Dynamic Overheating Report

Chase New Homes

The Barn Hotel

Final

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BEng (hons), MSc

September 2024

DOCUMENT CONTROL RECORD

REPORT STATUS: FINAL

Version	Date	Reason for issue	Author	Checked by	Approved for Issue by Project Manager
v.1	05.09.2024	Draft	H Fry	K Paxton	H Fry p.p., P Mohajerani
v.2	09.09.2024	Final	H Fry	K Paxton	P Mohajerani
v.3	11.09.2024	Final - Update	H Fry	K Paxton	P Mohajerani

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Executive Summary

The purpose of this report is to provide the overheating mitigation strategy for the proposed development at The Barn Hotel by Chase New Homes in The London Borough of Hillingdon, in support of the planning application and to ensure that the development is compliant with Part O (2021) of the Building Regulations.

The performance of dwellings has been assessed against the Charted Institution of Building Services Engineers (CIBSE) guidance TM59 *Design methodology for the assessment of overheating risk in homes* (2017) and including limitations imposed within Approved Document O *Overheating* (2021).

A sample of dwellings has been selected for the dynamic overheating assessment based on design characteristics that establish them as representative of the overall proposed scheme. This selection of dwellings includes consideration of varying floors and of different orientations.

The following passive mitigation measures have been explored as far as practicable to avoid the need for active cooling:

> Window design maximising openable area and reducing instances of fixed glazing to increase natural ventilation and reduce solar gain;

> Solar control glazing, with G-values optimised alongside the energy strategy to ensure minimal solar gain whilst still achieving fabric energy efficiency targets;

> Mechanical ventilation with heat recovery (MVHR), with ventilation rates exceeding minimum Part F; and

> Where necessary due to noise risk considerations, air tempering (also known as peak lopping) units connected to the MVHR system to allow for mitigation when window-opening is constrained.

All dwellings tested demonstrate compliance with the CIBSE TM59 and AD(O) overheating assessment criteria under the mandatory weather file (DSY1 for the 2020s, high emissions, 50% percentile scenario). The results are based on key design features and passive mitigation measures following the London Plan cooling hierarchy, as outlined within Table i.

Table i: Design features incorporated in accordance with the London Plan cooling hierarchy

Cooling hierarchy	Design feature	Discussion
1. Reduce amount of heat entering the building	Efficient building fabric and air tightness standards	In line with energy strategy (Hodkinson Consultancy, August 2024)

Cooling hierarchy	Design feature	Discussion
	Solar control glazing with G-value of 0.38	A low G-value reduces solar gain, but has implications on CO_2 emissions, fabric energy efficiency and internal daylight levels and has therefore been optimised to balance all aspects as far as possible
	External shading provided by balcony overhangs large external reveal depths	In line with design proposals (CMYK Design & Planning, August 2024)
2. Minimise internal heat generation	Energy efficient design of building services	In line with energy strategy (Hodkinson Consultancy, August 2024)
3. Manage the heat	225 mm concrete floor slab between dwellings in apartment blocks	The thermal mass of this will help reduce the risk of overheating by absorbing heat during the daytime
4. Passive ventilation	Openable windows used as the primary means of ventilation	Windows are simulated to open in accordance with the limits set out within Approved Document O (2021)
5. Mechanical ventilation	Background mechanical ventilation rate exceeding minimum Part F (up to 90 l/s)	Minimum Part F ventilation rates range from 0.57-0.90 ach for the assessed dwellings 90 l/s ventilation rates equivalent to 1.50-2.65 ach
6. Active cooling	Air tempering bolt-on to MVHR to be provided to those dwellings with window opening limitations due to external noise	Air tempering to provide 1.03kW cooling capacity and ventilation rate of 90 l/s No requirement for active cooling

CONTENTS

1. INTRODUCTION

1.1 This document has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, to present the overheating mitigation strategy for the proposed development at The Barn Hotel by Chase New Homes.

Site Location

1.2 The proposed development is located off West End Road in Ruislip, in the London Borough of Hillingdon. The site is located to the south of the London Underground rail line (Metropolitan and Piccadilly) and Ruislip train station and to the east of West End Road (A4180), as shown in Figure 1 below.

Figure 1: Site location (source: Google maps, Map data 2024)

Planning History & Development Description

1.3 This submission follows the refusal of full planning permission in June 2023 and grant of Listed Building Consent in October 2023 as well as detailed pre-application engagement between January and July 2024.

1.4 The application was refused for 11 reasons, these are summarised as follows:

> *The development would be overdevelopment of the site, detrimental to the setting of the Grade II listed buildings. A lack of detail of the treatment of the historic fabric of the listed buildings was provided to enable the benefits of the scheme to be weighed against any potential harms.*

> *The proposal would be visually dominant, and overdevelopment of the site at odds with the distinctive suburban character of the surrounding area, harming the visual amenity and character of the area.*

> *The unit mix fails to provide sufficient family sized units to reflect housing need in the Borough.*

> *Cycle parking design does not conform to the London Cycling Design Standards.*

> *Insufficient information on overheating and any mitigation required.*

> *Insufficient information on levels of daylight and sunlight amenity.*

> *Suitable SuDs was not shown to be incorporated.*

> *Inadequate information on potential harm to bat roosts.*

> *Failure to provide adequate provision of disabled units.*

> *Failure to provide adequate levels of amenity space for future occupants.*

> *Absence of completed S106 Agreement.*

1.5 On 24 October 2023 the parallel Listed Building Consent (LBC) application was granted (LPA Ref. 7969/APP/2023/1833). This approval therefore addressed part of reason for refusal 1.

1.6 This new scheme is a fresh design approach to development on the site which has taken account of all matters raised during engagement with the Local Planning Authority to date. This approach has enabled the Applicant to develop a sensitive and attractive scheme which responds to local context, including the sites heritage significance, and will add positively to the quality of the area.

1.7 The proposed development is described as follows:

'Partial demolition of 1no. Grade II Listed Building and conversion of both (2no.) listed buildings to provide 3no. dwellings. Demolition and redevelopment of the remainder of the site for residential use with associated infrastructure, public open space and landscaping.'

1.8 Figure 2 below indicates the proposed site plan.

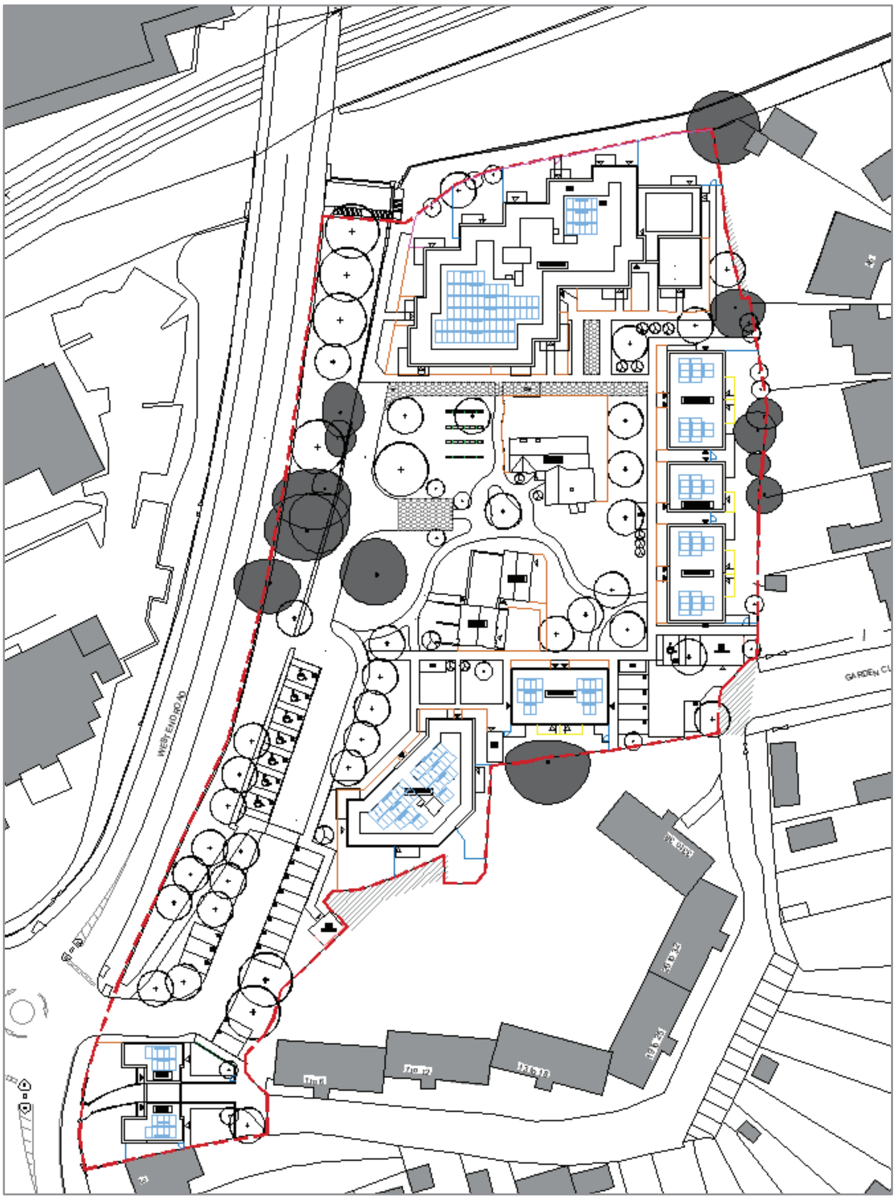


Figure 2: Proposed Block Plan (source: CMYK (Planning & Design) Ltd, August 2024)

Overheating and Thermal Comfort

1.9 Maintaining comfortable thermal comfort conditions in the face of climate change and increasing temperatures is one of the greatest challenges to be addressed by designers. 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.

1.10 Dynamic thermal simulations have been carried out for representative dwellings, to determine whether there is a risk of overheating. Appropriate mitigation measures have been recommended to mitigate the overheating risk and ensure that comfortable thermal conditions are achieved.

2. PLANNING POLICY

2.1 The following planning policies and requirements have informed the sustainable design of the proposed development.

National Planning Policy: NPPF

2.2 The revised National Planning Policy Framework (NPPF) was published on the 20th December 2023 and sets out the Government's planning policies for England. It describes a proactive approach that plans should take to mitigating and adapting to climate change, considering the risk of overheating from rising temperatures.

2.3 New developments should be planned for in ways that avoid increased vulnerability to the range of impacts arising from climate change.

Regional Planning Policy: The London Plan (2021)

2.4 The following key policy of the London Plan is considered relevant to the proposed development and this Overheating Assessment:

2.5 **Policy SI4 Managing Heat Risk** states that development proposals should minimise adverse impacts on urban heat island through design, layout, orientation, materials and the incorporation of green infrastructure and that major development proposals should demonstrate through an energy strategy how they will reduce the potential for internal overheating and reliance on air conditioning systems in accordance with the following cooling hierarchy (Figure 3):

2.6 Low-energy measures should be used to mitigate overheating risk. These include solar shading, building orientation and solar-controlled glazing. Occupant behaviour will also have an impact on overheating risk.

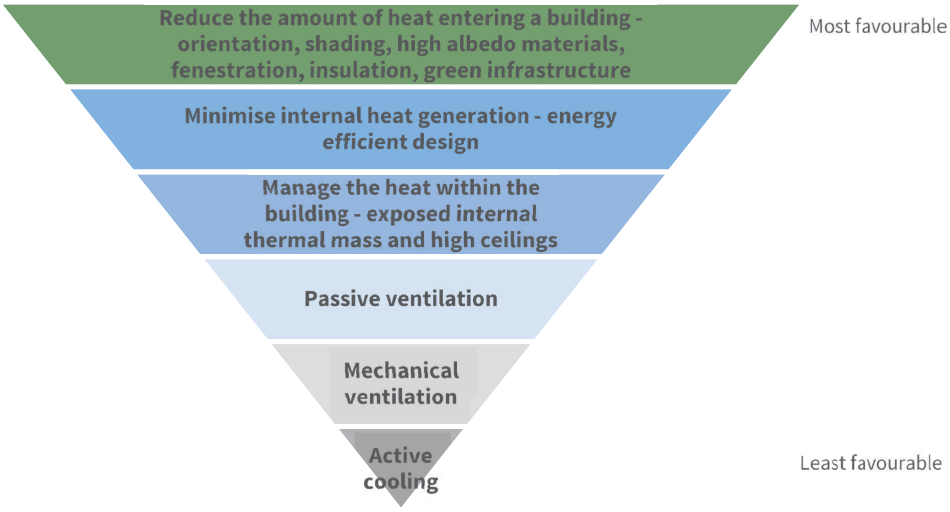


Figure 3: Cooling Hierarchy (London Plan 2021)

2.7 Passive ventilation should be prioritised, (accounting for external noise issues and local air quality). The increased use of air conditioning systems is not desirable. If active cooling systems, such as air conditioning systems, are unavoidable, these should be designed to reuse the waste heat they produce.

GLA Energy Assessment Guidance (2022)

2.8 The GLA Energy Assessment Guidance (2022) requires all developments to undertake a detailed analysis of the risk of overheating. The GHA Early Stage Overheating Risk Tool should be included within the assessment (see Appendix E).

2.9 For dwellings, final proposals must demonstrate compliance with Building Regulations Part O (2021) and CIBSE TM59 (2017).

Local Planning Policy: London Borough of Hillingdon Local Plan (2012)

2.10 London Borough of Hillingdon’s Local Plan was issued in two parts. Part 1: Strategic Policies was adopted in 2012 and Part 2: Development Management Policies was adopted in 2020. The key policies from these documents pertinent to this Overheating Assessment are:

> **Policy EM1: Climate Change Adaptation and Mitigation** – requires “*promoting the inclusion of passive design measures to reduce the impacts of urban heat effects*”.

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 The proposed development will be subject to Part O of the Building Regulations, for which requirements are set out within Approved Document O (AD(O)) for Overheating (2021). Compliance 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.

3.4 For the purposes of this assessment, the dynamic method has been used for demonstrating compliance.

CIBSE TM59 (2017) Assessment Criteria

3.5 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.

3.6 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 1ºC 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.

3.7 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).

Unit Selection

4.3 According to CIBSE TM59 "*The assessment should try to identify all the dwellings that are at risk of overheating. These are likely to be those (a) with large glazing areas, (b) on the topmost floor, (c) having less shading, (d) having large, sun-facing windows, (e) having a single aspect, or (f) having limited opening windows*".

4.4 The unit selection has followed the CIBSE TM59 methodology considering each of the criteria outlined above, including top floor units, those that are south facing with limited shading and those with limited window opening due to noise risk. The selection of units is broadly based on the following design characteristics, which make it representative of the development:

- Unit type (comprising both flats and maisonettes);
- Façade orientation, including north, east, south and west;
- Occupancy (e.g., 1B2P, 2B3P, 3B5P etc.);
- Floor levels, including ground and top floor units;

- Exposure to noise risk conditions – all noise risk scenarios are included within the selection; and
- Inclusion of 'worst-case' units.

4.5 Table 1 outlines the units selected for overheating assessment.

Table 1: Dwelling unit selection for overheating analysis

Unit	Type	Size (m^2)	Floor Level	Tenure	Orientation	Aspect	Noise Risk Category (Cass Allen, August 2024)
1	Apartment	89.0	Ground	2B4P	South	Dual	Windows fully open
2	Apartment	61.2	First	2B3P	South/East	Dual	Windows fully open
3	Apartment	82.1	Second	3B5P	South/West	Dual	Windows to 2% floor area /closed
4	Apartment	50.5	Top (Third)	1B2P	North	Dual	Windows to 4% floor area
5	Maisonette	68.4	Ground	2B3P	East/South/ West	Triple	Windows to 4% floor area /fully open
6	Maisonette	61.3	First	2B3P	North/South/ West	Triple	Windows to 4% floor area /fully open
7	Apartment	52.5	Ground	1B2P	North/West	Dual	Windows to 2% floor area /4% floor area
8	Apartment	70.8	Top (Second)	1B2P	North/West	Dual	Windows to 2% floor area /closed

4.6 It is acknowledged that not all unit types are included within the unit selection, however all scenarios that result in an increased risk of overheating have been included and all unit types across the development can be reasonably represented by one of the modelled types.

4.7 Internal layouts of the homes and communal corridors selected for assessment are presented in Appendix A. Design modelling inputs for the assessed dwellings can be found in Appendix B.

Site External Weather Conditions

4.8 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.

4.9 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).

4.10 CIBSE design summer year (DSY) weather data for London Heathrow (representative of urban and semi-urban areas outside of the central activity zone (CAZ)) has been used for the 2020s, high emissions, 50 % percentile scenario as required by CIBSE TM59.

4.11 The assessment of overheating risk has been undertaken using the DSY1 weather file, in accordance with the requirements of TM59, the London Plan 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

4.12 Overshadowing from the building blocks has been taken into account during the simulation, based on the model geometry and the site orientation.

4.13 Solar control forms an integral part of overheating mitigation strategies. External shading in the form of balconies is applied across many of the façades as part of the design proposals. These were incorporated in the simulation model as shown in Figure 4.

4.14 Horizontal shading devices such as balconies and overhangs are more efficient when applied in south oriented façades and during midday when the solar angle is high. Their role in reducing solar gains in the summer period is considered to be paramount.

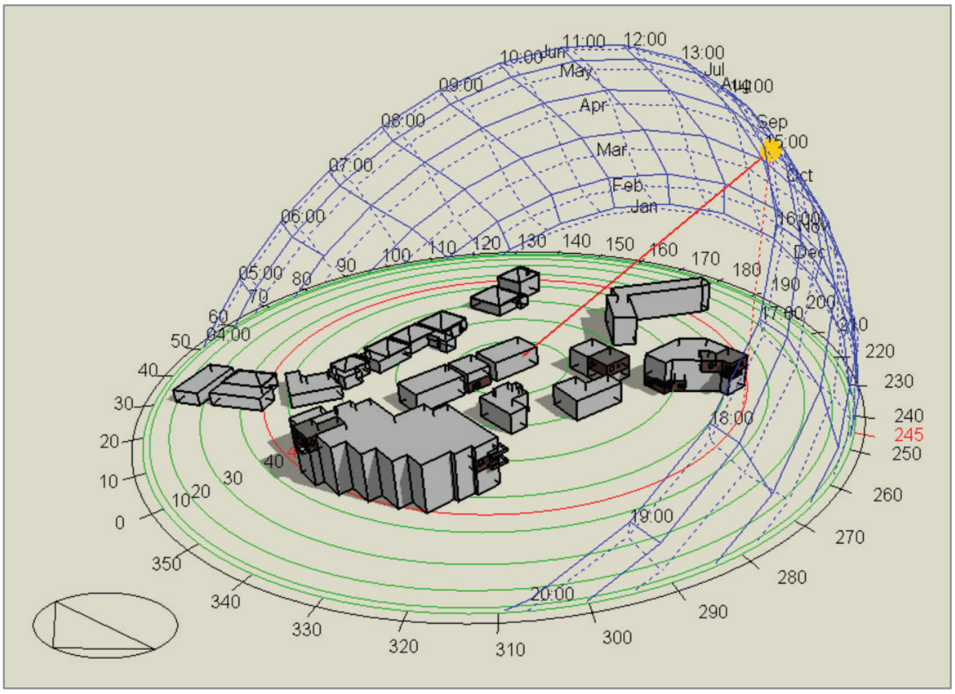


Figure 4: Simulation model from DesignBuilder (15th July @15:00)

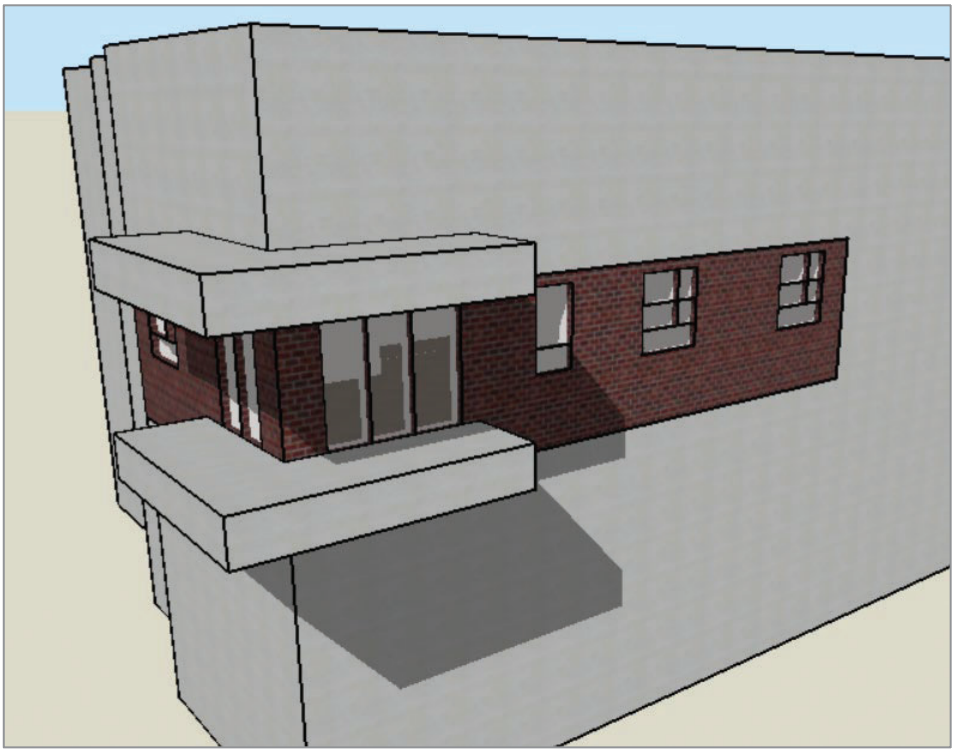


Figure 5: Solar control gazing example model from DesignBuilder (15th July @15:00)

5. PASSIVE MITIGATION STRATEGY

5.1 The following passive design measures have been incorporated in order to reduce the risk of overheating to an acceptable level, as determined by CIBSE TM59:

- High performance solar control glazing with a g-value of 0.38, optimised to mitigate overheating risk whilst achieving fabric energy efficiency targets and natural daylight provision
- External shading is provided to some windows in form of balconies and 145 mm external reveal depths;
- Highly efficient fabric envelope and high efficiency building services heating system, lighting and appliances are proposed in all dwellings to reduce internal gains;
- A concrete floor slab within the apartment blocks provides some thermal capacity to absorb excessive heat within the building;
- Openable areas of windows have been maximised, to ensure adequate natural ventilation:
    - For dwellings at first floor level and above, window casements open inwards to allow maximum openability;
    - Guarding heights are 1.1m from finished floor level, enabling windows to be fully open without the need for safety restrictors;
    - For dwellings with bedrooms at ground floor level, lockable louvred shutters are provided so windows can be securely open through the night. These shutters are located internally, with window casements opening outwards;
- A background mechanical ventilation system providing minimum Part F ventilation rates to dwellings, with the capacity to achieve up to 90l/s boosted air flow during hot weather;

Dwelling Results

5.2 The following results presented in Table 2 indicate that, based on the design modelling inputs in Appendix B and passive overheating mitigation measures outlined above, all assessed rooms meet the CIBSE TM59 criteria and therefore demonstrate an acceptable level of overheating risk.

5.3 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 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	
Unit 1	Bedroom 1	0.0	26	Pass
	Bedroom 2	0.0	32	Pass
	Bedroom 3	0.0	29	Pass
	Kitchen	0.1	n/a	Pass
	Living/Dining	0.2	n/a	Pass
Unit 2	Bedroom 1	0.1	30	Pass
	Bedroom 2	0.0	26	Pass
	LDK	0.1	n/a	Pass
Unit 3	Bedroom 1	0.0	26	Pass
	Bedroom 2	0.0	29	Pass
	Bedroom 3	0.1	32	Pass
	LDK	0.3	n/a	Pass
Unit 4	Bedroom	0.0	28	Pass

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	
	LDK	0.0	n/a	Pass
Unit 5	Bedroom 1	0.1	31	Pass
	Bedroom 2	0.1	29	Pass
	LDK	0.4	n/a	Pass
Unit 6	Bedroom 1	0.0	22	Pass
	Bedroom 2	0.0	26	Pass
	LDK	0.0	n/a	Pass
Unit 7	Bedroom	0.0	28	Pass
	LDK	0.2	n/a	Pass
Unit 8	Bedroom	0.0	28	Pass
	LDK	0.2	n/a	Pass

6. WINDOW OPENING CONSTRAINTS

6.1 A Noise Impact Evaluation has been completed by Cass Allen (August 2024), detailing window opening constraints due to noise under criteria within AD(O). The façade markup in , taken from the Cass Allen report, shows allowable window opening across the development site.

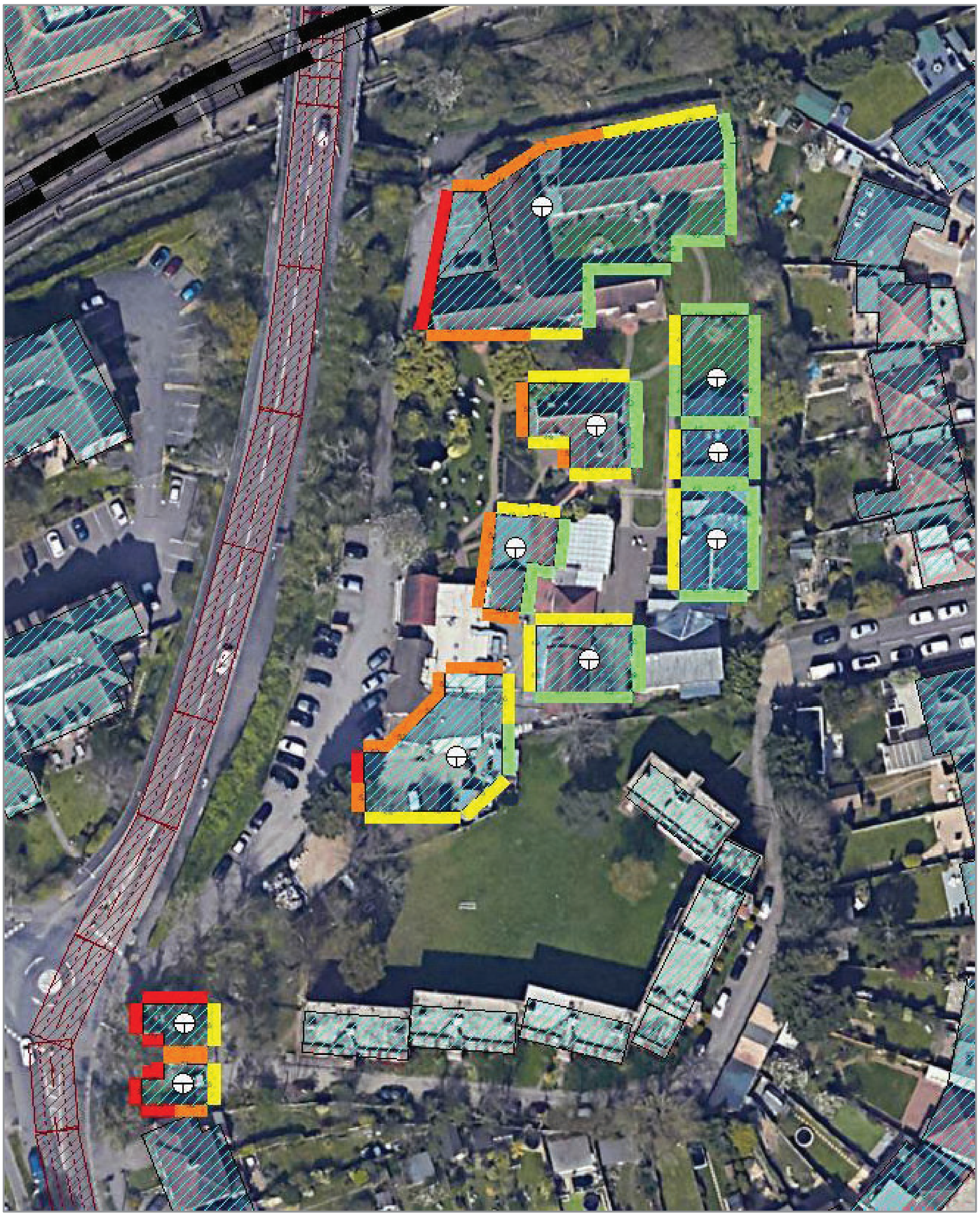


Figure 6: AD(O) acoustic markup (Cass Allen, August 2024)

6.2 An Air Quality Assessment has been completed for the development by Cass Allen (August 2024) and it has been concluded that windows will not be required to be fixed shut due to air quality risk.

6.3 Units at ground floor level have window opening constraints due to security risk. These units will not rely on window opening for natural ventilation during sleeping hours.

Dwelling Results

6.4 The following results presented in Table 4 demonstrate the impact that night-time window opening constraints due to external noise has on the risk of overheating within dwellings.

6.5 These results are based on the following limitations applied to bedroom windows:

Table 3: Window opening limitations in bedrooms at night

Noise Risk Zone Reference	Façade Colour (Figure6)	Window Openability (Bedrooms, 23:00-07:00) – Cass Allen, August 2024
Zone 1	Red	Windows closed during sleeping hours
Zone 2	Orange	Windows restricted to an opening no greater than 2% of the floor area during sleeping hours
Zone 3	Yellow	Windows restricted to an opening no greater than 4% of the floor area during sleeping hours
Zone 4	Green	No limitations, windows open as per AD(O) rules

Table 4: TM59 overheating results for dwellings (with window opening constraints due to noise) 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	
Unit 1	Bedroom 1	0.0	27	Pass
	Bedroom 2	0.0	31	Pass
	Bedroom 3	0.0	29	Pass
	Kitchen	0.1	n/a	Pass
	Living/Dining	0.2	n/a	Pass

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	
Unit 2	Bedroom 1	0.1	30	Pass
	Bedroom 2	0.0	26	Pass
	LDK	0.1	n/a	Pass
Unit 3	Bedroom 1	0.0	41	Fail
	Bedroom 2	0.0	48	Fail
	Bedroom 3	0.4	150	Fail
	LDK	0.4	n/a	Pass
Unit 4	Bedroom	0.0	47	Fail
	LDK	0.0	n/a	Pass
Unit 5	Bedroom 1	0.1	31	Pass
	Bedroom 2	0.1	29	Pass
	LDK	0.4	n/a	Pass
Unit 6	Bedroom 1	0.0	47	Fail
	Bedroom 2	0.0	38	Fail
	LDK	0.0	n/a	Pass
Unit 7	Bedroom	0.1	61	Fail
	LDK	0.2	n/a	Pass
Unit 8	Bedroom	0.0	47	Fail
	LDK	0.2	n/a	Pass

Mechanical Mitigation Measures

6.6 In order to mitigate the residual risk of overheating as a result of external noise constraints, mechanical measures have been explored. It is proposed to install an ‘air tempering’ (also known as ‘peak lopping’) cooling coil bolt-on to the MVHR system within the affected dwellings.

6.7 The air tempering system will be designed to provide 1.03 kW of DX cooling capacity and an air flow rate of 90 l/s. In flats falling into noise risk zone 1, air flow will be redirected to supply a greater proportion to bedrooms falling within this risk category.

6.8 The following results in Table 5 demonstrate that this system will be capable of reducing the risk of overheating to an acceptable level, within the CIBSE TM59 criteria. The criteria for predominantly naturally ventilated dwellings has been used, as windows can still be relied upon for daytime ventilation.

Table 5: TM59 overheating results for dwellings with air tempering strategy, 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	
Unit 1	Bedroom 1	0.0	27	Pass
	Bedroom 2	0.0	31	Pass
	Bedroom 3	0.0	29	Pass
	Kitchen	0.1	n/a	Pass
	Living/Dining	0.2	n/a	Pass
Unit 2	Bedroom 1	0.1	30	Pass
	Bedroom 2	0.0	26	Pass
	LDK	0.1	n/a	Pass
Unit 3	Bedroom 1	0.0	22	Pass
	Bedroom 2	0.0	23	Pass
	Bedroom 3	0.0	32	Pass
	LDK	0.3	n/a	Pass
Unit 4	Bedroom	0.0	2	Pass
	LDK	0.0	n/a	Pass
Unit 5	Bedroom 1	0.1	31	Pass
	Bedroom 2	0.1	29	Pass
	LDK	0.4	n/a	Pass
Unit 6	Bedroom 1	0.0	17	Pass
	Bedroom 2	0.0	9	Pass
	LDK	0.0	n/a	Pass
Unit 7	Bedroom	0.0	4	Pass
	LDK	0.0	n/a	Pass
Unit 8	Bedroom	0.0	1	Pass
	LDK	0.0	n/a	Pass

7. CONCLUSION

7.1 The purpose of this report is to provide the overheating mitigation strategy for the proposed development at The Barn Hotel by Chase New Homes in The London Borough of Hillingdon, in support of the planning application and to ensure that the development is compliant with Part O (2021) of the Building Regulations.

7.2 The performance of dwellings has been assessed against the Charted Institution of Building Services Engineers (CIBSE) guidance TM59 *Design methodology for the assessment of overheating risk in homes* (2017) and including limitations imposed within Approved Document O *Overheating* (2021).

7.3 A sample of dwellings has been selected for the dynamic overheating assessment based on design characteristics that establish them as representative of the overall proposed scheme. This selection of dwellings includes consideration of varying floors and of different orientations.

7.4 For the purpose of this report, passive measures including improved window design, solar control glazing and enhanced background mechanical ventilation have been explored as far as practicable to avoid the need for active cooling.

7.5 Due to the noise risk at the site, window opening is constrained and passive measures are not sufficient to mitigate overheating in affected units. It has been demonstrated that peak lopping MVHR reduces overheating to an acceptable level in this instance, avoiding the need for full comfort cooling.

7.6 All dwellings tested demonstrate compliance with the CIBSE TM59 and AD(O) overheating assessment criteria under the mandatory weather file (DSY1 for the 2020s, high emissions, 50% percentile scenario). The results are based on key design features and passive mitigation measures following the London Plan cooling hierarchy.

APPENDICES

Appendix A
Assessed Dwellings

Appendix B
Design Modelling Inputs

Appendix C
Results of DSY2 and DSY3 Weather Scenarios

Appendix D
Overheating Strategy Markup

Appendix E
GHA Early Stage Overheating Risk Tool

Appendix A

Assessed Dwellings

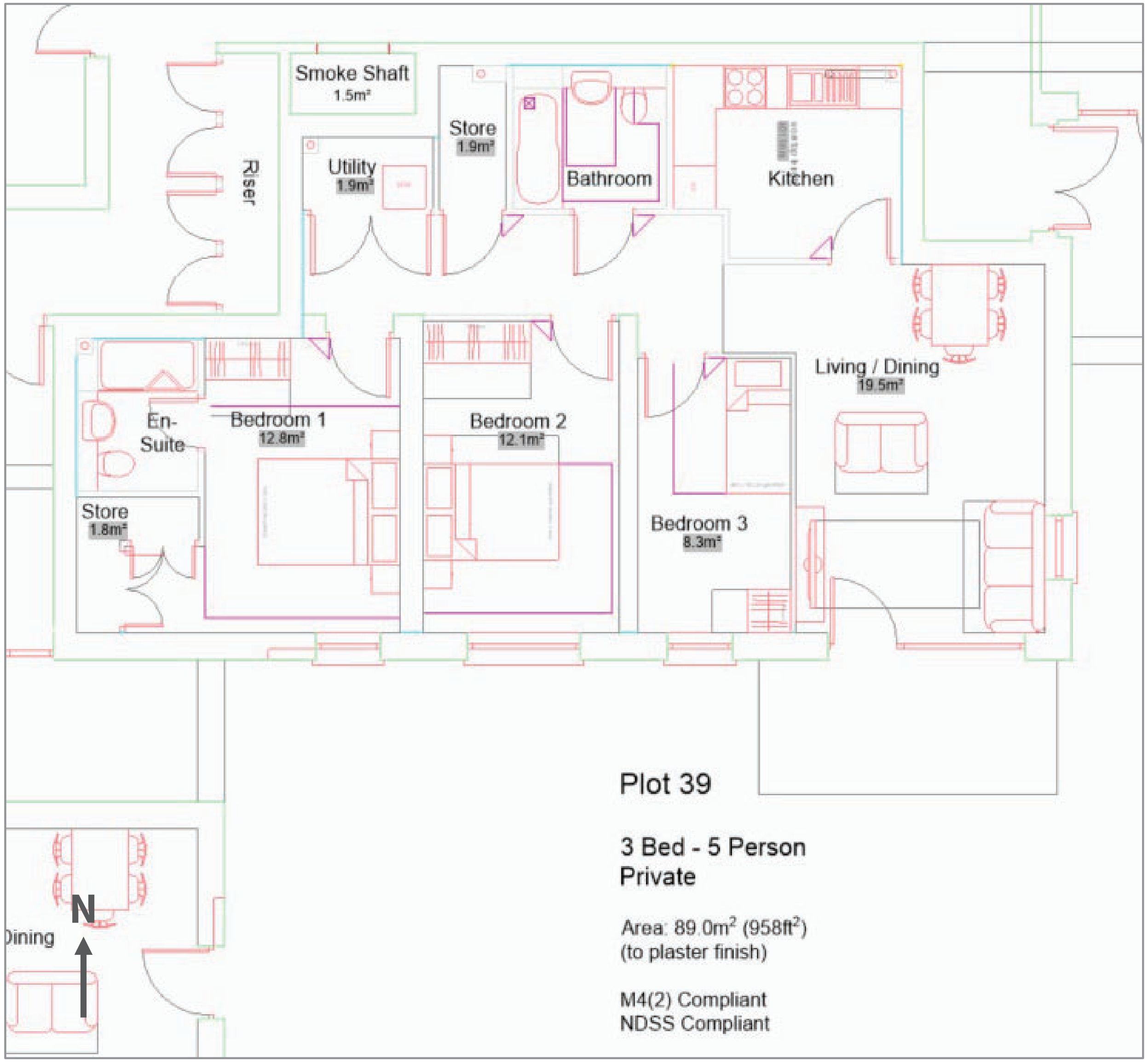


Figure A.1: Unit 1

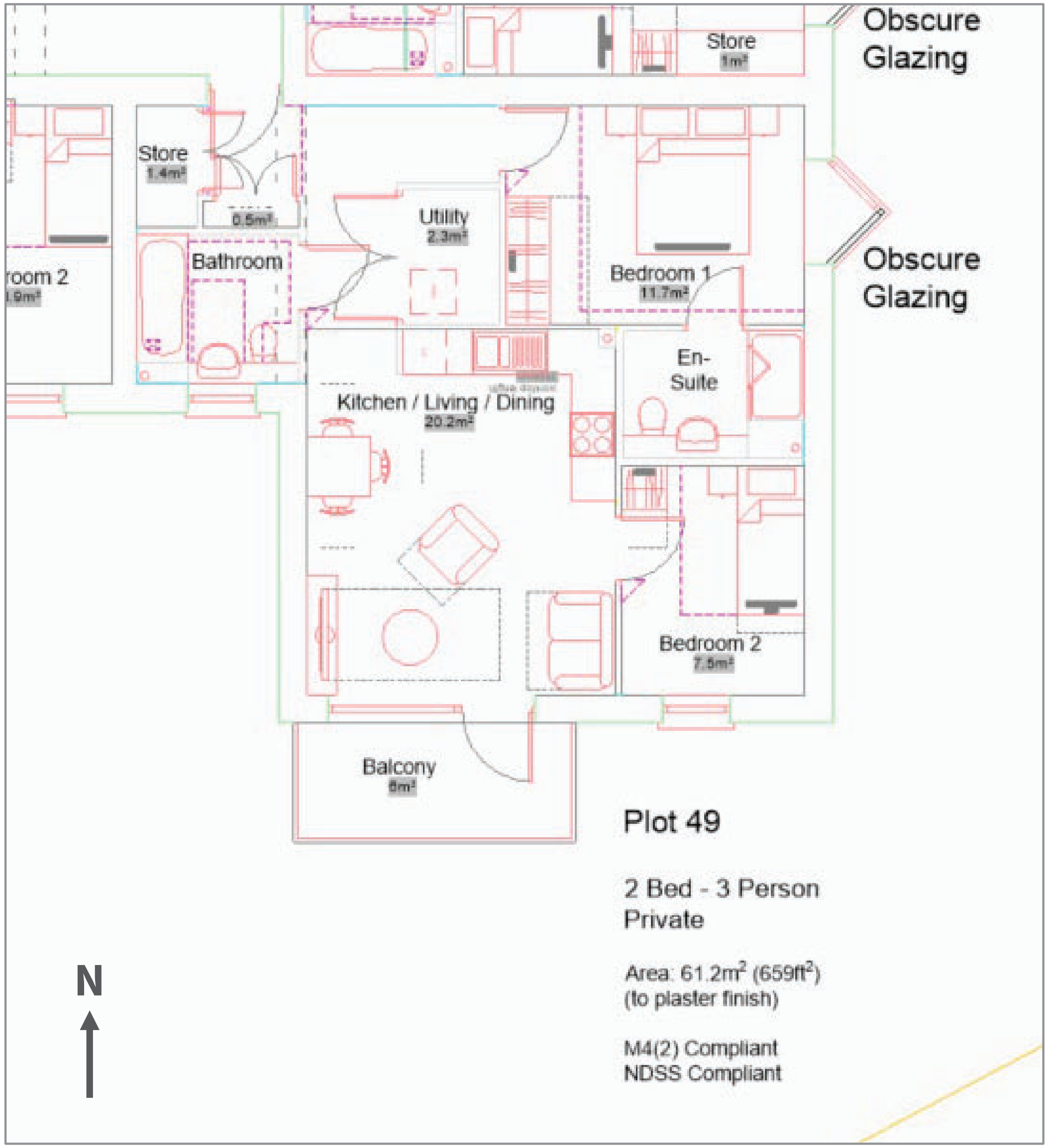


Figure A.2: Unit 2

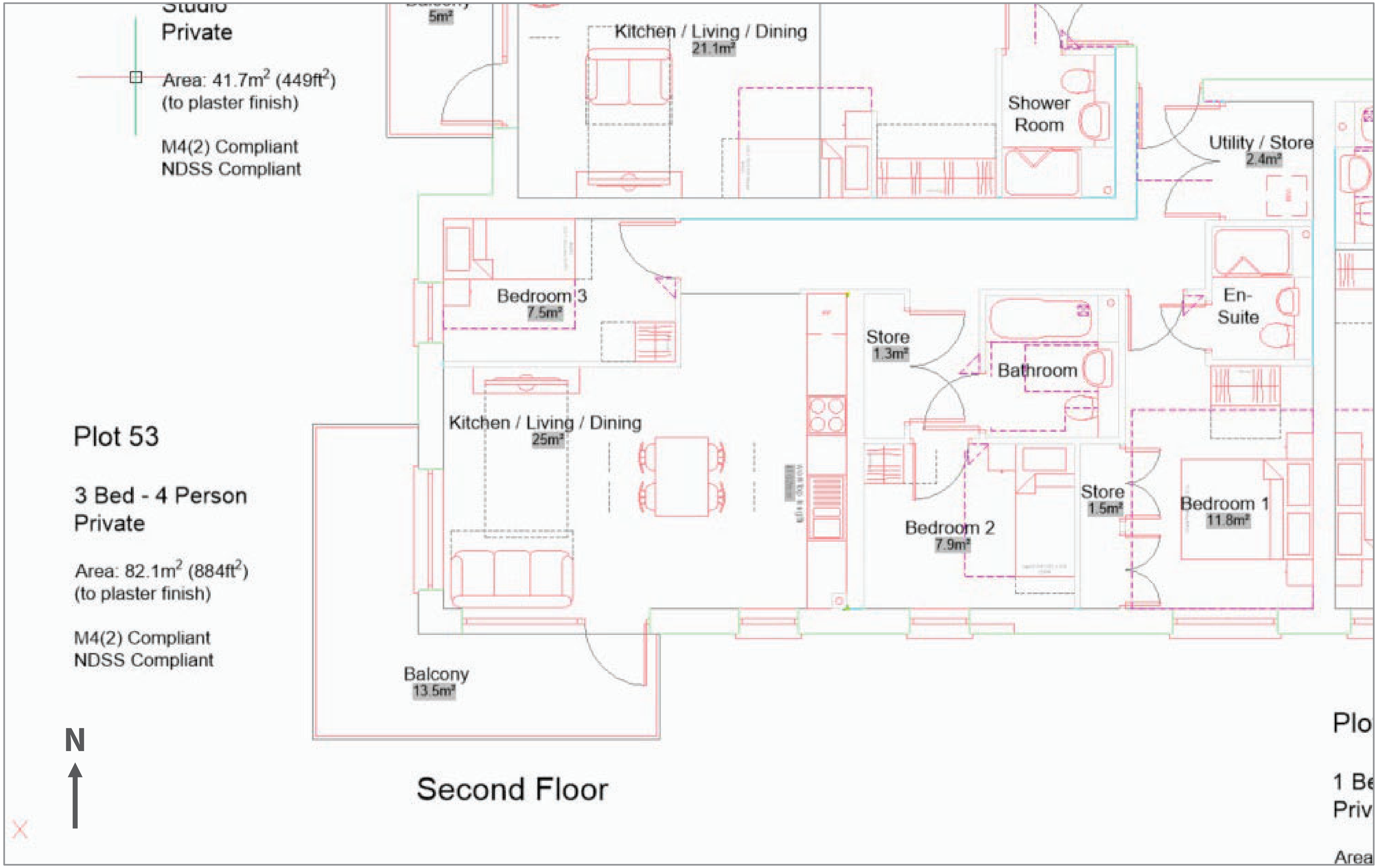


Figure A.3: Unit 3

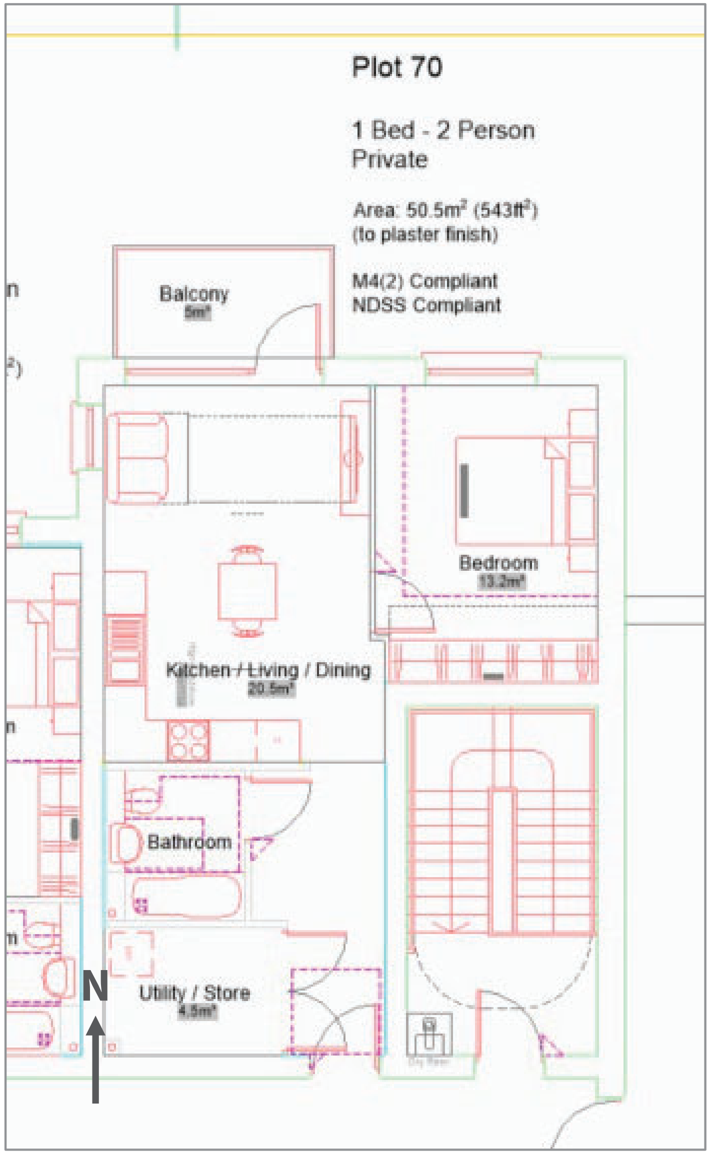


Figure A.4: Unit 4

Ground Floor

2B3P Maisonette
Plot 23

Figure A.5: Unit 5

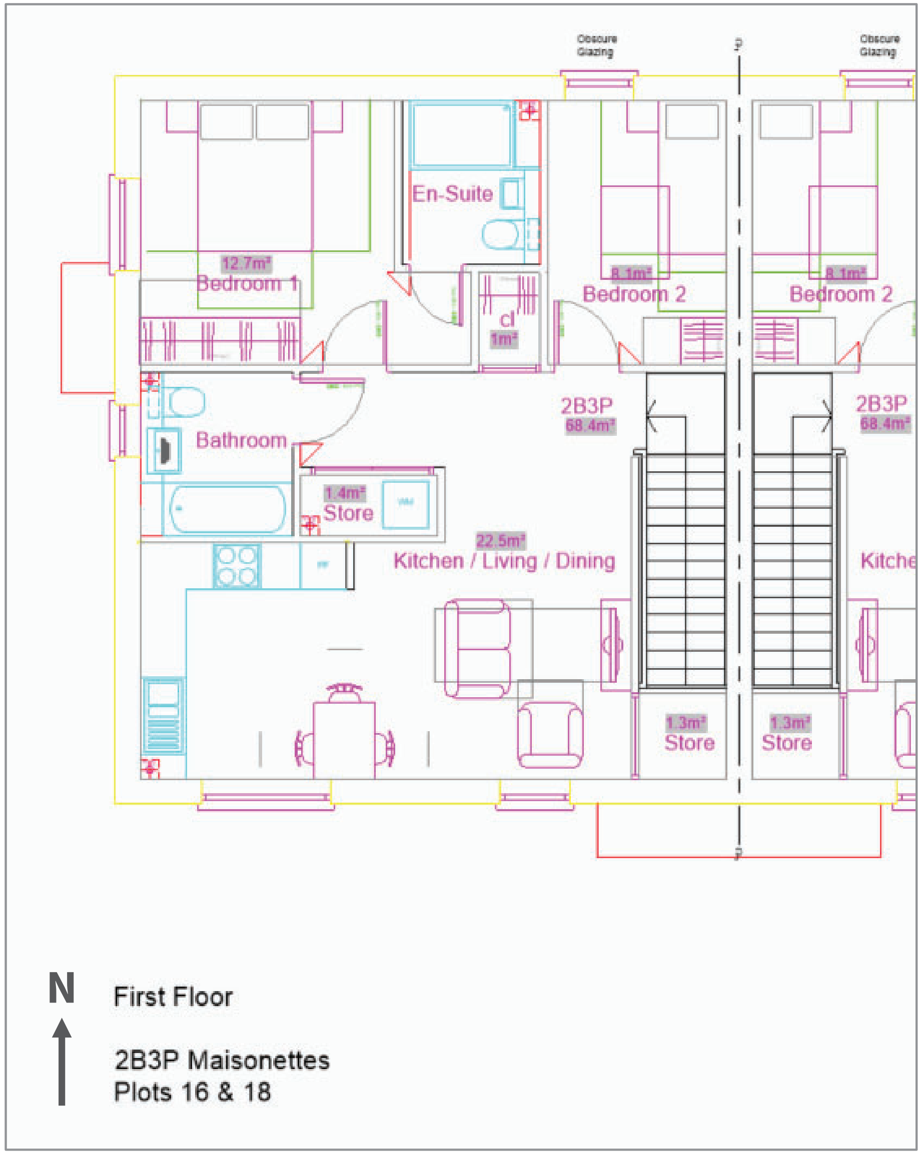


Figure A.6: Unit 6

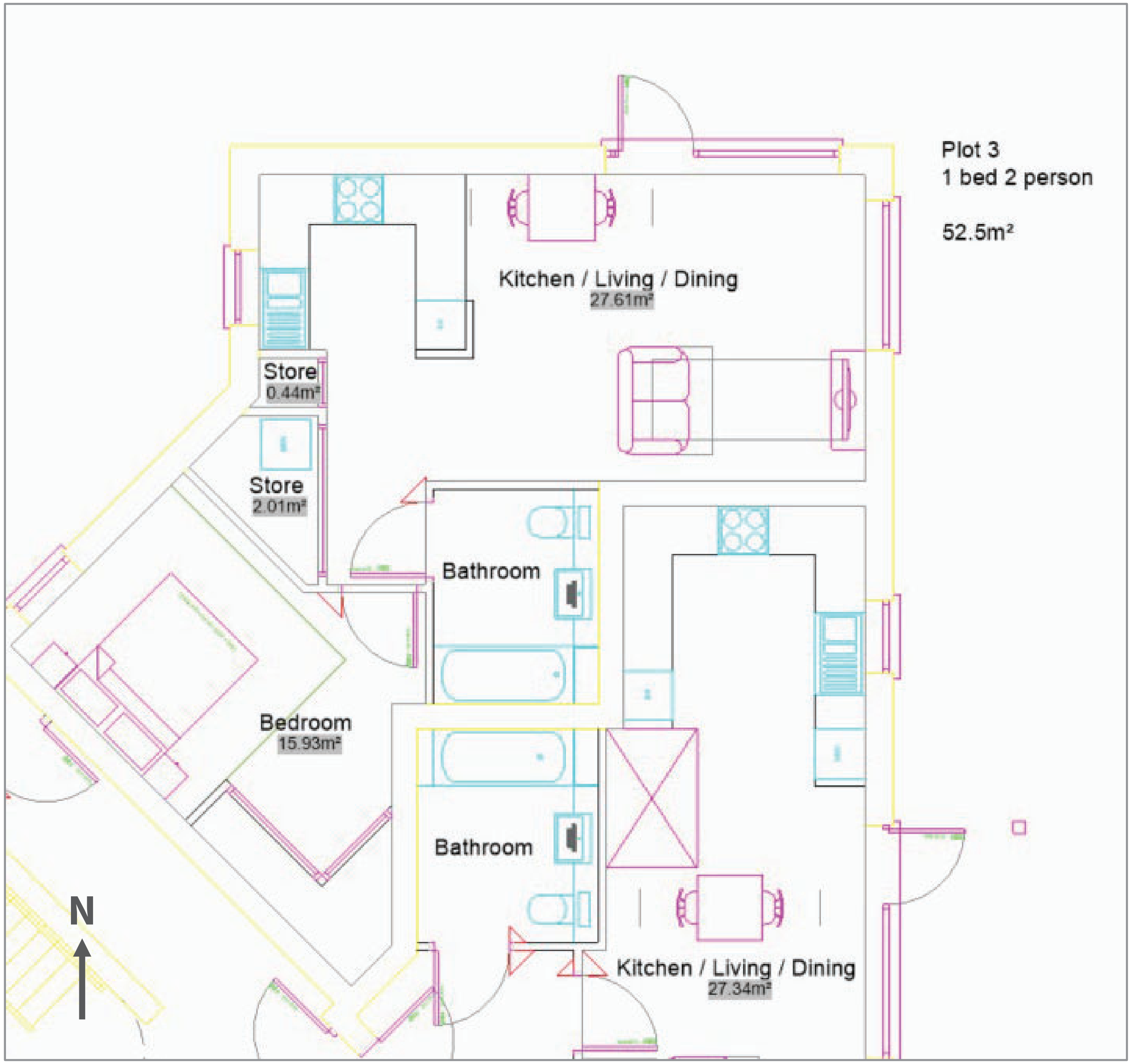


Figure A.7: Unit 7

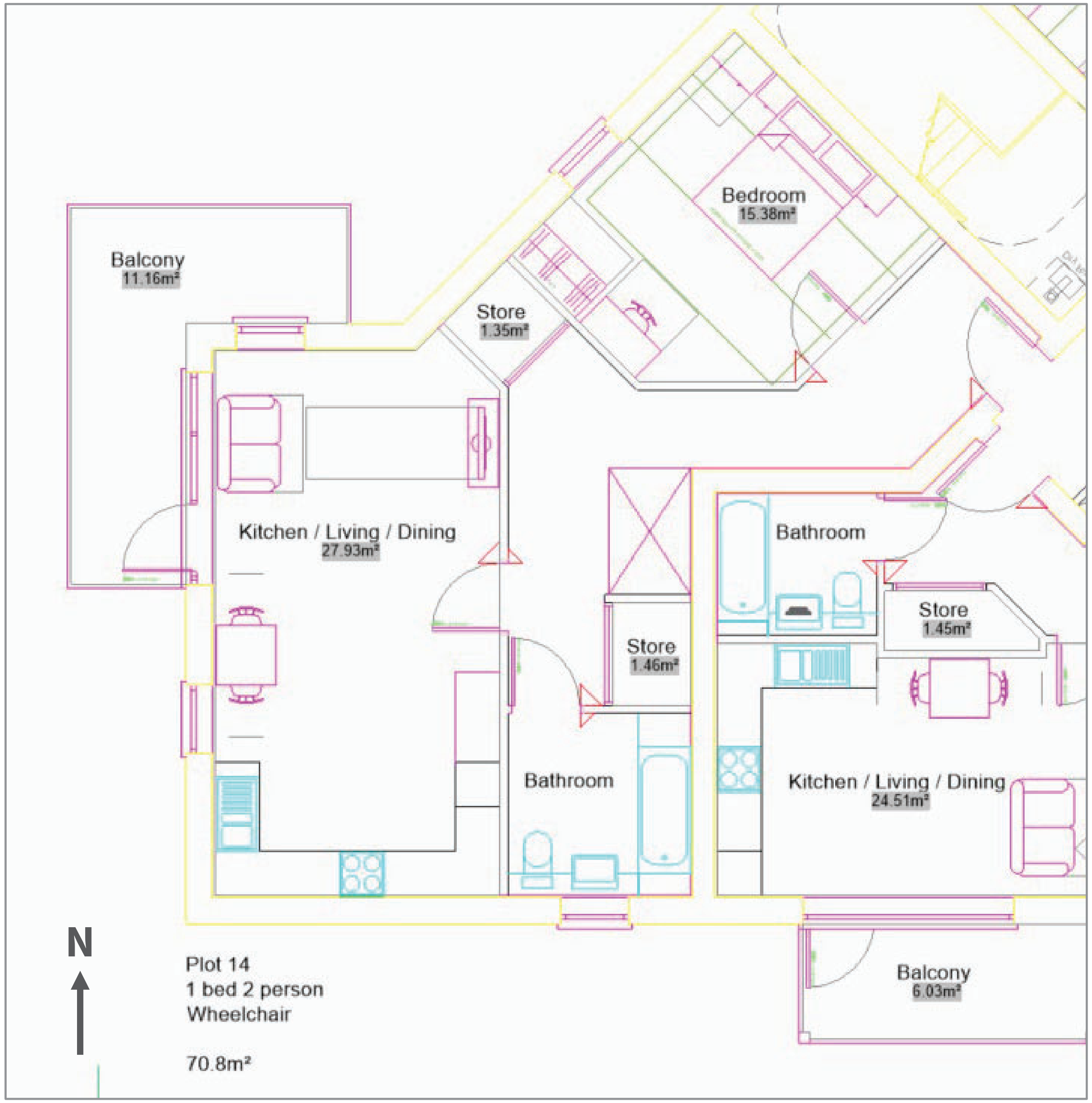


Figure A.8: Unit 8

Appendix B
Design Modelling Inputs

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**	0.18 W/m^{2}K	*As per the Energy Statement (Hodkinson Consultancy, August 2024)*
	Roofs	Apartments - 0.11 W/m^{2}K Houses - 0.09 W/m^{2}K	*As per the Energy Statement (Hodkinson Consultancy, August 2024)*
	Ground floor	0.10 W/m^{2}K	*As per the Energy Statement (Hodkinson Consultancy, August 2024)*
	Ceilings/floors	Assumed to be adiabatic between adjacent floors	*Concrete slabs will add to the thermal capacity of the building* *When dwelling units above / below heat loss is assumed to be zero*
	Party walls between units	Assumed to be adiabatic between adjacent dwellings	*Walls adjacent to other units are assumed to be lightweight partitions* *Adjacent units have been included in the dynamic simulation calculations*
	Partitions within units	Plasterboard partitions	*Assumed thicknesses as per drawings*
	Internal doors	0.914 m width	*As measured from drawings (CMYK, August 2024)*
Windows	**Windows and Glazed Doors**	U value 0.90 W/m^{2}K	*As per the Energy Statement (Hodkinson Consultancy, August 2024)*
	Reveal depth	External reveal: 145 mm	*As measured from drawings (CMYK, August 2024)*
	Sill / transom height	1.10 m	*In line with Part O requirements*
	Opening type	Windows: Inwards opening Glazed doors: Inwards/outwards, opening angle	*As confirmed by design team*

Data Input			Discussion
	Discharge Coefficient	Discharge coefficient: 0.53 – 0.55	*Calculated from window dimensions as per drawings (ARCHITECT, DATE) using the BB101 discharge coefficient calculator stated within Approved Document O (2021)*
Infiltration	**Air Tightness**	3.0 m^3/hr-m^2 @ 50 pascals	*As per the Energy Statement (Hodkinson Consultancy, August 2024)*

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
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
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
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
Single bedroom	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
Utility cupboard	N/A	61 W on 24/7

Appendix C

Result of DSY2 and DSY3 Weather Scenarios

The dynamic overheating assessment has also been run under the more extreme DSY2 and DSY3 weather files, with results presented in Tables C.1 and C.2.

TM59 states that compliance should be met for the DSY1 weather scenario, and that additional testing can be undertaken using the 2020 versions of DSY2 and DSY3. However, it is acknowledged that meeting the CIBSE compliance criteria is challenging for the DSY2 and DSY3 weather files.

The overheating mitigation strategy presented within the main body of this report demonstrates the passive measures that have been implemented to reduce the risk of overheating as far as practicable. In the future, residents could use further adaptation measures to combat any additional overheating risk.

Table C.1: Dwelling overheating results for DSY2 2020s – TM59

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	
Unit 1	Bedroom 1	0.1	68	Fail
	Bedroom 2	0.3	72	Fail
	Bedroom 3	0.3	69	Fail
	Kitchen	0.8	n/a	Pass
	Living/Dining	1.1	n/a	Pass
Unit 2	Bedroom 1	0.2	61	Fail
	Bedroom 2	0.7	63	Fail
	LDK	1.4	n/a	Pass
Unit 3	Bedroom 1	0.2	61	Fail
	Bedroom 2	0.3	60	Fail
	Bedroom 3	0.4	70	Fail
	LDK	1.4	n/a	Pass
Unit 4	Bedroom	0.1	16	Pass
	LDK	0.6	n/a	Pass
Unit 5	Bedroom 1	0.4	62	Fail
	Bedroom 2	0.6	60	Fail
	LDK	1.5	n/a	Pass

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	
Unit 6	Bedroom 1	0.3	52	Fail
	Bedroom 2	0.2	32	Pass
	LDK	1.1	n/a	Pass
Unit 7	Bedroom	0.4	28	Pass
	LDK	1.3	n/a	Pass
Unit 8	Bedroom	0.0	8	Pass
	LDK	1.2	n/a	Pass

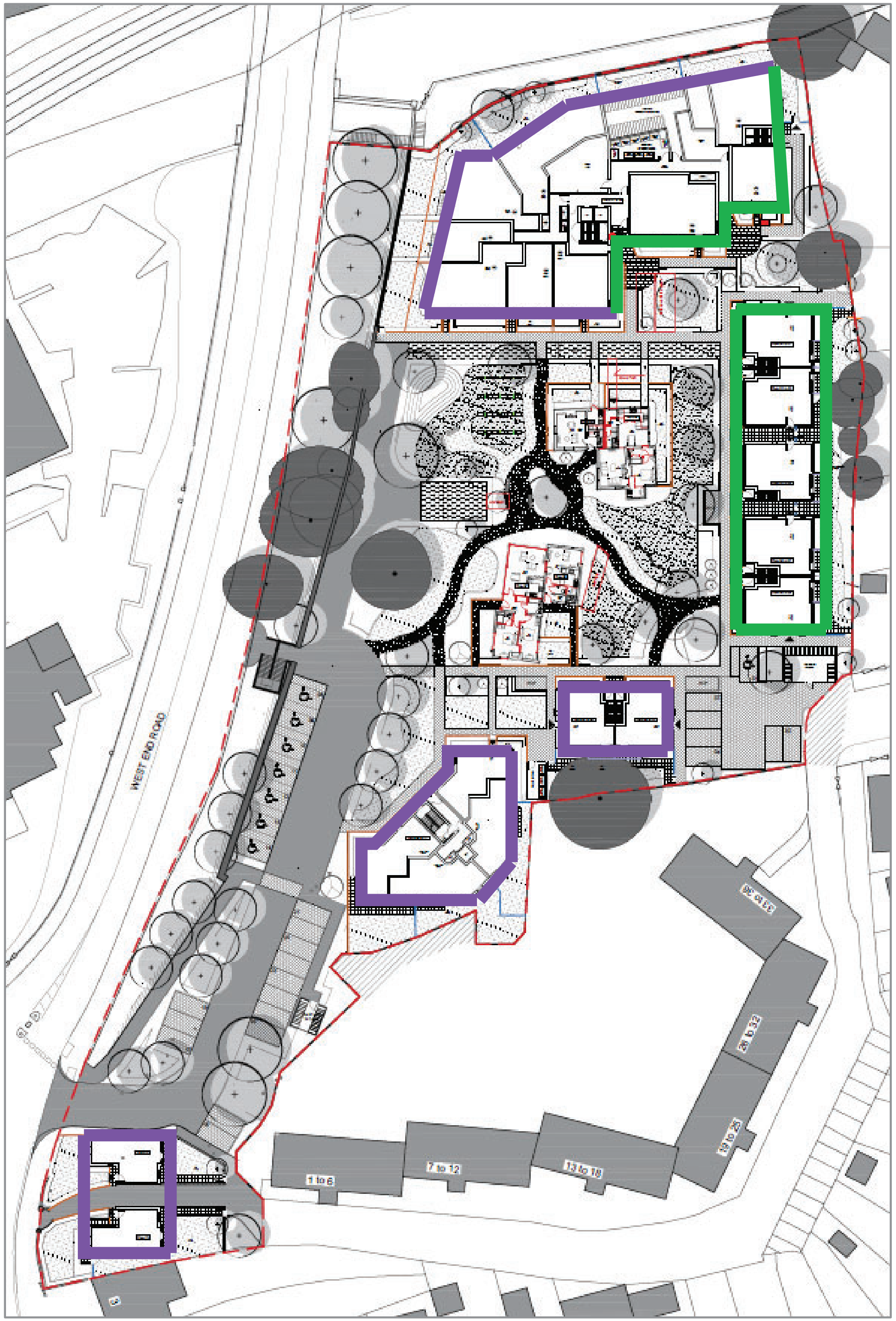
Table C.2: Dwelling overheating results for DSY3 2020s – TM59

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	
Unit 1	Bedroom 1	0.0	93	Fail
	Bedroom 2	0.0	97	Fail
	Bedroom 3	0.0	94	Fail
	Kitchen	0.7	n/a	Pass
	Living/Dining	1.2	n/a	Pass
Unit 2	Bedroom 1	0.2	82	Fail
	Bedroom 2	0.3	81	Fail
	LDK	0.9	n/a	Pass
Unit 3	Bedroom 1	0.0	80	Fail
	Bedroom 2	0.0	75	Fail
	Bedroom 3	0.3	103	Fail
	LDK	1.4	n/a	Pass
Unit 4	Bedroom	0.0	15	Pass
	LDK	0.0	n/a	Pass
Unit 5	Bedroom 1	0.4	85	Fail
	Bedroom 2	0.7	82	Fail

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	
	LDK	2.9	n/a	Pass
Unit 6	Bedroom 1	0.1	67	Fail
	Bedroom 2	0.0	42	Fail
	LDK	0.2	n/a	Pass
Unit 7	Bedroom	0.0	27	Pass
	LDK	0.0	n/a	Pass
Unit 8	Bedroom	0.0	10	Fail
	LDK	0.4	n/a	Pass

Appendix D

Overheating Strategy Markup



🟪 **Ground floor: 0.38 G-value, peak lopping**

First floor and above: 0.38 G-value, peak lopping

🟩 **Ground floor: 0.38 G-value, peak lopping**

First floor and above: 0.38 G-value, peak lopping NOT required

HODKINSON

Appendix E

GHA Overheating Checklist

EARLY STAGE OVERHEATING RISK TOOL

Version 1.0, July 2019

Good Homes Alliance

This tool provides guidance on how to assess overheating risk in residential schemes at the early stages of design. It is specifically a pre-detail design assessment intended to help identify factors that could contribute to or mitigate the likelihood of overheating.

The questions can be answered for an overall scheme or for individual units. Score zero wherever the question does not apply. Additional information is provided in the accompanying guidance, with examples of scoring and advice on next steps.

Find out more information and download accompanying guidance at goodhomes.org.uk/overheating-in-new-homes.

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? See guidance for map	South east	4	4
	Northern England, Scotland & NI	0	
	Rest of England and Wales	2	

#2 Is the site likely to see an Urban Heat Island effect? See guidance for details	Central London (see guidance)	3	2
	Grtr London, Manchester, B'ham	2	
	Other cities, towns & dense sub-urban areas	1	

#8 Do the site surroundings feature significant blue/green infrastructure? Proximity to green spaces and large water bodies has beneficial effects on local temperatures; as guidance, this would require at least 50% of surroundings within a 100m radius to be blue/green, or a rural context	1	1

Site characteristics

#3 Does the site have barriers to windows opening? - Noise/Acoustic risks - Poor air quality/smells e.g. near factory or car park or very busy road - Security risks/crime - Adjacent to heat rejection plant	**Day** - reasons to keep all windows closed	8	0
	Day - barriers some of the time, or for some windows e.g. on quiet side	4	
	Night - reasons to keep all windows closed	8	8
	Night - bedroom windows OK to open, but other windows are likely to stay closed	4	

#9 Are immediate surrounding surfaces in majority pale in colour, or blue/green? Lighter surfaces reflect more heat and absorb less so their temperatures remain lower; consider horizontal and vertical surfaces within 10m of the scheme	1	0
#10 Does the site have existing tall trees or buildings that will shade solar-exposed glazed areas? Shading onto east, south and west facing areas can reduce solar gains, but may also reduce daylight levels	1	1

Scheme characteristics and dwelling design

#4 Are the dwellings flats? Flats often combine a number of factors contributing to overheating risk e.g. dwelling size, heat gains from surrounding areas; other dense and enclosed dwellings may be similarly affected - see guidance for examples	3	2
#5 Does the scheme have community heating? i.e. with hot pipework operating during summer, especially in internal areas, leading to heat gains and higher temperatures	3	0

#11 Do dwellings have high exposed thermal mass AND a means for secure and quiet night ventilation? Thermal mass can help slow down temperature rises, but it can also cause properties to be slower to cool, so needs to be used with care - see guidance	1	1

#12 Do floor-to-ceiling heights allow ceiling fans, now or in the future? Higher ceilings increase stratification and air movement, and offer the potential for ceiling fans	>2.8m and fan installed	2	0
	> 2.8m	1	

Solar heat gains and ventilation

#6 What is the estimated average glazing ratio for the dwellings? (as a proportion of the facade on solar-exposed areas i.e. orientations facing east, south, west, and anything in between). Higher proportions of glazing allow higher heat gains into the space	>65%	12	4
	>50%	7	
	>35%	4	

#7 Are the dwellings single aspect? Single aspect dwellings have all openings on the same facade. This reduces the potential for ventilation	Single-aspect	3	1
	Dual aspect	0	

#13 Is there useful external shading? Shading should apply to solar exposed (E/S/W) glazing. It may include shading devices, balconies above, facade articulation etc. See guidance on "full" and "part". Scoring depends on glazing proportions as per **#6**		Full	Part	0
	>65%	6	3	
	>50%	4	2	
	>35%	2	1	

#14 Do windows & openings support effective ventilation? Larger, effective and secure openings will help dissipate heat - see guidance		Openings compared to Part F purge rates			3
		= Part F	+50%	+100%	
	Single-aspect	minimum required	3	4	
	Dual aspect		2	3	

TOTAL SCORE 15 = Sum of contributing factors: 21 *minus* Sum of mitigating factors: 6

High 12 Medium 8 Low

score >12:
Incorporate design changes to reduce risk factors and increase mitigation factors
AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score between 8 and 12:
Seek design changes to reduce risk factors and/or increase mitigation factors
AND Carry out a detailed assessment (e.g. dynamic modelling against CIBSE TM59)

score <8:
Ensure the mitigating measures are retained, and that risk factors do not increase (e.g. in planning conditions)