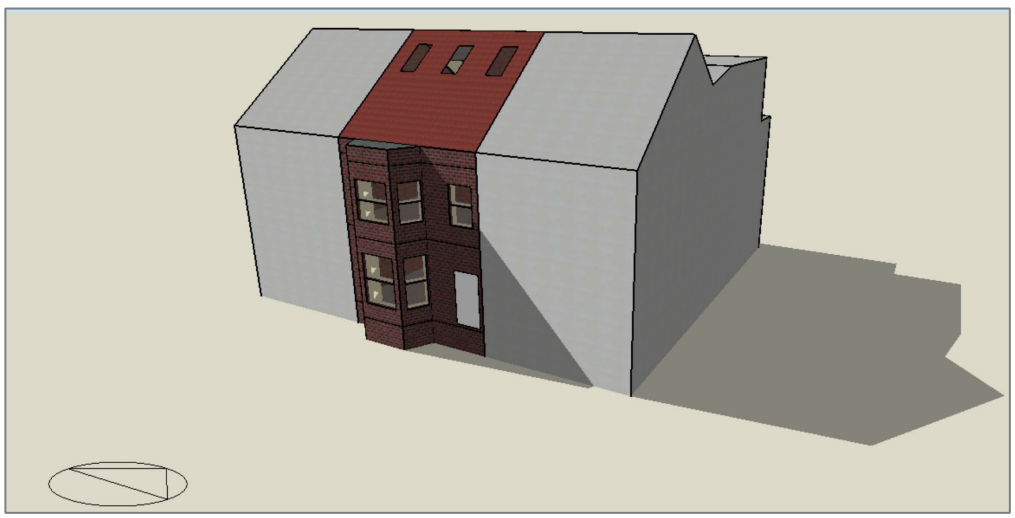


Figure 3: Simulation model from DesignBuilder (21st June @15:00)

5. RESULTS

5.1 The following results presented in Table 1 indicate that, based on the design modelling inputs in Appendix B and passive overheating mitigation measures outlined above, assessed bedrooms do not meet the CIBSE TM59 criteria and therefore demonstrate an unacceptable level of overheating risk.

5.2 These results are based on windows being open with no usability constraints, in accordance with paragraph 2.6 of AD(O):

- *When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following:*
  - *Start to open when the internal temperature exceeds 22°C;*
  - *Be fully open when the internal temperature exceeds 26°C;*
  - *Start to close when the internal temperature falls below 26°C;*
  - *Be fully closed when the internal temperature falls below 22°C.*
- *At night (11pm to 8am), openings should be modelled as fully open if both of the following apply:*
  - *The opening is on the first floor or above and not easily accessible;*
  - *The internal temperature exceeds 23°C at 11pm.*
- *When a ground floor or easily accessible room is unoccupied, both of the following apply:*
  - *In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely;*
  - *At night, windows, patio doors and balcony doors should be modelled as closed.*

Table 1: TM59 overheating results for dwellings (assuming no window opening constraints) under DSY1 2020s

Unit	Room	TM59 Criterion A: Hours of exceedance (pass ≤ 3 %)	TM59 Criterion B: Bedroom temperature hours > 26 °C (pass ≤ 32)	Overall compliance with TM59
		% Hours of overheating	Hours of overheating	
57 Hillfield Road	GF-LKD	4.7	n/a	Fail
	1F Bedroom 1	17.7	216	Fail
	1F Bedroom 2	5.6	321	Fail
	1F Bedroom 3	10.5	263	Fail
	2F Bedroom 4	21.7	330	Fail
	2F M.Bedroom	53.6	702	Fail

Passive Measures

5.3 In line with the Cooling Hierarchy as described within Local Plan policy CC2, passive measures should be explored prior to any consideration of comfort cooling.

5.4 Explored passive measures are workable within the context of an existing building and do not include invasive measures or those that would result in a significant visual impact to the buildings' exterior. The measures explored within modelling include:

> Reduced window g-value to 0.40, achievable through installation of solar control films to windows;

> High reflectivity internal blinds.

5.5 Results from dynamic modelling incorporating the passive measures outlined above are shown in Table 2. It is shown that despite installation of passive measures, a significant level of overheating risk remains at the property.

Table 2: TM59 overheating results for dwellings (assuming no window opening constraints) under DSY1 2020s

Unit	Room	TM59 Criterion A: Hours of exceedance (pass ≤ 3 %)	TM59 Criterion B: Bedroom temperature hours > 26 °C (pass ≤ 32)	Overall compliance with TM59
		% Hours of overheating	Hours of overheating	
57 Hillfield Road	GF LDK	2.3	n/a	Pass
	1F Bedroom 1	7.2	156	Fail
	1F Bedroom 2	3.8	256	Fail
	1F Bedroom 3	7.6	239	Fail
	2F Bedroom 4	19.2	305	Fail
	2F M.Bedroom	50.4	663	Fail

Mechanical Measures

5.6 Due to the significant extent of overheating risk at the property, it is recommended that a comfort cooling solution is more appropriate to mitigate the level of overheating risk. It is proposed that an air conditioning system be installed at the property.

6. CONCLUSION

6.1 The purpose of this report is to outline the level of overheating risk at the existing property at 57 Hillfield Road.

6.2 The performance of the property has been assessed against the Chartered Institute of Building Services Engineers (CIBSE) guidance TM59 Design methodology for the assessment of overheating risk in homes (2017) and Approved Document O Overheating (2021).

6.3 Passive measures have been deemed insufficient for mitigating the extent of overheating risk present at the property and are additionally ruled out on the grounds of visual impact and difficulty in retrofitting the property.

6.4 The property does not demonstrate compliance with CIBSE TM59 and AD(O) overheating assessment criteria under the London Heathrow weather file (DSY1 for the 2020s, high emissions, 50% percentile scenario). This demonstrates that the property is subject to significant overheating risk.

6.5 A comfort cooling solution is recommended as the most appropriate way to mitigate the overheating risk.

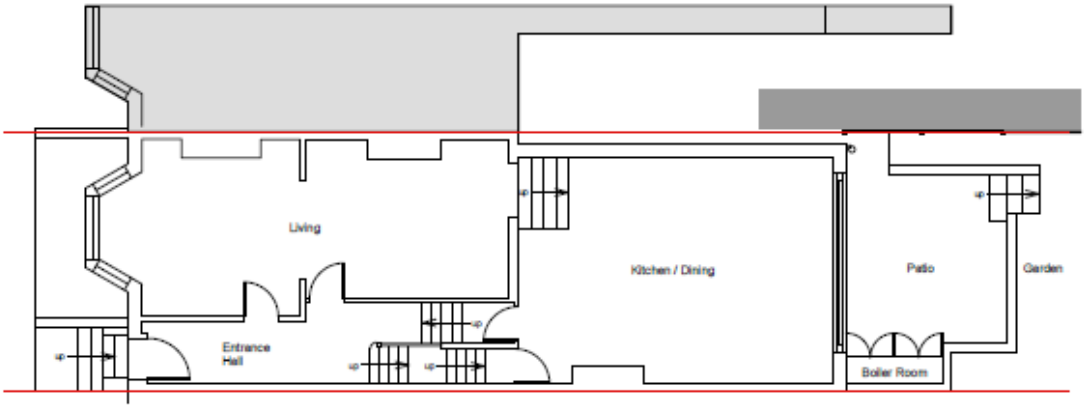
APPENDICES

Appendix A – Floor Plans

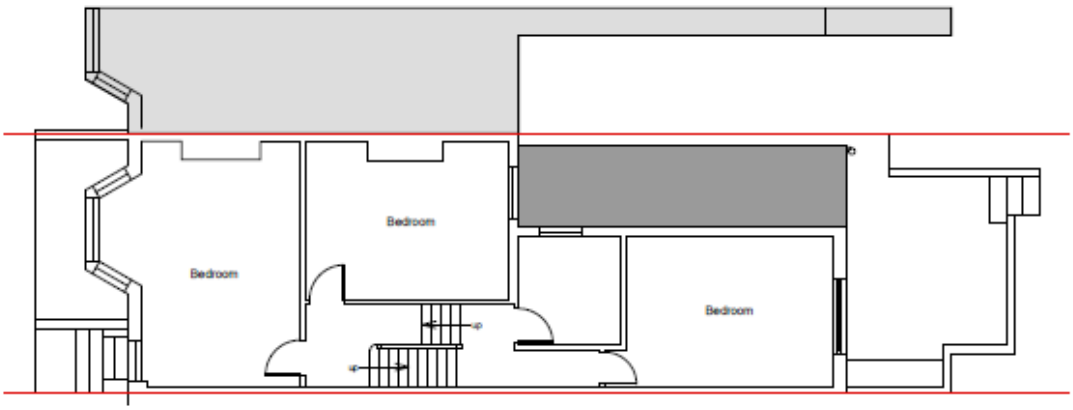
Appendix B – Model Inputs Table

Appendix C – Results for DSY2 & DSY3

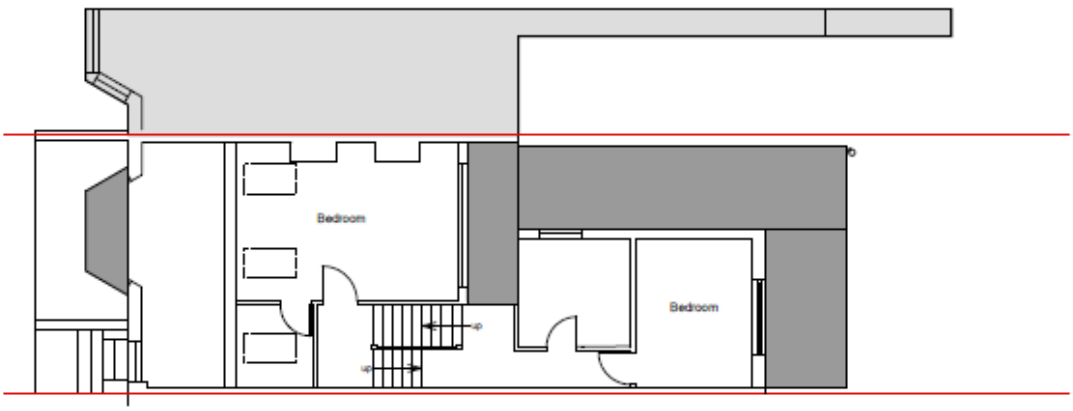
APPENDIX A – FLOOR PLANS



Ground Floor Plan as Existing - 1:100



First Floor Plan as Existing - 1:100



2nd Floor Plan as Existing - 1:100

Figure A1: Floor plans (JAS, April 2024)

APPENDIX B – MODEL INPUTS TABLE

The following modelling inputs have been included in the baseline dynamic thermal simulation.

Table B.1: Baseline dynamic thermal modelling design assumptions

Data Input			Discussion
Weather data	**Location**	CIBSE London Heathrow Design Summer Years (DSYs) for 2020s, high emissions, 50% percentile scenario	*Geographically closest and most representative industry-standard CIBSE weather data file*
Building Fabric Construction details	**External walls**	2.10 W/m^{2}K	*As per RdSAP Pre-1900 England and Wales values with solid brick construction.*
	Roofs	2.30 W/m^{2}K	*As per the As per RdSAP Pre-1900 England and Wales values.*
	Ground floor	1.20 W/m^{2}K	*As per the As per RdSAP Pre-1900 England and Wales values.*
	Party walls between units	Assumed to be adiabatic between adjacent dwellings	
	Partitions within units	Solid brick partitions	*Assumed thicknesses as per drawings (JAS Design, April 2024)*
	Internal doors	Widths assumed as per drawings	*As per drawings (JAS Design, April 2024)*
Windows	**Windows and Glazed Doors**	U value 4.8 W/m^{2}K	*RdSAP Window characteristics values.*
	Reveal depth	External reveal: 100 - 139 mm	*As per drawings (JAS Design, April 2024)*
	Sill / transom height	500-600 mm	*As per drawings (JAS Design, April 2024)*
	Opening type	Windows: sash windows Glazed doors: outwards opening angle	*As determined from drawings (JAS Design, April 2024) and photographs provided by Architect.*
	Discharge Coefficient	Discharge coefficient: 0.37 – 0.58	*Calculated from window dimensions as per drawings (JAS Design, April 2024) using the BB101 discharge coefficient calculator stated within Approved Document O (2021)*
Infiltration	**Air Tightness**	5.0 m^3/hr-m^2 @ 50 pascals	*Nominal assumption in line with building age.*

The following occupancy schedules and internal gains assumptions have been used, in accordance with CIBSE TM59 guidance.

Table B.2: Occupancy and equipment gains for dwellings (CIBSE TM59)

Unit/room type	Occupancy	Equipment Load
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
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

APPENDIX C – RESULTS FOR DSY2 & DSY3

Table C.1: TM59 overheating results for dwellings (assuming no window opening constraints) under DSY2 2020s

Unit	Room	TM59 Criterion A: Hours of exceedance (pass ≤ 3 %)	TM59 Criterion B: Bedroom temperature hours > 26 °C (pass ≤ 32)	Overall compliance with TM59
		% Hours of overheating	Hours of overheating	
57 Hillfield Road	GF-LKD	3.4	n/a	Fail
	1F Bedroom 1	6.5	149	Fail
	1F Bedroom 2	4.6	208	Fail
	1F Bedroom 3	6.2	223	Fail
	2F Bedroom 4	14.7	268	Fail
	2F M.Bedroom	45.4	627	Fail

Table C.2: TM59 overheating results for dwellings (assuming no window opening constraints) under DSY3 2020s

Unit	Room	TM59 Criterion A: Hours of exceedance (pass ≤ 3 %)	TM59 Criterion B: Bedroom temperature hours > 26 °C (pass ≤ 32)	Overall compliance with TM59
		% Hours of overheating	Hours of overheating	
57 Hillfield Road	GF-LKD	4.9	n/a	Fail
	1F Bedroom 1	8.0	188	Fail
	1F Bedroom 2	6.0	286	Fail
	1F Bedroom 3	8.5	273	Fail
	2F Bedroom 4	19.1	337	Fail
	2F M.Bedroom	48.0	656	Fail