/INTEGRATION
40 BOWLING GREEN LANE
LONDON EC1R 0NE
+44 (0) 20 7415 7206
INTEGRATIONUK.COM

DATE
8th JUNE 2017

OVERHEATING ANALYSIS
115 – 119 GOLDHURST TERRACE
LONDON NW6 3EY

INTEGRATION
40 BOWLING GREEN LANE
LONDON EC1R 0NE
+44 (0) 20 7415 7206
INTEGRATIONUK.COM

DOCUMENT STATUS

PROJECT
115-119 Goldhurst Terrace
London
NW6 3EY

PROJECT NO.
243

CLIENT
Hive1 Ltd
3 Belsize Place
London
NW3 5AL

IN CONJUNCTION WITH
KSR Architects LLP
14 Greenland Street
London
NW1 0ND

REVISION	STATUS	CHECKED	DATE
1	Draft Issue for Comments	Dan Brooks	08.06.17
2	Issued	Dan Brooks	08.06.17
3	Issued	Dan Brooks	08.06.17

page blank

FOREWORD

About /INTEGRATION

INTEGRATION provide building services and environmental design consultancy for architects, developers and private clients.

INTEGRATION was founded on the principle that for buildings to be sustainable its designers must integrate sustainability into their day-to-day design processes and ongoing learning and development programmes.

About the author:

ALAN HARRIES • BEng PhD MEI CEnv (ALAN.HARRIES@INTEGRATIONUK.COM)

As a Director of Integration, Alan brings fifteen-years' experience spanning sustainable building and energy design, development, implementation and post-occupancy evaluation.

He has worked on several prestigious developments such as one of the first BREEAM "Excellent" buildings (The National Assembly of Wales) and the first BREEAM "Outstanding" education building (the London School of Economics Student Centre) as well as major international developments such as Central Market and the Zayed National Museum in Abu Dhabi. He also led the technical development of the Blind Light exhibition for artist Antony Gormley. He has studied the real-world energy performance of large commercial buildings and carried out numerous energy audits for clients such as the Crown Estate.

He has a 1st Class Degree and PhD in engineering, is a Chartered Environmentalist (CEnv) and a member of the Energy Institute (MEI) and has been lecturing for over ten years at one of the leading architectural schools, the Architectural Association in London, to Sustainable Environmental Design (SED) Masters students and undergraduates. He was the lead author of the Urban Wind Energy book and the journal paper: "London 2012 Velodrome – integrating advanced simulation into the design process". The main industry body, CIBSE, now use examples of his project work to exemplify best practice building simulation in their latest industry guides.

CONTENTS

EXECUTIVE SUMMARY

This Overheating Analysis has been prepared by Integration Consultancy Limited in support of the planning application for the proposed development at 115-119 Goldhurst Terrace, London.

The analysis follows the industry standard CIBSE Technical Memorandum TM52 (2013) methodology. This requires the creation of a full 3D dynamic thermal model of the proposed development and surrounding shadow casters.

For the proposed development, there are large areas of glazing on the front (west) and rear (east) façade in order to provide high daylight penetration and a sense of connectivity. These windows will receive solar gains from low-level morning and afternoon sun. Whilst this will allow for passive heating in the winter, this could cause an overheating risk in the summer months.

The TM52 analysis shows that **the proposed scheme passes the CIBSE overheating test**.

This is mainly due to the absence of fenestration to the south, the high-quality window specification and the dual aspect design which allows for cross-flow ventilation through a relatively high level of openable window area.

Overheating is considered by CIBSE to occur if an occupied room fails two or more of the following three criteria:

- Criteria 1 – Overheating Hours.
  3% of occupied hours the operative temperature exceeds the threshold comfort temperature (upper limit of the range of comfort temperature) by 1°C from 1st May to 30th September.
- Criteria 2 – Severity of Overheating.
  The severity of overheating, which is defined as a function of both temperature rise and its duration, exceeds a value for the daily weighted exceedance of 6 in any one day.
- Criteria 3 – Upper Limit Temperature.
  The maximum daily operative temperature for a room exceeds 4°C above the TM52 maximum comfort temperature.

The room specific results are given below. These are based on the assumptions contained within the report associated with heat gains, building operation, construction thermal properties and windows openings.

Blinds have not been used in the dynamic model in order to achieve the pass ratings given below. Therefore there are additional measures that can be readily put in place to decrease the risk should overheating become an issue in the future in certain areas.

	Criteria 1 – Overheating Hours.	**Criteria 2 – Severity of Overheating.**	**Criteria 3 – Upper Limit Temperature.**	**Criteria Failed**	**OVERALL PASS or FAIL?**
GF F05 BEDROOM	0	0	0	-	PASS
GF F05 BATHROOM	0.3	6	1	-	PASS
GF F05 BEDROOM 1 ENSUITE	0.3	5	1	-	PASS
GF F05 BEDROOM 1	0	0	0	-	PASS
GF F05 MASTER ENSUITE	0	0	0	-	PASS
GF F05 STORAGE	0	0	0	-	PASS
1F F07 BEDROOM 2	0	0	0	-	PASS
1F Unit 7 BATHROOM	0.6	10	2	2	PASS
1F Unit 7 BEDROOM 1 ENSUITE	0.6	11	2	2	PASS
1F Unit 7 BEDROOM 1	0	0	0	-	PASS
1F Unit 7 LIVING ROOM	1.5	24	4	2	PASS
1F Unit 7 MASTER ENSUITE	0	0	0	-	PASS
1F Unit 7 MASTER	0	0	0	-	PASS
2F Unit 9 MASTER ENSUITE	0	0	0	-	PASS
2F Unit 9 LIVING ROOM	1.8	26	4	2	PASS
2F Unit 9 BATHROOM	0.6	9	2	2	PASS
2F Unit 9 MASTER	0	0	0	-	PASS
2F Unit 9 BEDROOM 1	0	0	0	-	PASS
3F Unit 10 MASTER ENSUITE	1.4	22	3	2	PASS
3F Unit 10 MASTER	0.2	2	2	-	PASS
3F Unit 10 BEDROOM 1 ENSUITE	0.6	8	2	2	PASS
3F Unit 10 BEDROOM 1	0.1	1	1	-	PASS
3F Unit 10 LIVING ROOM	2.3	26	4	2	PASS
GF Unit 05 MASTER	0	0	0	-	PASS
GF Unit 05 LIVING ROOM	1.2	21	3	2	PASS
2F Unit 10 STAIRCASE	1.8	26	4	2	PASS
1B Unit 03 LIVING ROOM	1.9	19	4	2	PASS
1B Unit 03 BEDROOM 1 ENSUITE	0	0	0	-	PASS
1B Unit 03 BEDROOM 1 HALL	0	0	0	-	PASS
1B Unit 03 BEDROOM 1	0	0	0	-	PASS
1B Unit 03 MASTER	0	0	0	-	PASS
1B Unit 03 MASTER ENSUITE	0	0	0	-	PASS

Table 1: Overheating analysis results for each unit

1 INTRODUCTION

Integration Consultancy Limited have been appointed to undertake an Overheating Analysis in support of the full planning application for the proposed development at 115-119 Goldhurst Terrace, London. The report is one of several that accompany the planning application and should be read in conjunction with these documents.

PROPOSED DEVELOPMENT OVERVIEW

The proposed development includes the creation of 1,118m^2 of new build residential units. The details of the proposed accommodation are summarised below.

Unit	Type
Unit 1 (Lower ground)	1 bed
Unit 2 (Lower ground)	1 bed
Unit 3 (Lower ground)	2 bed
Unit 4 (Ground)	3 bed
Unit 5 (Ground)	3 bed
Unit 6a and 6b (1st Floor)	1 & 2 bed
Unit 7 (1st Floor)	2 bed
Unit 8 (2nd floor)	2 bed
Unit 9 (2nd floor)	2 bed
Unit 10 (3rd floor)	2 bed

Table 2: Accommodation summary

There are large areas of glazing on the front (west) and rear (east) façade in order to provide high daylight levels and sense of connectivity. These windows will receive solar gains from low level morning and afternoon sun. Whilst these solar heat gains provide passive heating in the winter, they could cause an overheating risk in the summer months.

Figure 1: Proposed development

CIBSE TM52 OVERHEATING REQUIREMENT

The analysis follows the industry standard CIBSE Technical Memorandum TM52 (2013) methodology. Overheating is considered to occur if an occupied room fails two or more of the following three criteria:

- Criteria 1 – Overheating Hours.
  3% of occupied hours the operative temperature exceeds the threshold comfort temperature (upper limit of the range of comfort temperature) by 1°C from 1st May to 30th September.
- Criteria 2 – Severity of Overheating.
  The severity of overheating, which is defined as a function of both temperature rise and its duration, exceeds a value for the daily weighted exceedance of 6 in any one day.
- Criteria 3 – Upper Limit Temperature.
  The maximum daily operative temperature for a room exceeds 4°C above the TM52 maximum comfort temperature.

2 THERMAL MODEL

The CIBSE Technical Memorandum TM52 (2013) methodology requires the creation of a full 3D dynamic thermal model of the proposed development including surrounding shadow casters such as neighbouring buildings and trees. The set-up is described below.

MODEL DATA

Software: IES VE PRO Engineer (2017)

Weather Data: CIBSE DSY (Design Summer Year) for London

TM52 Parameters: Building Category 2 (new build and refurbishment)

Sampling: The study considers the one unit on each floor which includes Unit 3, 5, 7, 9, and 10. Unit 10 occupies the entire upper floor.

Model Assumptions: Occupancy density 1 person per 20m^2

Additional Input values are presented in the tables below.

Geometry Data: Geometry is given below and is based on drawing as indicated the table below.

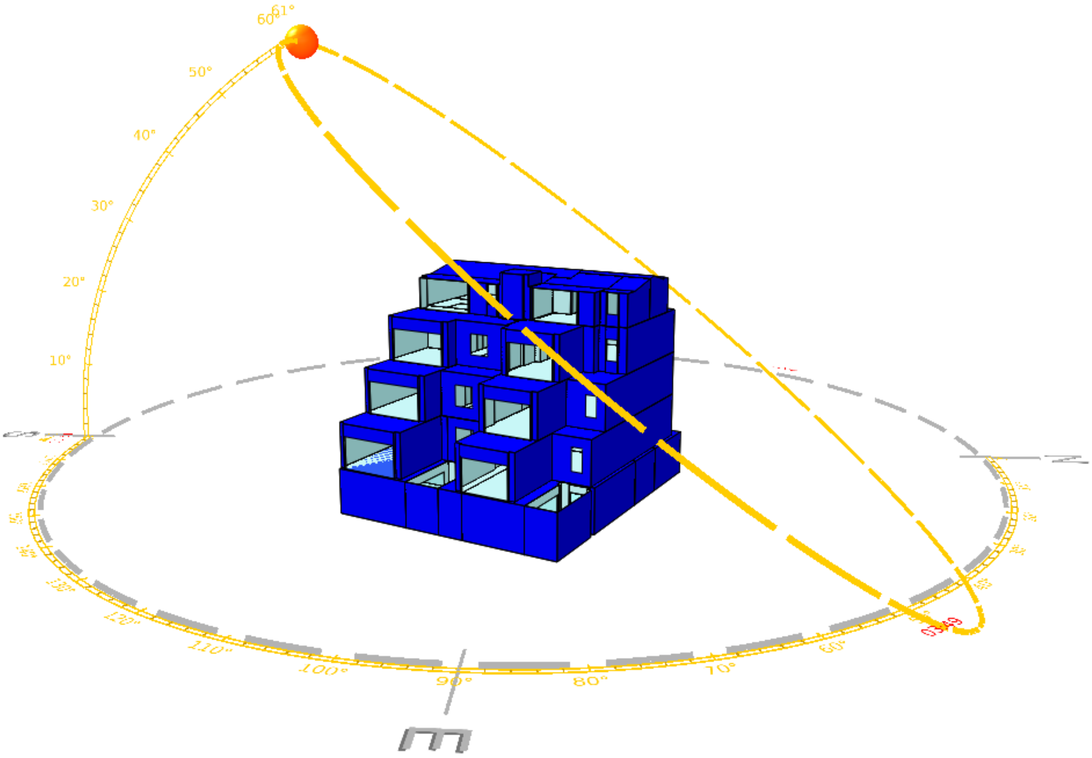

Figure 2: Model geometry – Proposed building only including basement level – 3D view from the East

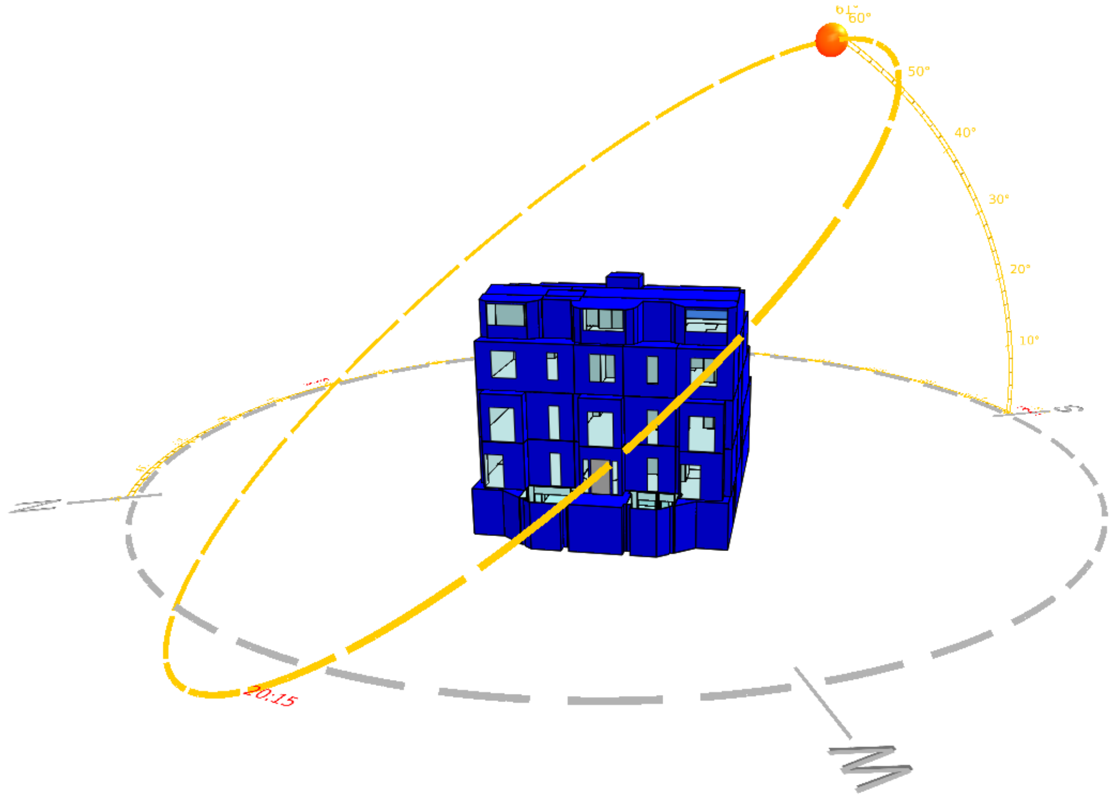

Figure 3: Model geometry – Proposed building only including basement level – 3D view from the West

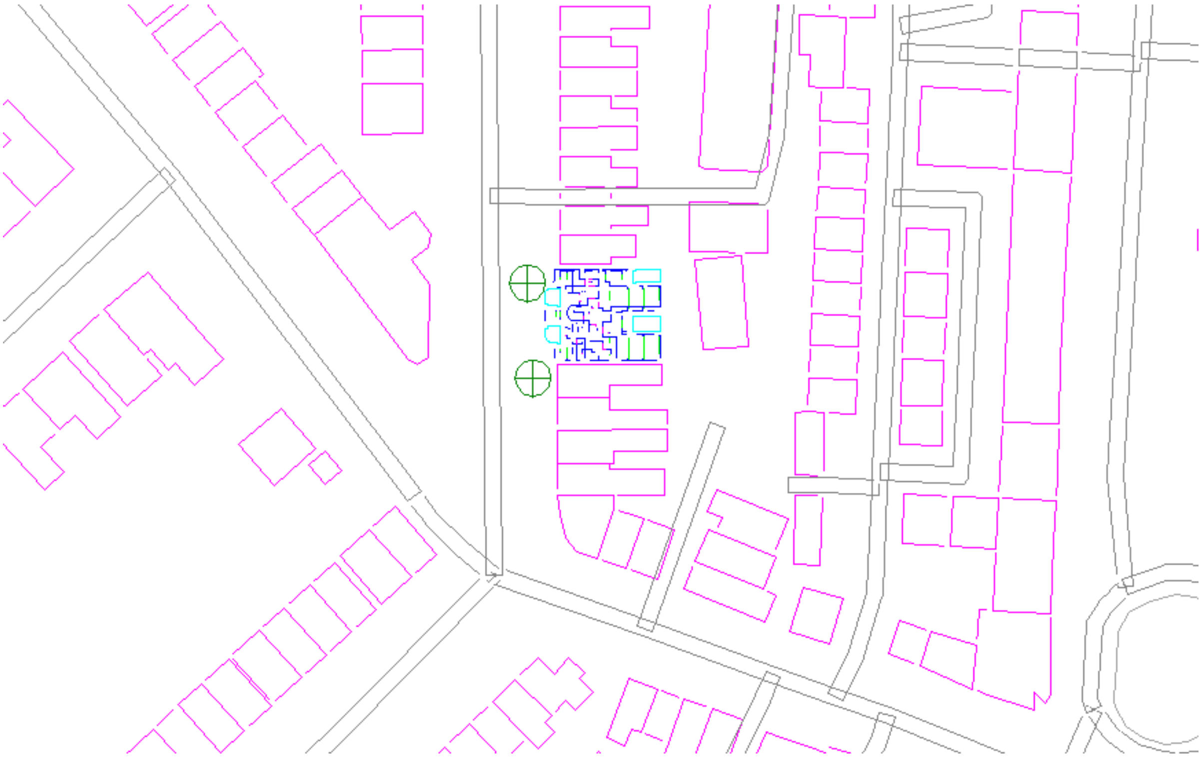

Figure 4: Model geometry – plan showing adjacent buildings

Drawing No (version)	Name	Source
15033-P090 Rev A	Basement Floor GA Plan	KSR
15033-P100 Rev A	Ground Floor GA Plan	KSR
15033-P110 Rev B	First Floor GA Plan	KSR
15033-P120 Rev A	Second Floor GA Plan	KSR
15033-P130 Rev A	Third Floor GA Plan	KSR
15033-P140 Rev A	Roof GA Plan	KSR
15033-P210 Rev A	Section B-B	KSR
15033-P212 Rev A	Section C-C	KSR
15033-P213 Rev A	Section D-D	KSR
15033-P310 Rev A	Front (West Elevation)	KSR
15033-P311 Rev A	Rear (East) Elevation	KSR

Table 3: Drawings used to construct the model

The building construction and operation is summarised as follows:

Element	Inputs
	U Value W/m²K
External Walls	0.15 W/m²K
Floor	0.13 W/m²K
Roof	0.13 W/m²K
Windows	1.10 W/m²K
External Opaque Doors	1.10 W/m²K
Air Tightness	3.0 m³/m²/h @50Pa or 0.1 ACH average infiltration (CIBSE guide A)
Ventilation type	Mechanical ventilation with heat recovery (0.3 l/s/m² fresh air supply)
Active-cooling / air-conditioning	None

Table 4: Modelling assumptions

The window opening schedule is given below. It has been assumed that occupants can open windows fully from 8am to 7pm as required.

Night time ventilation has been applied to the living room areas on the second and third floor units. These high-level units will not have the potential security issues faced by the lower levels. The living room windows are assumed to be open at only 10% their maximum capacity in order to allow trick-ventilation to cool the thermal mass over the duration of the night. This has not been applied to bedroom areas as some occupants will want to have the windows closed at night for acoustic reasons.

Figure 5: Window Types – see table below. (Left image – Front/West Elevation. Right image – Rear/East Elevation).

Window Type	Description	Opening Area	Restrictions
Type 1 (ORANGE)	Full height Sliding door	50% openable	none
Type 2 (GREEN)	Sliding door	Either 50% or 100% openable	none
Type 3 (BLUE)	Fixed window	0% openable	NA
Type 4 (RED)	Bi-folding door or sliding door	100% openable	none

Table 5: Window types)

Heat gain type	Description	Heat gain	Areas	Profile
Lighting (Living Room)	Sensible Gain	6 W/m^2	Living room, Circulation Areas, bathrooms	100% 20:00 - 22:00 (Diversity 0.8)
Lighting (Bedroom)	Sensible Gain	6 W/m^2	Bedrooms	100% 20:00 – 22:00 (Diversity 0.3)
Computer	Sensible Gain	150 W	Living room	100% 8:00 – 22:00 (Diversity 0.15)
Fridge	Sensible Gain	50 W	Living room	100% Continuous
TV	Sensible Gain	100 W	Living room, Bedrooms	100% 8:00 – 22:00 (Diversity 0.5)
Cooking	Sensible Gain	1500 W	Living room	100% 8:00 - 9:00 & 12:00 – 13:00 & 18:00 – 19:00 (Diversity 0.5)
People (Sleeping)	Sensible Gain	65 W/person	Bedrooms	100% 22:00 - 8:00 (Diversity 1.0)
	Latent Gain	30 W/person		
	Occupancy density	20 m^2/person		
People (Normal Activity)	Sensible Gain	90 W/person	Living room, Circulation Areas, bathrooms	100% 8:00 - 22:00 (Diversity 1.0)
	Latent Gain	60 W/person		
	Occupancy density	20 m^2/person		

Table 6: Heat Gains assumptions

3 MODEL RESULTS

	Criteria 1 – Overheating Hours.	Criteria 2 – Severity of Overheating.	Criteria 3 – Upper Limit Temperature.	Criteria Failed	OVERALL PASS or FAIL?
GF F05 BEDROOM	0	0	0	-	PASS
GF F05 BATHROOM	0.3	6	1	-	PASS
GF F05 BEDROOM 1 ENSUITE	0.3	5	1	-	PASS
GF F05 BEDROOM 1	0	0	0	-	PASS
GF F05 MASTER ENSUITE	0	0	0	-	PASS
GF F05 STORAGE	0	0	0	-	PASS
1F F07 BEDROOM 2	0	0	0	-	PASS
1F Unit 7 BATHROOM	0.6	10	2	2	PASS
1F Unit 7 BEDROOM 1 ENSUITE	0.6	11	2	2	PASS
1F Unit 7 BEDROOM 1	0	0	0	-	PASS
1F Unit 7 LIVING ROOM	1.5	24	4	2	PASS
1F Unit 7 MASTER ENSUITE	0	0	0	-	PASS
1F Unit 7 MASTER	0	0	0	-	PASS
2F Unit 9 MASTER ENSUITE	0	0	0	-	PASS
2F Unit 9 LIVING ROOM	1.8	26	4	2	PASS
2F Unit 9 BATHROOM	0.6	9	2	2	PASS
2F Unit 9 MASTER	0	0	0	-	PASS
2F Unit 9 BEDROOM 1	0	0	0	-	PASS
3F Unit 10 MASTER ENSUITE	1.4	22	3	2	PASS
3F Unit 10 MASTER	0.2	2	2	-	PASS
3F Unit 10 BEDROOM 1 ENSUITE	0.6	8	2	2	PASS
3F Unit 10 BEDROOM 1	0.1	1	1	-	PASS
3F Unit 10 LIVING ROOM	2.3	26	4	2	PASS
GF Unit 05 MASTER	0	0	0	-	PASS
GF Unit 05 LIVING ROOM	1.2	21	3	2	PASS
2F Unit 10 STAIRCASE	1.8	26	4	2	PASS
1B Unit 03 LIVING ROOM	1.9	19	4	2	PASS
1B Unit 03 BEDROOM 1 ENSUITE	0	0	0	-	PASS
1B Unit 03 BEDROOM 1 HALL	0	0	0	-	PASS
1B Unit 03 BEDROOM 1	0	0	0	-	PASS
1B Unit 03 MASTER	0	0	0	-	PASS
1B Unit 03 MASTER ENSUITE	0	0	0	-	PASS

Table 7: Overheating analysis results

4 CONCLUSIONS

This Overheating Analysis follows the industry standard CIBSE Technical Memorandum TM52 (2013) methodology. Overheating is considered to occur if an occupied room fails two or more of the following three criteria:

> Criteria 1 – Overheating Hours.
> 3% of occupied hours the operative temperature exceeds the threshold comfort temperature (upper limit of the range of comfort temperature) by 1°C from 1st May to 30th September.
>
> Criteria 2 – Severity of Overheating.
> The severity of overheating, a function of both temperature rise and its duration, exceeds 6 in any one day.
>
> Criteria 3 – Upper Limit Temperature.
> The maximum daily operative temperature for a room exceeds 4°C.

The TM52 analysis shows that **the proposed scheme passes the CIBSE overheating test**. This is mainly due to the absence of fenestration to the south, the high-quality window specification and the dual aspect design which allows for cross-flow ventilation through a relatively high level of openable window area.

Therefore, based on the assumptions contained within the report associated with heat load, building operation, construction thermal properties and windows openings, the proposed development is considered to have low overheating risk.

Blinds have not been used in the dynamic model in order to achieve the pass ratings. Therefore there are additional measures that can be readily put in place to decrease the risk should overheating become an issue in the future in certain areas.