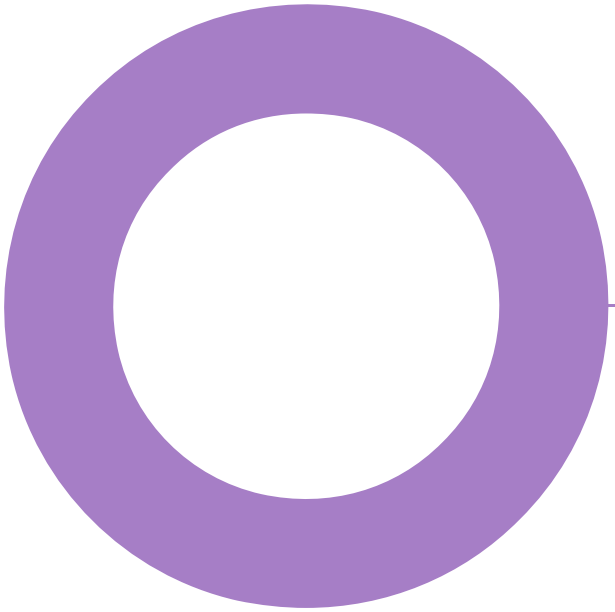
HOARE LEA

Elmsbrook Local Centre. Bicester.
A2Dominion.

SUSTAINABILITY
OVERHEATING ANALYSIS
RESIDENTIAL
REVISION 03 – 07 OCTOBER 2019



Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	04/03/2019	First Issue	JT	RG	PK
02	28/05/2019	Update following comments from client	JT	RG	JF
03	07/10/2019	Update for phased development	JT	RG	KC

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Contents.

Executive summary

This report has been produced in support of the planning application for the development of a new Elmbrook Local Centre in Northwest Bicester. Full permission is sought for Local Centre Community floorspace (Use Class D1 with ancillary A1/A3), with a total GIA of 552 sqm, and 16 residential units (use class C3) with associated access, servicing, landscaping and parking. Outline consent is sought for Local Centre Retail, Community or Commercial Floorspace (flexible Use Class A1/A2/A3/A4/A5/B1/D1).

This report reviews the overheating risk assessment carried out in line with CIBSE TM59 for the 16 proposed residential units in Elmsbrook Local Centre. A selection of apartments has been included in the assessment, including different sizes and orientations, which are considered to present the highest risk of overheating.

The occupied areas in the Community Centre will have active cooling to provide thermal comfort in the summer, given the high occupancy densities expected in these spaces, and therefore have not been included in this analysis.

The thermal simulations show that all the assessed spaces achieve compliance with the requirements in CIBSE TM59 with mechanical ventilation and the use of blinds. Some rooms would not achieve compliance with the aforementioned requirements without the use of internal blinds equal to or better than the performance criteria stated in Section 3.7.

Full results are included in Section 4 of this report.

1. Introduction

This report reviews the overheating risk assessment carried out for the proposed residential buildings in the Elmsbrook Local Centre, using dynamic simulation modelling following the guidance detailed in *CIBSE TM59 Design methodology for the assessment of overheating risk in homes* (2017).

The occupied areas in the Community Centre will have active cooling to provide thermal comfort in the summer, given the high occupancy densities expected in these spaces, and therefore have not been included in this analysis.

2. Overheating criteria – CIBSE TM59

CIBSE published in 2017 the technical memorandum *TM59 Design methodology for the assessment of overheating risk in homes* with the purpose of defining a standardised approach to assessing overheating risk in residential buildings using dynamic thermal modelling. It uses the principles of the adaptive thermal comfort approach developed in CIBSE TM52 to assess overheating in naturally ventilated buildings.

This document details the profiles and internal gain values that should be used in the dynamic thermal modelling for the different spaces, based on typical usage patterns for homes, with occupancy throughout the day to ensure that the test captures key aspects of overheating (i.e. risk of overheating in the hottest period of the day and the risk of bedrooms not cooling down sufficiently overnight, which could negatively affect the quality of sleep).

2.1 Compliance criteria for homes predominantly mechanically ventilated

For homes with restricted window openings, the CIBSE fixed temperature test must be followed, i.e. all occupied rooms should not exceed an operative temperature of 26 ˚C for more than 3% of the annual occupied annual hours (CIBSE Guide A (2015a)).

3. Input Criteria & Assumptions

3.1 Profile templates & internal gains

Occupancy profiles for the different spaces have been created following the guidance in CIBSE TM59. Details of these profiles are included in Appendix A.

3.2 Geometry

The thermal model been based on the drawings received from ADP on the 11th of February 2019.

3.3 Assessed apartments

A variety of different apartments have been included in this assessment, to best represent the range of orientation and apartment capacities, predominantly southwest and southeast orientated apartments. These apartments are expected to have the highest risk of overheating. The selected apartments are detailed in Appendix B.

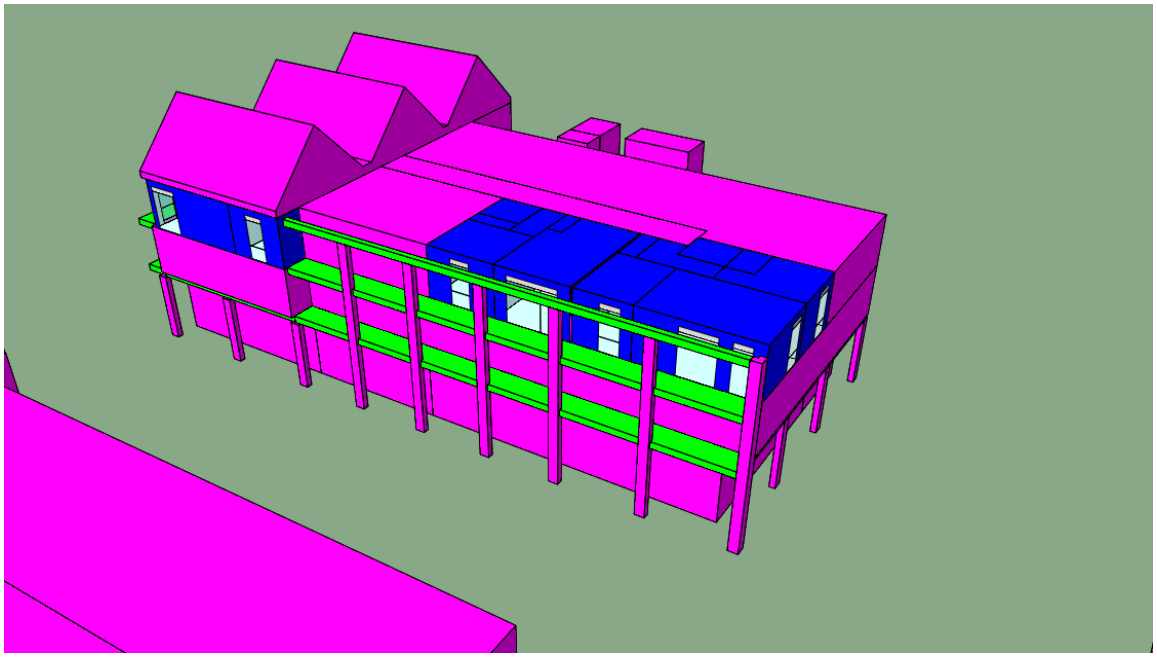


Figure 1: North block – South East view

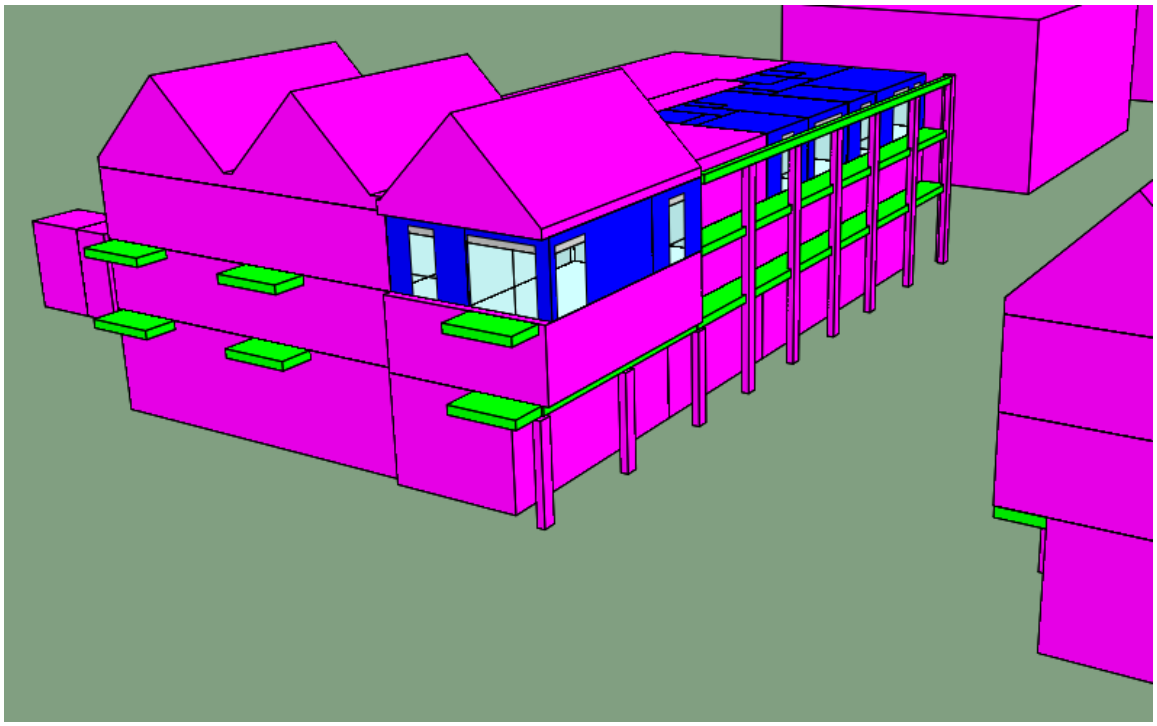


Figure 2: North– South West view

3.4 Weather file

The weather file used for this analysis is the nearest CIBSE DSY1 (Design Summer Year) for the 2020s high emissions, 50% percentile scenario (i.e. Swindon_Brize_Norton DSY1 2020 High50), in line with CIBSE TM59 guidelines.

3.5 Gains

Internal gains have been included in the simulations following the guidance in CIBSE TM59, as detailed in Table 1 below.

	Occupancy	Lighting	Small Power
Double bedroom	2 people*	2W/m^2	80W
Living room/kitchen – 1 bed apartments	1 people*	2W/m^2	450W
Living room/kitchen – 2 bed apartments	2 person*	2W/m^2	450W

* 75W (sensible) & 55W (latent) per person

Table 1: Internal gains

3.6 Fabric & Constructions

All assigned fabric constructions and U-Values have been assumed and are detailed in Table 2 below.

Construction element	U-value
Wall U-value	0.15 W/m^2.K
Roof U-value	0.12 W/m^2.K
Window U-value (including frame)	1.3 W/m^2.K
Glazing g-value	0.5
Thermal mass	Low
Infiltration	0.10ach

Table 2: Fabric performance

3.7 Internal blinds

Internal blinds have been included in the simulations to reduce the solar gains to a manageable level. The blinds have been assumed to have a shading coefficient (SC) of 0.3 and a short-wave radiant fraction (SWRF) of 0.6.

3.8 Mechanical ventilation

Mechanical ventilation has been included in all occupied areas, with the flowrates specified in Table 3 below. These flowrates are higher than required for minimum ventilation requirements in Building Regulations Part F.

	Total apartment	Living room	Bedroom 1	Bedroom 2	Bedroom 3
1 bed apartment	90 l/s	50 l/s	30 l/s	-	-
2 bed apartment	135 l/s	75 l/s	30 l/s	30 l/s	-

Table 3: Mechanical ventilation rates included in the model.

3.9 Opening doors and windows

All apartments will be fit with openable windows however these cannot be included in the overheating assessment due to acoustic restrictions. Mechanical ventilation will be the primary ventilation method. It has been assumed that internal doors will be open during the day.

4. Results

The simulation has been run both with and without blinds to demonstrate their effect on the thermal conditions of each space.

Without blinds

Room	% Occ. Hours when T > T_{max} (should not exceed 3%)	Compliance with TM59
02_01_Bed	2.6	Pass
02_01_Living/Kitchen	4.7	Fail
02_02_Bed 02	2.8	Pass
02_02_Living/Kitchen	5.1	Fail
02_02_Bed 01	3	Pass
02_03_Bed 02	5	Fail
02_03_Bed 01	4.5	Fail
02_03_Living/kitchen	9.3	Fail

Table 4: TM59 results without blinds.

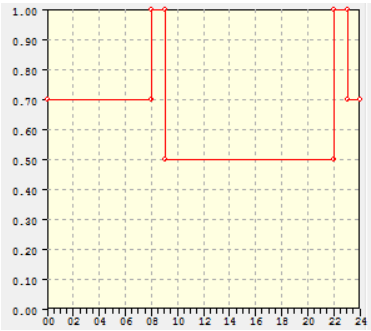
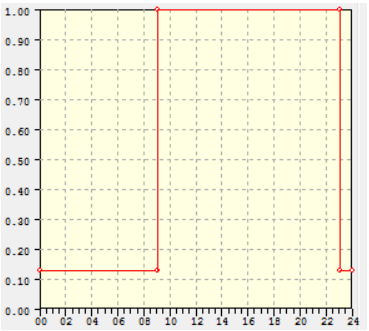
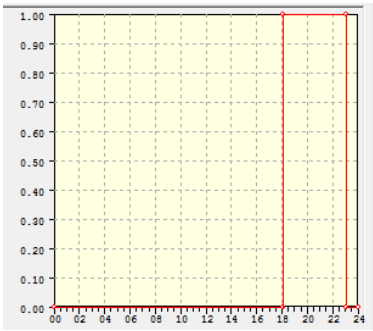
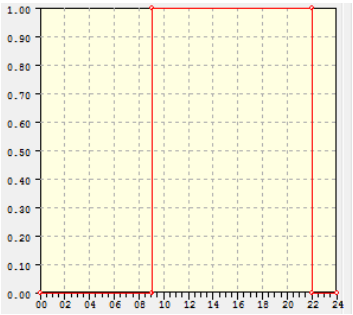
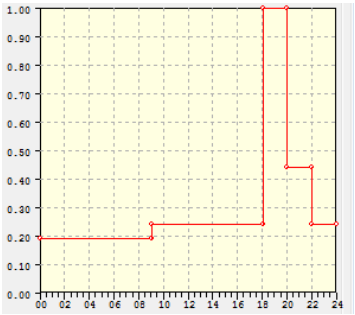
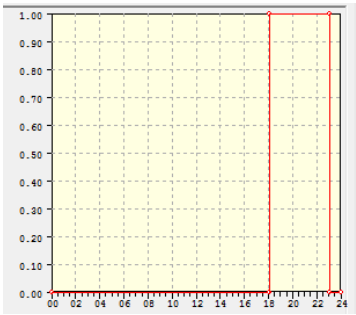
With blinds

Room	% Occ. Hours when T > T_{max} (should not exceed 3%)	Compliance with TM59
02_01_Bed	0.7	Pass
02_01_Living/Kitchen	1.3	Pass
02_02_Bed 02	0.9	Pass
02_02_Living/Kitchen	1.7	Pass
02_02_Bed 01	0.9	Pass
02_03_Bed 02	1.4	Pass
02_03_Bed 01	1.2	Pass
02_03_Living/kitchen	3	Pass

Table 5: TM59 results with blinds.

The results of the two simulations show that without adequate solar gain reduction the occupied spaces will not be able to achieve compliance with TM59. The suggested blind specification in section 3.7 is the minimum required for all spaces to pass.

Appendix A – Internal gain profiles

	Occupancy	Equipment	Lighting
Double bedroom			
Living room/ kitchen			

Appendix B – Evaluated Apartment Mark-ups

Second Floor

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