

Overheating Analysis

Alistair & Paula Flutter

11 & 11a View Road
London Borough of Haringey
N6 4DJ



Version	Revision	Date	Author	Reviewer	Project Manager
1	A	18.01.2023	Aniruth Raghunathan	Alaister Coffey	Alaister Coffey
1	B	23.01.2023	Aniruth Raghunathan	Alaister Coffey	Alaister Coffey
1	C	07.02.2023	Aniruth Raghunathan	Alaister Coffey	Alaister Coffey

© Copyright SRE Ltd 2023

All rights reserved. No part of this publication may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods, without the prior written permission of the author, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law. For permission requests, write to the author, at the address below:

SRE Registered Office | Greenforde Farm

Stoner Hill Road | Froxfield

Petersfield | Hampshire | GU32 1DY

01730 710044

info@sre.co.uk

www.sre.co.uk

Contents

Executive Summary.....	1
1.0 Introduction	3
1.1 The Proposed Development	3
1.2 Methodology.....	4
2.0 Dynamic Model	7
2.1 Building Fabric.....	8
2.2 Occupancy and internal gain profiles.....	9
2.3 Air Exchange	10
2.4 Window Openings.....	10
2.5 Shading devices.....	12
2.6 Weather File	13
3.0 Results	15
3.1 Current Weather File – DSY1	15
4.0 Conclusions	17
Appendix A – Floor Plans.....	A
Appendix B – Minimum Free Openable Area/Geometric Area required for each assessed space.	D
Appendix C – Results under future weather conditions or scenario (London LWC DSY1 2050s high emissions, 50 th percentile).....	E

A large, teal-colored abstract graphic on the left side of the page. It consists of several overlapping geometric shapes, including a large rectangle with rounded corners and a smaller, more complex shape that fits into the corner of the larger one. The overall effect is a modern, minimalist design element.

Executive Summary

Executive Summary

This Overheating Report has been undertaken by SRE for the proposed residential development at 11 & 11a View Road, Haringey, London (the Proposed Development) on behalf of Charlton Brown Architecture & Interiors for Alistair & Paula Flutter (the Client).

This report assesses thermal comfort measures for the Proposed Development, in order to ensure that the thermal condition within the building and the associated rooms meets the standards set out in CIBSE TM59.

In order to assess the thermal performance of the Proposed Development, a model of the Proposed Development has been created within the dynamic thermal analysis software IES-VE 2022. All results are based on the simulation output and should be taken as an indication of the likely final situation, but these conditions cannot be guaranteed.

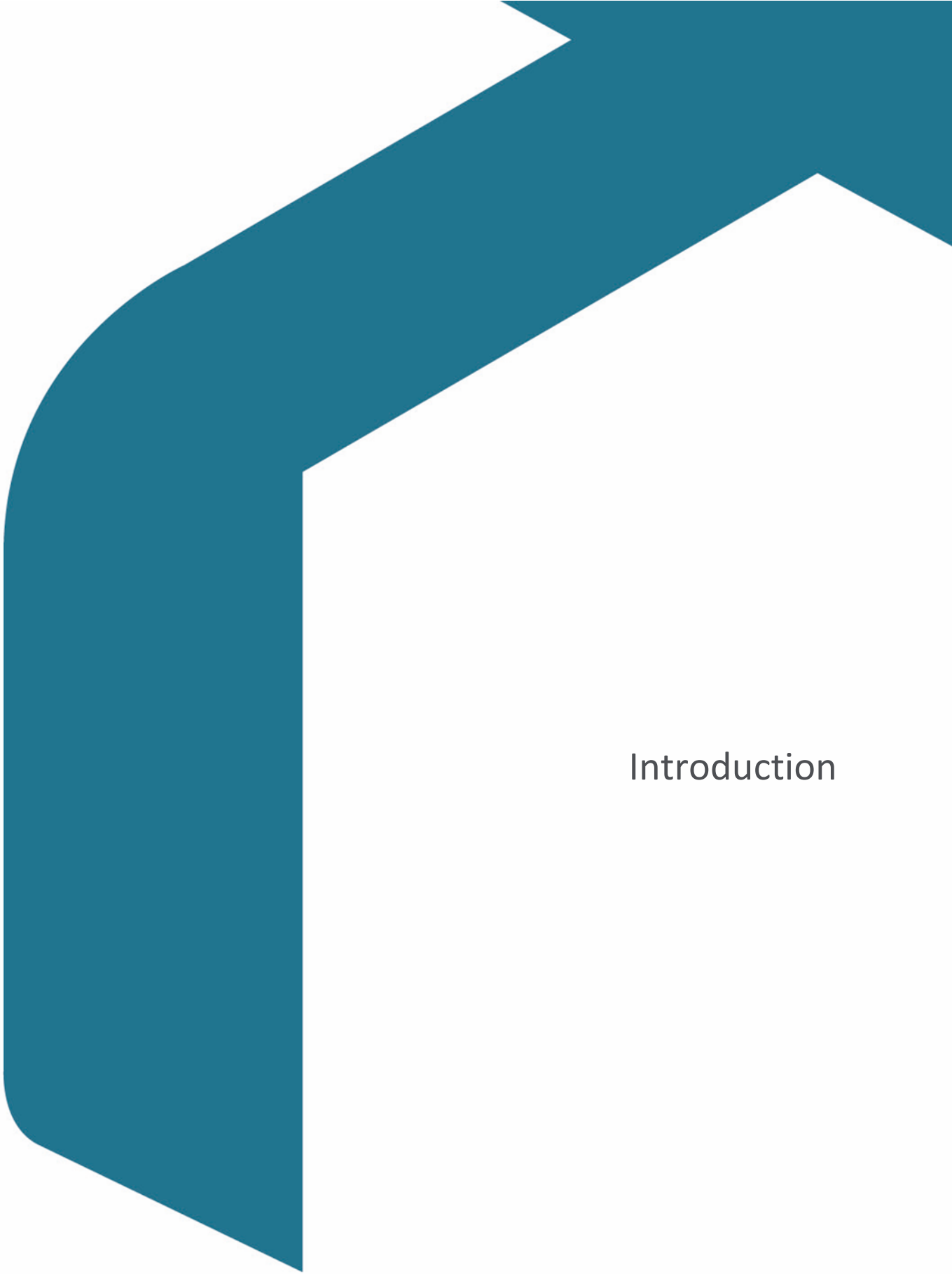
This report describes the dynamic thermal modelling exercise undertaken, lists all the assumptions used and presents the results obtained.

A range of passive design measures have been incorporated, where feasible, to optimise summertime thermal comfort conditions and minimise the overheating risks through a combination of buildings' shape, solar control glazing with a g-value of 0.40 and openable windows. Active design measures such as MVHR with summer bypass and efficient lighting have also been incorporated into the design.

The results of the simulations indicate that under current climate conditions (Weather file: London_LWC_DSY1), the Proposed Development passes the assessment criteria, indicating a good level of thermal comfort during summer periods, thereby complying with Building Regulations Part O1¹.

An additional simulation was carried out using a future weather file (London LWC DSY1 2050s high emissions, 50th percentile) to further test the robustness of the design even though there is no requirement from TM59 methodology for the building to pass under this scenario. The result for this scenario is tabulated in Appendix C.

¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1057374/ADO.pdf



Introduction

1.0 Introduction

This Overheating Report has been undertaken by SRE for the Proposed Development at 11 & 11a View Road, Haringey, London.

Following the guidance of CIBSE TM59: 2017, this study assesses the Proposed Development's overheating risk in relation to the intensity of heat gains, occupancy patterns, building orientation, dwelling layout, shading strategy and ventilation method in response to the relevant requirements for the development.

All results are based on the output from dynamic thermal simulation software IES-VE 2022, which is fully compliant with CIBSE TM33 and ASHRAE 140 standards among other software testing standards and should be taken as an indication of the likely final situation. However, these conditions cannot be guaranteed.

It is important to note that with any modelling exercise there are assumptions and approximations that have to be made. As far as possible, details of all assumptions made, and approximations used are supplied as part of the report.

1.1 The Proposed Development

The Site is located on View Road and positioned between View Road to the North and Highgate Allotments to the South. The Site currently consists of a two-storey dwelling which is to be demolished entirely. The Proposed Development is a redevelopment of the current site into a 5-bed house. The Proposed Development consists of the design and construction of 5 bed-house with a combined kitchen and living space, gym, music room, study room, office and meeting room along with ancillary spaces such as corridors, plant room, garage, store and WC.



Figure 1 – Front Elevation of the Proposed Development (Charlton Brown Architecture & Interiors)

1.2 Methodology

1.2.1 CIBSE TM59. Design Methodology for the Assessment of Overheating Risk in Homes

The performance standards set in CIBSE TM59: 2017 have been used to assess the overheating risk within the Proposed Development. Compliance is based on passing both of the following two criteria:

1. For living rooms, kitchens and bedrooms: the number of hours during which the operative temperature exceeds the threshold comfort temperature by 1°C during the period May to September inclusive shall not be more than 3% of occupied hours. (CIBSE TM52 Criterion 1: Hours of exceedance).
2. For bedrooms only: the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26°C for more than 1% of occupied hours. (Note: 1% of occupied hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours will be recorded as a fail).

In addition to living rooms, kitchens and bedrooms, the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. The overheating test for corridors should be based on the number of annual hours for which an operative temperature of 28 °C is exceeded. Whilst there is no mandatory target to meet, if an operative temperature of 28 °C is exceeded for more than 3% of the total annual hours, then this should be identified as a significant risk within the report.

The overheating risk of the spaces are assessed under the CIBSE design summer year (DSY) weather files. A pass is required using the DSY1 2020s, high emissions, 50th percentile weather file. Other files including the more extreme DSY2 and DSY3 files, as well as future files (i.e. 2050s or 2080s), should be used to further test designs of particular concern, but a pass is not mandatory.

1.2.2 Approved Document Building Regulations Part O

The approved document Building Regulations Part O1 has been written with the aim to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures.

Compliance with requirement O1 can be demonstrated by using one of the following methods:

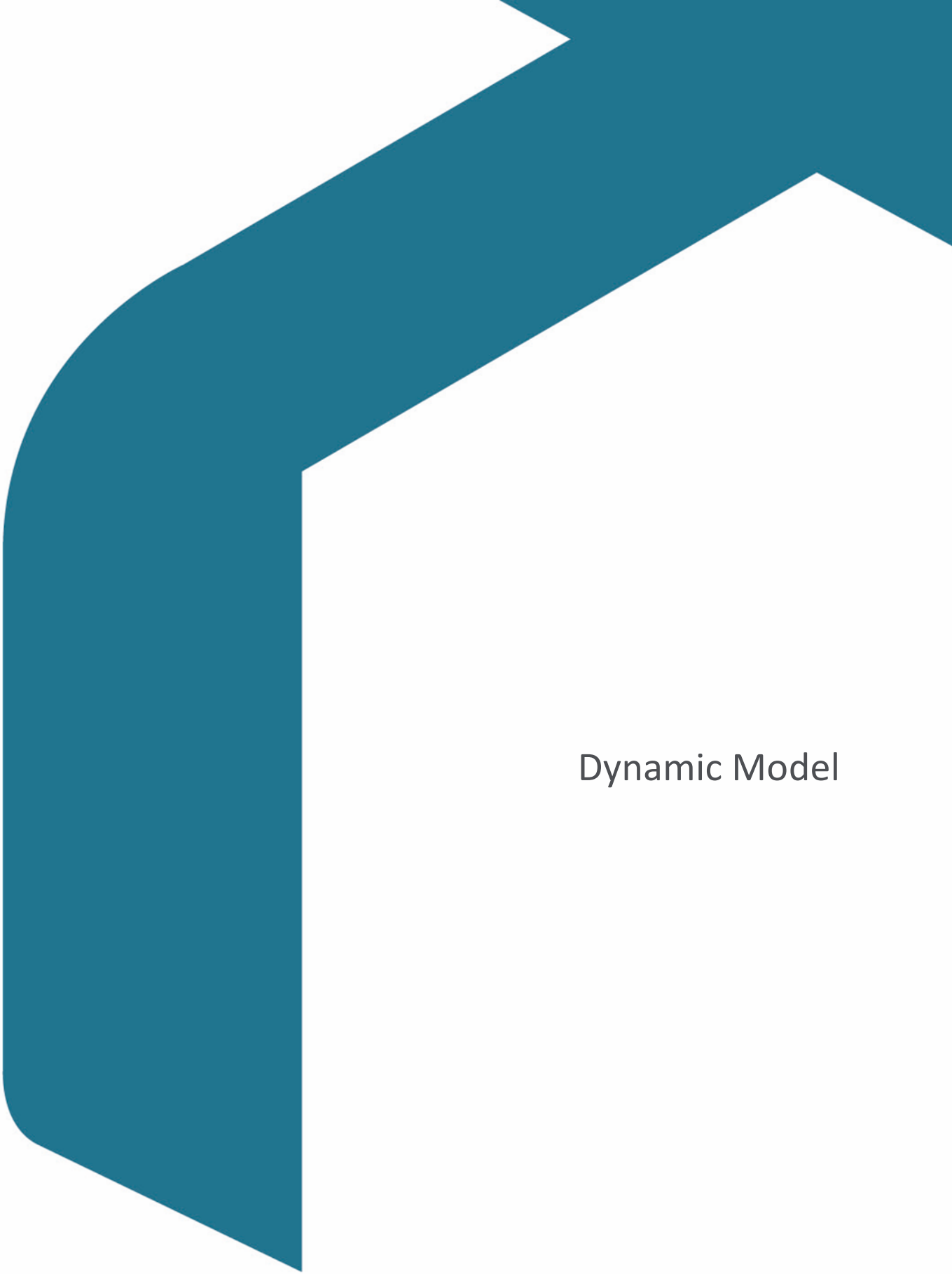
- a. The simplified method for limiting solar gains and providing a means of removing excess heat
- b. The dynamic thermal modelling method

This report details a dynamic thermal modelling method for demonstrating compliance with requirement O1. It provides a standardised approach to predicting overheating risk for residential buildings using dynamic thermal modelling as an alternative to the simplified method.

CIBSE's TM59 method requires the modeller to make choices. The dynamic thermal modelling method in Part O applies limits to these choices, including:

- a. When a room is occupied during the day (8am to 11pm), openings should be modelled to do all of the following:
 - i. Start to open when the internal temperature exceeds 22°C.
 - ii. Be fully open when the internal temperature exceeds 26°C.
 - iii. Start to close when the internal temperature falls below 26°C.
 - iv. Be fully closed when the internal temperature falls below 22°C.
- b. At night (11pm to 8am), openings should be modelled as fully open if both of the following apply:
 - i. The opening is on the first floor or above and not easily accessible.
 - ii. The internal temperature exceeds 23°C at 11pm.

- c. When a ground floor or easily accessible room is unoccupied, both of the following apply:
 - i. In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely.
 - v. At night, windows, patio doors and balcony doors should be modelled as closed.
- d. An entrance door should be included, which should be shut all the time.



Dynamic Model

2.0 Dynamic Model

The thermal modelling has been carried out using IES-VE 2022. IES-VE is a fully dynamic analysis tool which is compliant with CIBSE TM33 and ASHRAE 140 standards among other software testing standards. A 3D thermal model of the Proposed Development has been created based on the architectural drawings provided by the design team.

The following images are taken from the 3D IES-VE model and show the full geometry of the Proposed Development within the thermal model. As with any modelling exercise, some approximations have to be made, but care has been taken to ensure that the scale and dimensions of the model are as close as practicable to the design drawings, and that glazing areas are accurately represented.

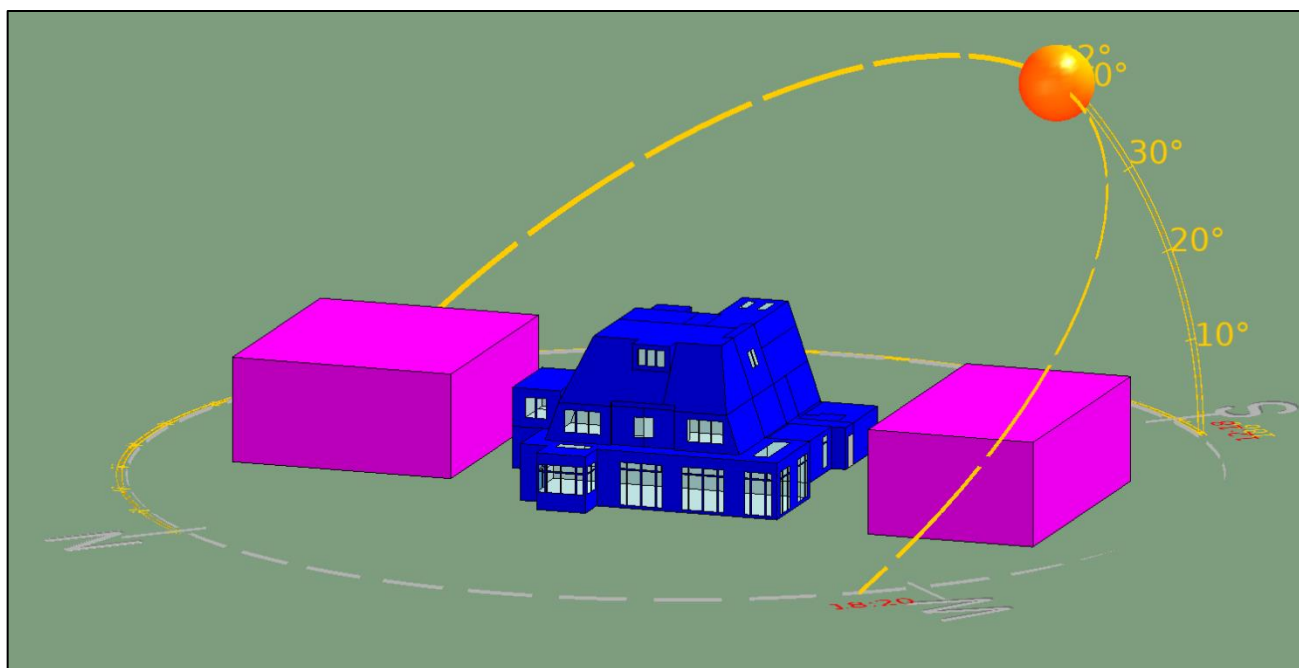


Figure 2 - Image of the 3D model in the IES-VE 2022 software, from the Northwest

The building has been divided into different zones in relation to use. Appropriate profiles and internal gains have been assigned in the different areas, but only the results of the main occupied spaces have been assessed in this study. Secondary spaces, occupied only briefly (less than 30 minutes), such as toilets and cupboards are outside the scope of this study. Figure 3 and table 1 shows the assessed zones; the coloured spaces indicate the different thermal and occupancy profiles applied.

Thermal Template	Zones Applied	Spaces included within the assessment
TM59 - Bathroom	All Ensuites, Bathrooms and WC	No – not continuously occupied
TM59 - Circulation in Flats	All Stairs and Lobbies	No – not continuously occupied
TM59 - Cupboards	Cupboard and Voids	No – not continuously occupied
TM59 - Double Bedroom	All Bedrooms and Guest Bedroom	Yes – continuously occupied

TM59 - Living	TV Room, Gym, Play Room, Music Room, Meeting, Office	Yes – continuously occupied
TM59 - Living/Kitchen/Dining	Kitchen Dining Living Area	Yes – continuously occupied
TM59 - Store	Garage, Cloak Room, AV, Storage, Utility, Plant Room and Dressing Room	No – not continuously occupied

Table 1 – Assigned Thermal Template

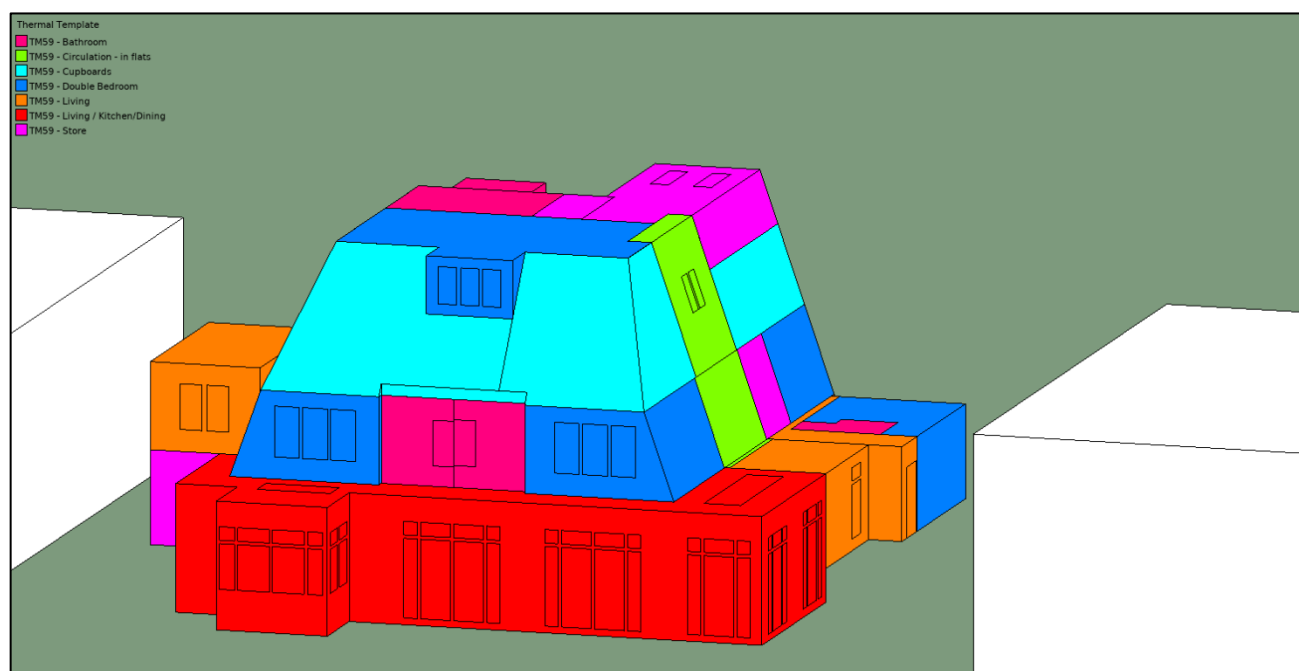


Figure 3 - Thermal zones of assessed spaces within the Proposed Development

2.1 Building Fabric

High performance fabric has been specified to eliminate heat transfer between the internal conditioned areas and the ambient environment. Table 2 summarises the U-Values of all the fabric elements in the model.

Fabric Element	U-Value
External Walls	0.16
External Roof	0.10
Ground Floor	0.08
External Windows	1.00 (g=0.40)
Glazed Doors	1.00 (g=0.40)
Rooflights	1.20 (g=0.40)
Solid Doors	1.00

Table 2 - Construction details of the Proposed Development

Internal floors construction is proposed to be timber joists or steel frame floor construction with ceiling voids for services thus having a lightweight thermal mass category.

2.2 Occupancy and internal gain profiles

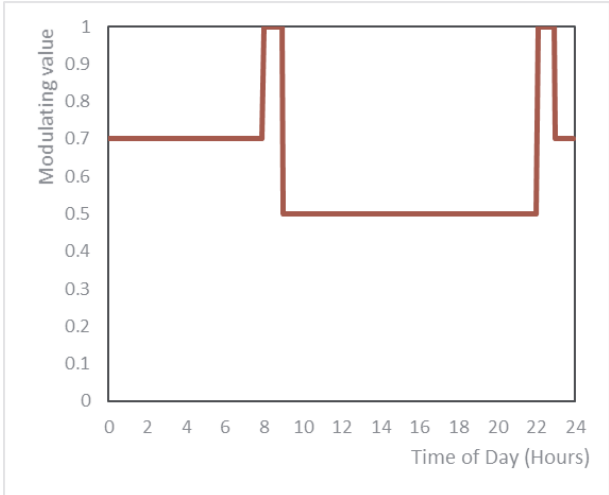
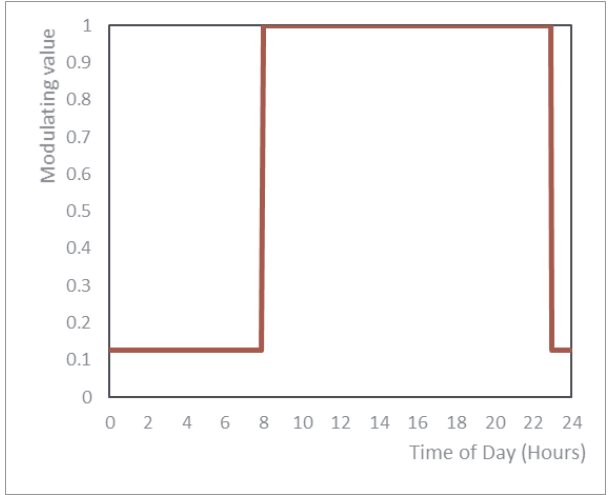
Based on CIBSE Guide A, a maximum sensible heat gain of 75 W/person and a maximum latent heat gain of 55 W/person are assumed in occupied spaces in the assessment.

In addition, heat gains from equipment are also included in the assessment, based on the methodology described in CIBSE TM59, which are summarised in Table 3. Lighting load of 2 W/m² is applied for all occupied spaces.

Usage	Equipment Peak Load (W)	Lighting Load (W/m ²)
TM59 - Double Bedroom	80	2
TM59 - Living	150	2
TM59 - Living / Kitchen / Dining	450	2

Table 3 - Equipment peak load for different usages

The occupancy and internal gain profiles have been based on the methodology described in CIBSE TM59 standard profiles according to usage, which can be seen in Table 4.

TM59 - Double Bedroom Occupancy	TM59 - Double Bedroom Equipment
	
TM59 - Living and Living/Kitchen/Dining Occupancy	TM59 - Living and Living/Kitchen/Dining Equipment

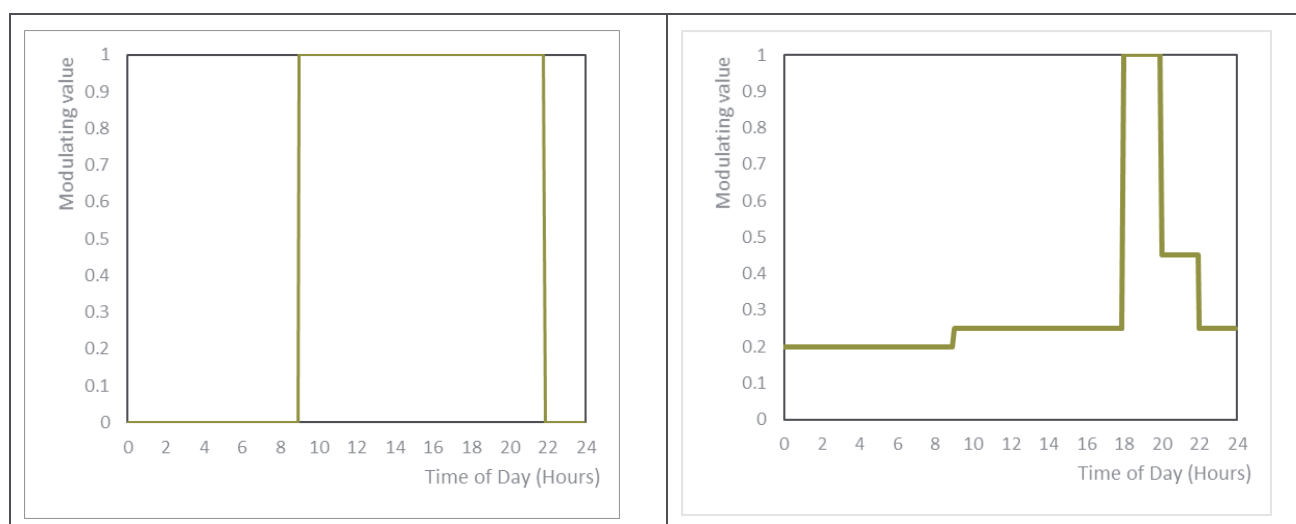


Table 4 - Occupancy and equipment profiles for the occupied space

These profiles represent a robust test that ensures the key aspects of overheating are captured, which include the following characteristics:

- Bedrooms are set with a 24-hour occupancy profile: one person is always considered in each bedroom during the daytime and two people in each double bedroom at night.
- Kitchens/living rooms are unoccupied during the sleeping hours and occupied during the rest of the day.
- No differences between weekdays and weekends are considered and the dwelling is modelled as occupied for 24 hours.

2.3 Air Exchange

Ventilation in all units will be provided through a mixed-mode strategy via a whole house MVHR system with summer bypass along with natural ventilation through openable windows and doors in the living/kitchen/dining area. Ground floor side hung openable windows have been modelled as always shut during night-time for security reasons. Therefore, ventilation in these spaces on the ground floor are assumed to be provided mainly by the MVHR system and the top hung windows during night time for bedrooms.

The supply rate of the MVHR system has been modelled as 1 ach within the each of the continuously occupied spaces (i.e. spaces classified as continuously occupied as per table 1).

A design air tightness of 3 m³/hr/m² @50 Pa has been applied in all areas. The subsequent infiltration rate is assumed at 0.0662 ach.

2.4 Window Openings

Based on the information supplied by the Architect, the specification for the opening areas and angle are summarised in Table 5. Figures 4, 5 and 6 shows the opening type applied within the thermal comfort model. The minimum free opening areas required for each occupied rooms are highlighted in Appendix B.

Opening type	Opening category	Openable area (%)	Max. opening angle
Fixed Shut	None	0	0
Side Hung/Sliding Door (Day)	Side Hung	100	45

Opening type	Opening category	Openable area (%)	Max. opening angle
Side Hung (Day & Night)	Side Hung	100	45
Top Hung (Day)	Top Hung	100	30
Top Hung (Day & Night)	Top Hung	100	30

Table 5 - Glazing specification - openable areas

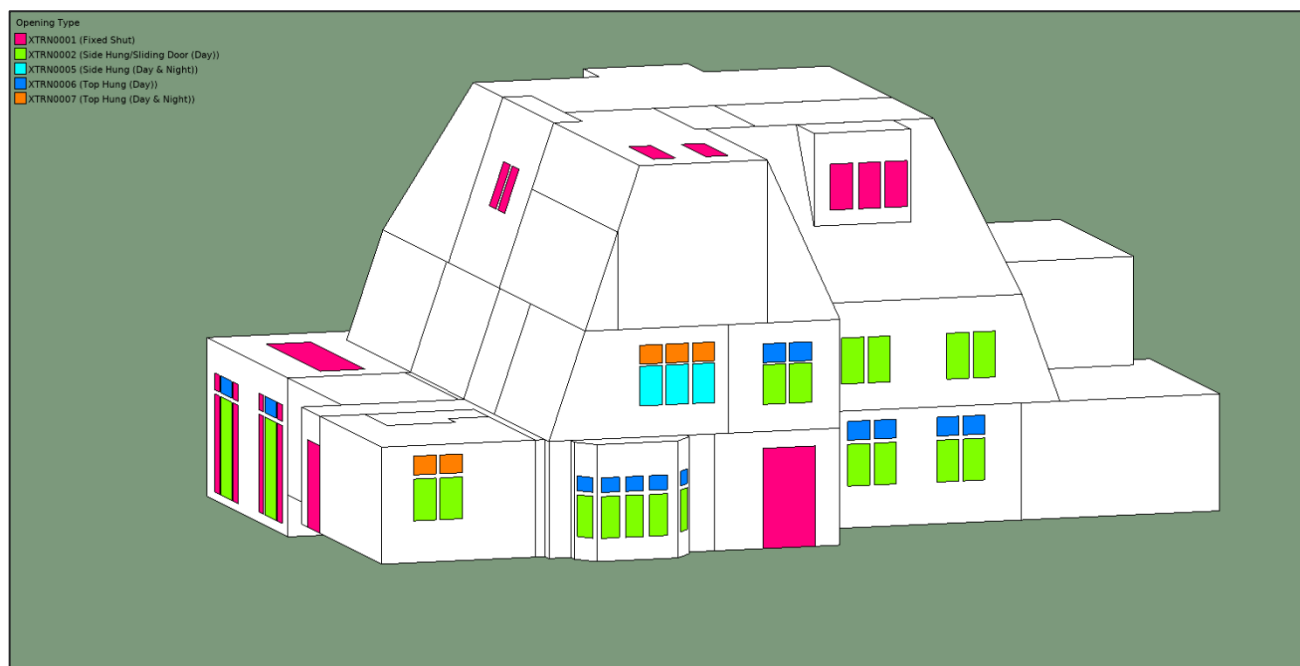


Figure 4 – Opening Types applied within the model (view from Southeast Elevation)

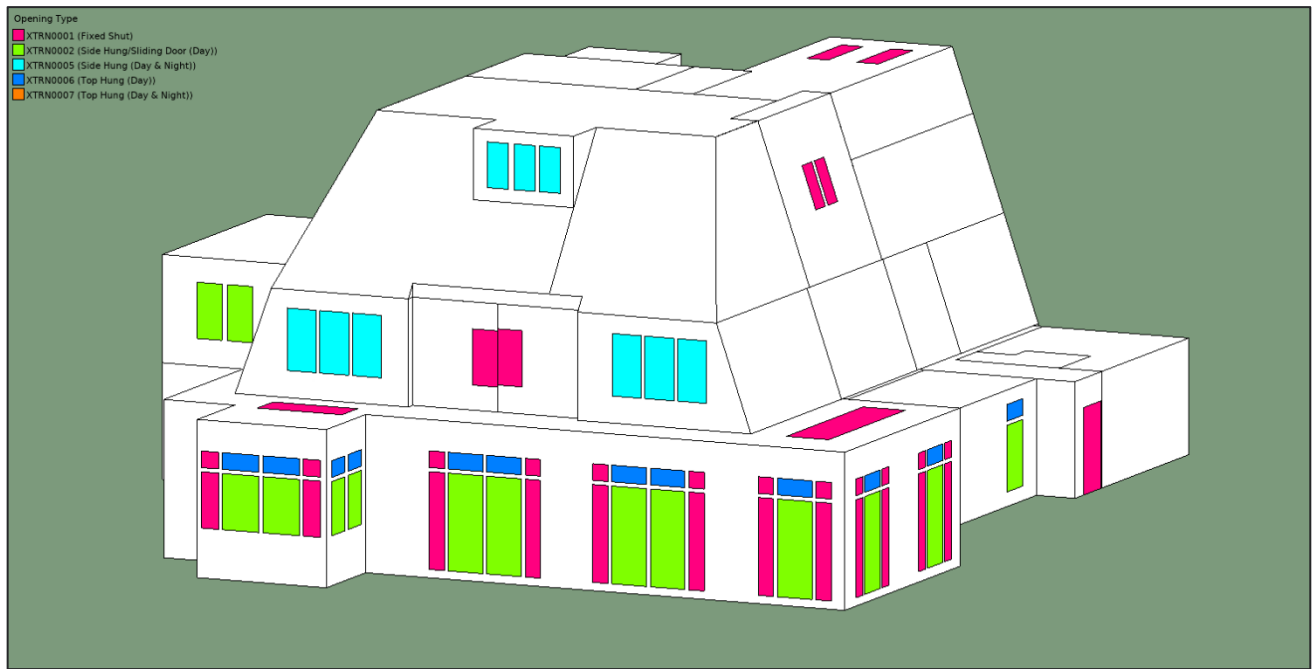


Figure 5 - Opening Types applied within the model (view from Northwest Elevation)

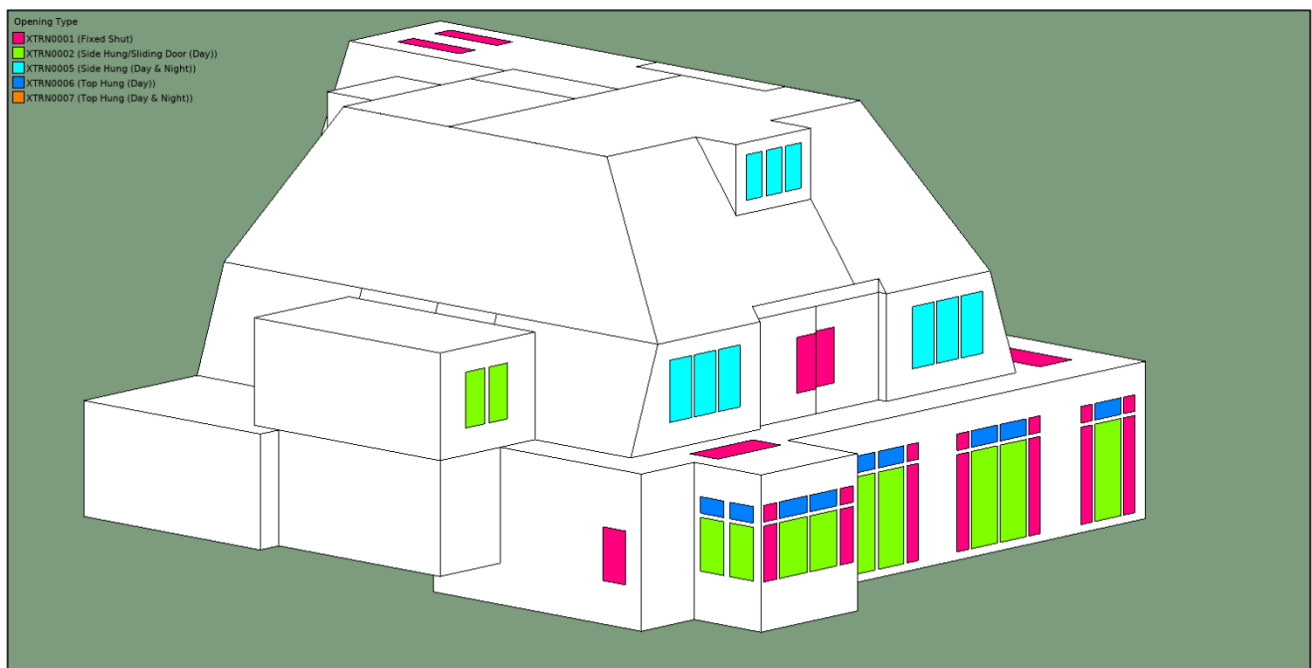


Figure 6 - Opening Types applied within the model (view from North Elevation))

Openable windows are provided for all occupied rooms in the Proposed Development. However, due to security concerns, side hung windows on all the ground floor rooms are modelled to be shut at night-time (11 pm to 8 am) as per Part O1 limitations on TM59 modelling.

All the rooflights are assumed to be fixed shut.

2.5 Shading devices

Although internal blinds can be applied to all non-openable windows to reduce solar gains during the daytime, this has not been modelled as per Part O1 guidance.

2.6 Weather File

The thermal comfort analysis is conducted under both current and projected future climate conditions, based on the below weather files:

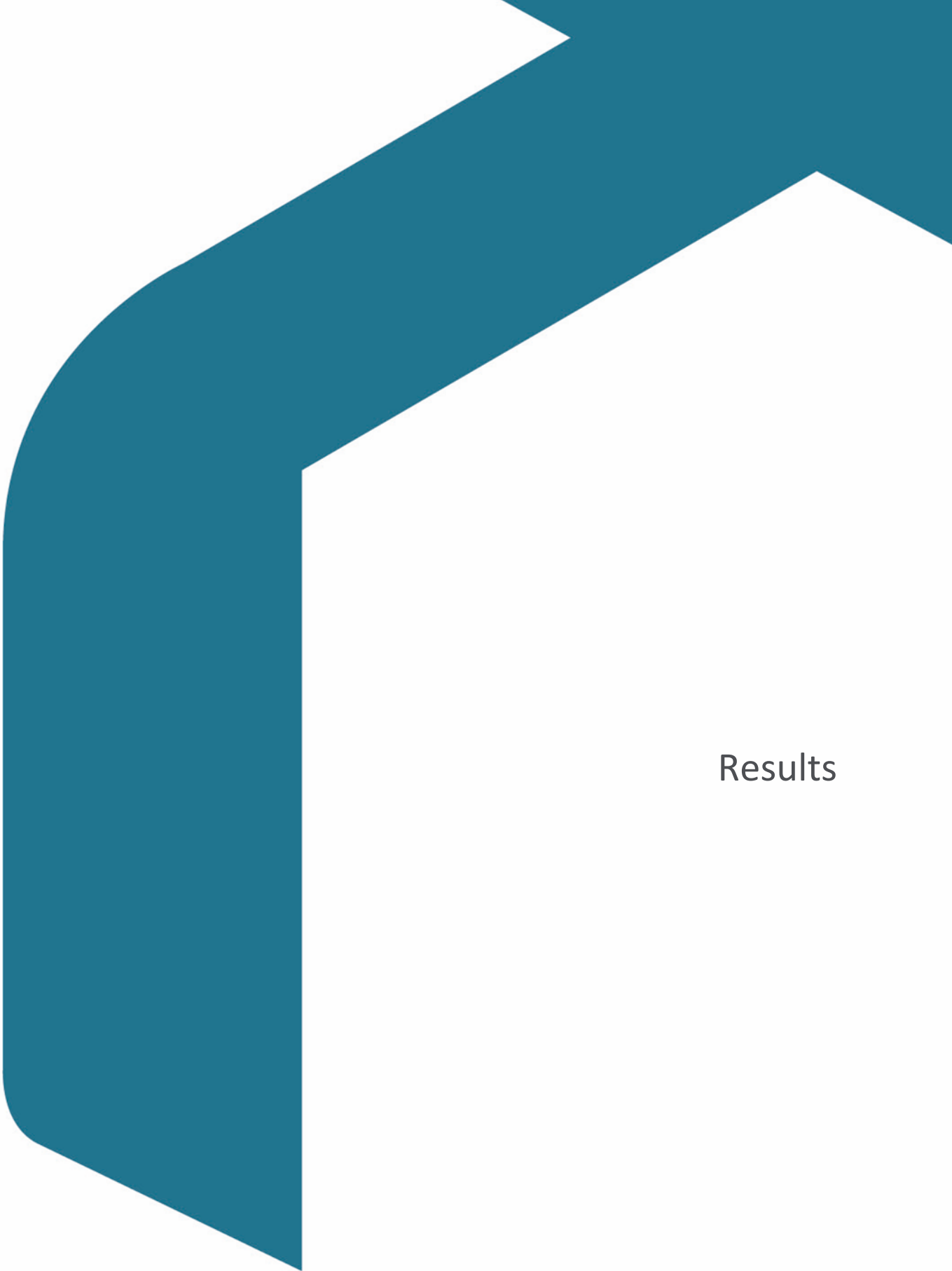
Current condition:

- London LWC DSY1

Future condition:

- London LWC DSY1 2050s high emissions 50th percentile

The solar gains are calculated from the IES software based on the weather file, the building's geometry and orientation of its facades, surrounding obstacles, transmission coefficients of the glazing and the solar angles.

A large, teal-colored abstract graphic on the left side of the page. It consists of a thick, curved line that starts from the top left, curves downwards and to the right, and then continues as a straight line towards the bottom left. The shape is reminiscent of a stylized letter 'L' or a corner of a building.

Results

3.0 Results

According to CIBSE TM59, the overheating assessment has been undertaken for the summer period, from 1st May to 30th September. The air speed is set at 0.1 m/s to generate operative temperature, and the thermal comfort category is assumed to be Category II (new building) in the assessment. Dynamic thermal simulation has been conducted with the settings described in Section 2.0. Results for the current weather conditions are presented in this section and for the future conditions the results are presented in Appendix C.

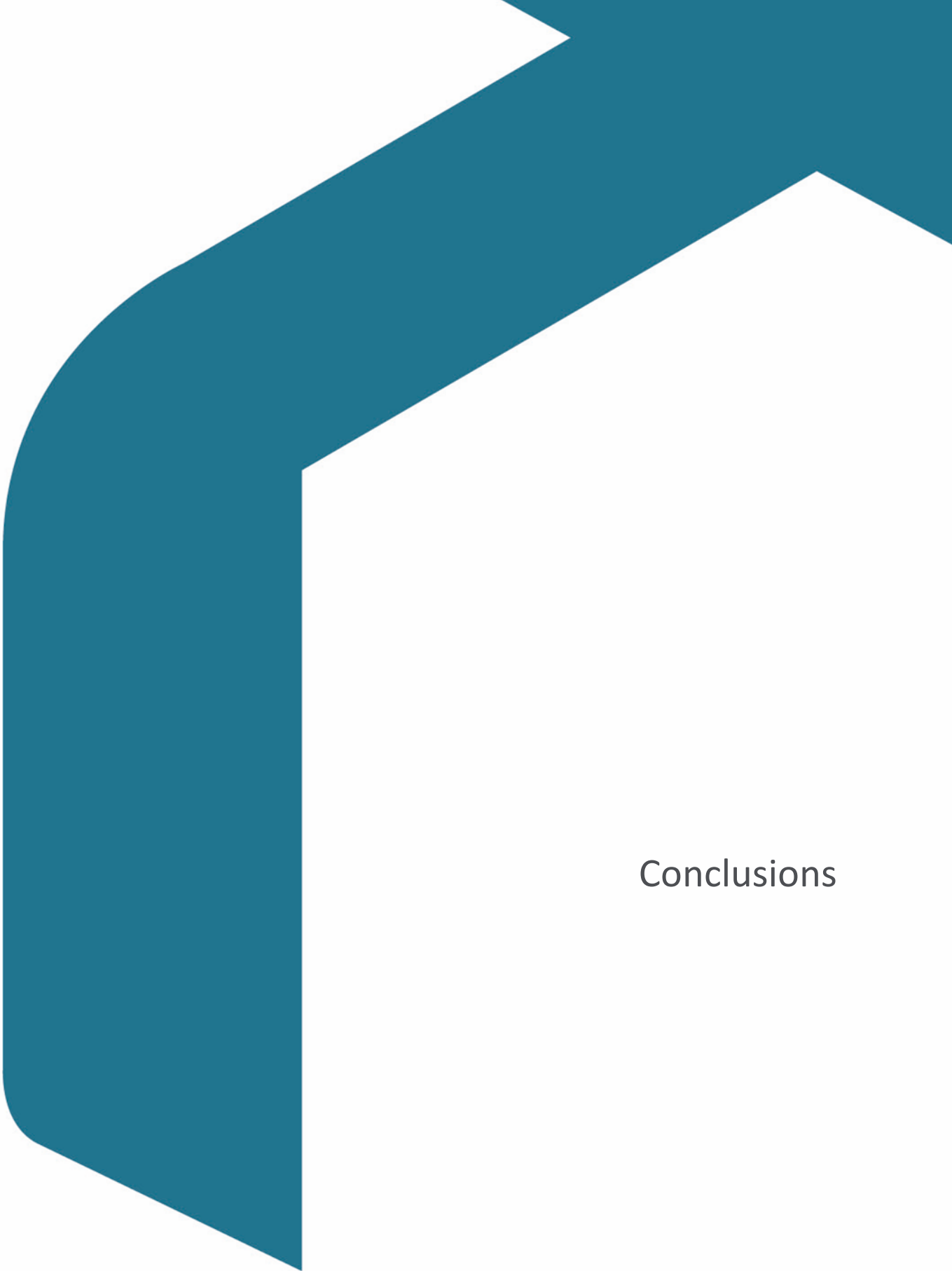
3.1 Current Weather File – DSY1

Results for current weather conditions using London Weather Centre DSY1 are presented in this section.

Space	Criterion 1 (% hours top-max $\geq$ 1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
Guest Bedroom	0.7	26	Pass
Bedroom 1	0.5	13	Pass
Bedroom 2	0.5	6	Pass
Bedroom 3	0.5	6	Pass
Bedroom 4	0.4	19	Pass
TV Room	0.9	-	Pass
Gym	1.5	-	Pass
Play Room	1	-	Pass
Music Room	0.8	-	Pass
Meeting	1.3	-	Pass
Office	0.9	-	Pass
Kitchen Living Dining	1.7	-	Pass

Table 6 – Simulation results summary for occupied spaces – using the DSY1 current weather file

As demonstrated in Table 6, all of occupied rooms of the Proposed Development pass the assessment under the current weather condition or scenario, thus satisfying TM59 requirements and complying with Part O1. A further simulation with future weather file has been carried out for design purposes and the results of it are tabulated in Appendix C.

A large, teal-colored abstract graphic on the left side of the page. It consists of a thick, curved line that starts at the top left, curves downwards and to the right, then turns back to curve downwards and to the left, ending in a pointed shape at the bottom left. The rest of the page is white.

Conclusions

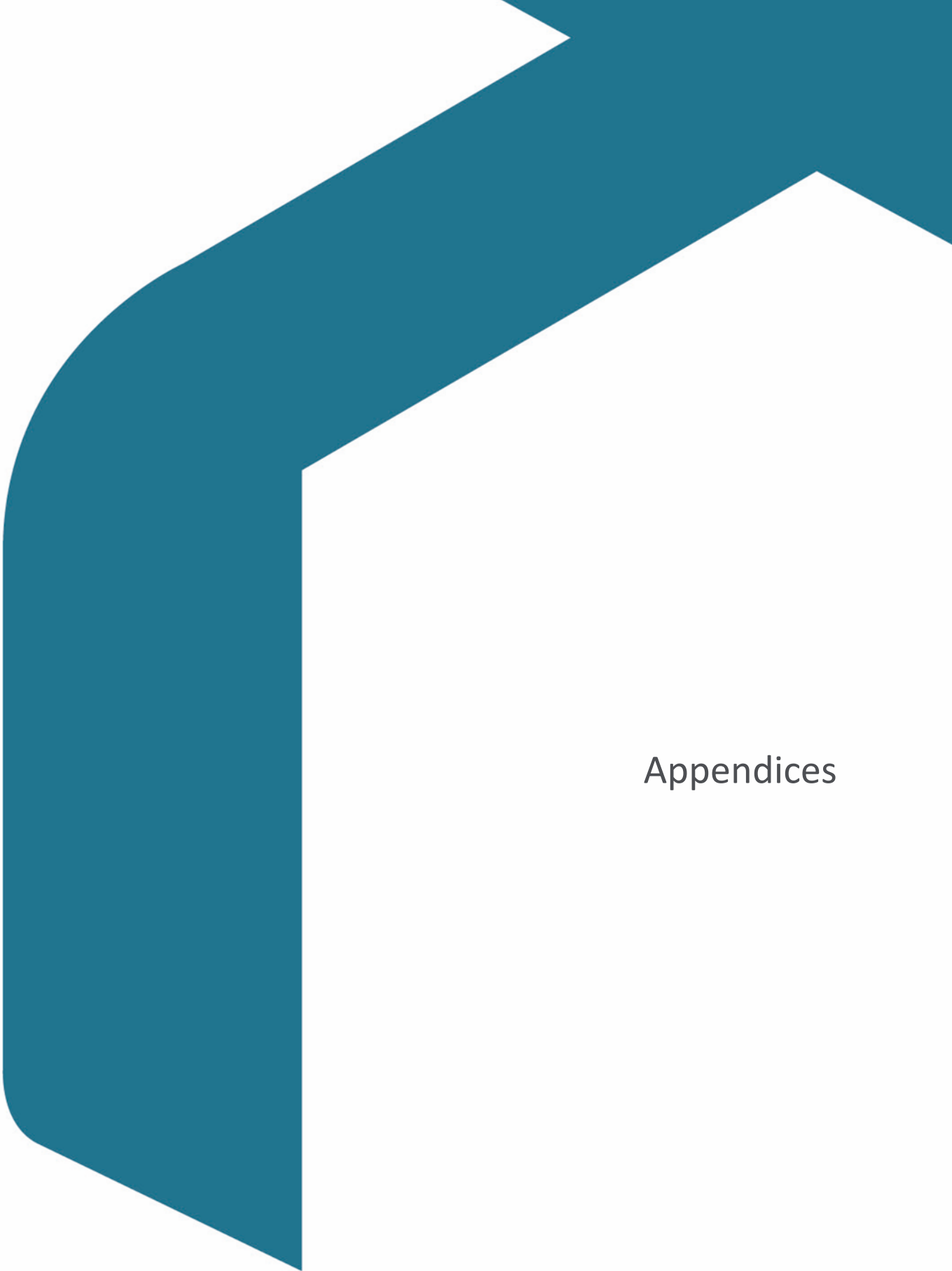
4.0 Conclusions

This Overheating Report has been undertaken by SRE for the proposed residential development at 11 & 11a View Road, Haringey, London in order to assess the risks of overheating and the thermal comfort conditions in the occupied areas.

The following passive and active design measures to address summertime overheating have been incorporated into the design of all occupied rooms.

- Building Shape
- Solar Control Glass with g-value of 0.40
- Mixed mode ventilation via openable windows and MVHR

An additional simulation for a future weather condition scenario (DSY1 2050s high emissions, 50th percentile) have also been conducted to further test the robustness of the design. The results show that majority of the rooms fail to meet the assessment criteria under the future weather file. This indicates that adaptive measures such as provision for internal blinds, external shutters and/or table fans will have to be put in place in order for good levels of thermal comfort conditions to be achieved during severe heat waves in the future.

A large, teal-colored abstract graphic on the left side of the page. It consists of several overlapping geometric shapes, including a large 'L' shape with rounded corners and a smaller, more complex shape above it, creating a modern, architectural feel.

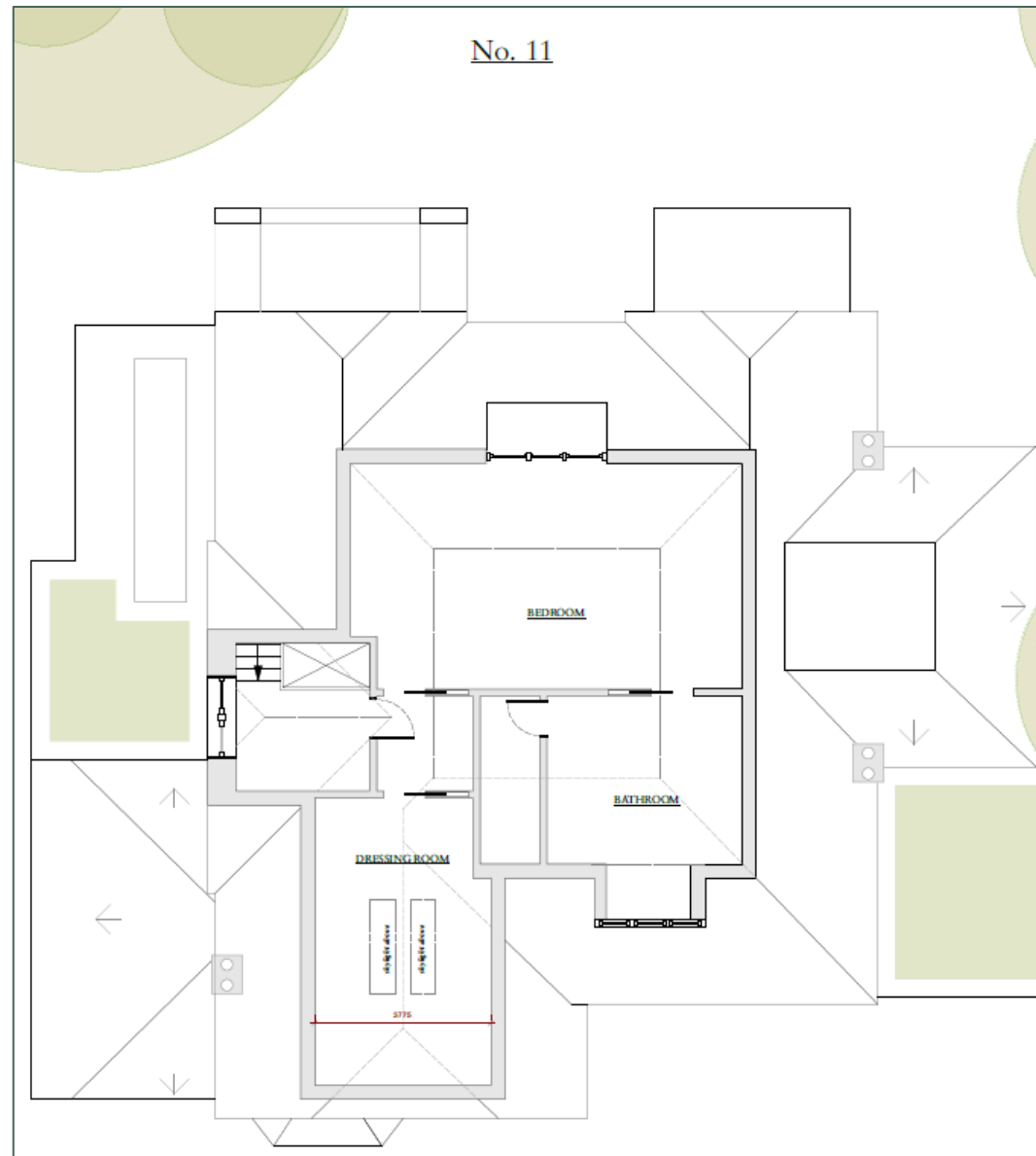
Appendices

Appendix A – Floor Plans

Ground Floor Plan







Appendix B – Minimum Free Openable Area/Geometric Area required for each assessed space.

Space	Internal Floor Area (m ²)	External Glazing Area (m ²)	Free Openable Area/Geometric Area (m ²)
Guest Bedroom	14.740	1.595	1.175
Bedroom 1	23.052	2.310	1.695
Bedroom 2	27.909	3.375	2.722
Bedroom 3	27.909	3.375	2.722
Bedroom 4	46.370	1.815	1.464
TV Room	37.669	3.037	2.272
Gym	12.760	1.800	1.370
Play Room	19.800	1.755	1.415
Music Room	22.838	3.190	2.349
Meeting	10.450	1.540	1.130
Office	27.590	2.420	1.952
Kitchen Living Dining	124.213	46.12	23.829

Table 7 – Free Opening Area required to mitigate overheating for each assessed rooms.

Appendix C – Results under future weather conditions or scenario (London LWC DSY1 2050s high emissions, 50th percentile)

In order to further test the robustness of the design, further simulations have been carried out under future weather file DSY1 2050s high emissions 50th percentile and results tabulated in Table 8.

According to results, further adaptive measures like provision for internal blinds and/or table fans will have to be put in place in order for good levels of thermal comfort conditions to be achieved during severe heat waves in the future.

However, it should be noted that a pass is not mandatory requirement of TM59 under future weather conditions.

Space	Criterion 1 (% hours top-max $\geq$ 1K)	Criterion 2 (hours operative temp. $>26^{\circ}\text{C}$)	Pass / Fail
Guest Bedroom	3	167	Fail
Bedroom 1	2	59	Fail
Bedroom 2	2.2	45	Fail
Bedroom 3	2.1	43	Fail
Bedroom 4	1.5	84	Fail
TV Room	2.9	-	Pass
Gym	6.6	-	Fail
Play Room	5.3	-	Fail
Music Room	2.8	-	Pass
Meeting	6	-	Fail

Space	Criterion 1 (% hours top-max $\geq$ 1K)	Criterion 2 (hours operative temp. >26°C)	Pass / Fail
Office	3.4	-	Fail
Kitchen Living Dining	6.8	-	Fail

Table 8 - Simulation results summary for occupied spaces – using the DSY1 2050 future weather file.



SRE Registered Office | Greenforde Farm
Stoner Hill Road | Froxfield
Petersfield | Hampshire | GU32 1DY
T: +44 (0)1730 710044
E: info@sre.co.uk

SRE London Office | Parkshot House
5 Kew Road | Richmond
Surrey | TW9 2PR

T: +44 (0)20 8332 6633
W: www.sre.co.uk