

# Overheating Analysis

(in accordance with CIBSE TM59 and Part O)

Aspect (Eastleigh) Ltd

237 Chamberlayne Road  
Eastleigh  
SO50 5HX  
Eastleigh Borough Council



| Version | Revision | Date       | Author               | Reviewer        | Project Manager      |
|---------|----------|------------|----------------------|-----------------|----------------------|
| 1       | A        | 24.05.2023 | Meeradevi Kathaliyil | Alisha Pinheiro | Meeradevi Kathaliyil |
|         |          |            |                      |                 |                      |
|         |          |            |                      |                 |                      |
|         |          |            |                      |                 |                      |

© 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](mailto:info@sre.co.uk)

[www.sre.co.uk](http://www.sre.co.uk)

## Contents

|                                                                                             |    |
|---------------------------------------------------------------------------------------------|----|
| Executive Summary .....                                                                     | 1  |
| 1.0 Introduction.....                                                                       | 3  |
| 1.1 The Proposed Development.....                                                           | 3  |
| 2.0 Methodology .....                                                                       | 4  |
| 2.1 CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Homes.....     | 4  |
| 2.2 CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Corridors..... | 4  |
| 2.3 Approved Document Building Regulations Part O .....                                     | 5  |
| 3.0 Dynamic Model .....                                                                     | 7  |
| 3.1 Building Fabric.....                                                                    | 11 |
| 3.2 Occupancy and internal gain profiles.....                                               | 11 |
| 3.3 Air Exchange .....                                                                      | 13 |
| 3.4 Window Openings.....                                                                    | 14 |
| 3.5 Shading devices .....                                                                   | 17 |
| 3.6 Weather File .....                                                                      | 18 |
| 4.0 Results.....                                                                            | 20 |
| 4.1 Current Weather File – 2020s DSY1.....                                                  | 20 |
| 4.2 Future Weather File – DSY1 2050 .....                                                   | 22 |
| 5.0 Conclusions.....                                                                        | 25 |
| Appendix A – Site Plan, Floor Plans, Elevations and Sections .....                          | A  |

A large, teal-colored abstract graphic on the left side of the page. It consists of several overlapping geometric shapes, including a large curved rectangle and a series of triangles, creating a dynamic, modern look.

## Executive Summary

## Executive Summary

This Overheating Report has been undertaken by SRE for the proposed 'Maple Place' Residential Development at 237 Chamberlayne Road, Eastleigh (the Proposed Development) on behalf of Aspect (Eastleigh) Ltd (the Client).

This report assesses thermal comfort measures for the proposed residential units, to demonstrate compliance with 2021 Building Regulations Part O1, thus ensuring the summertime thermal condition within the building and the associated rooms meet the standards set out in CIBSE TM59.

To assess the thermal performance of the Proposed Residential units, 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 expected 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.

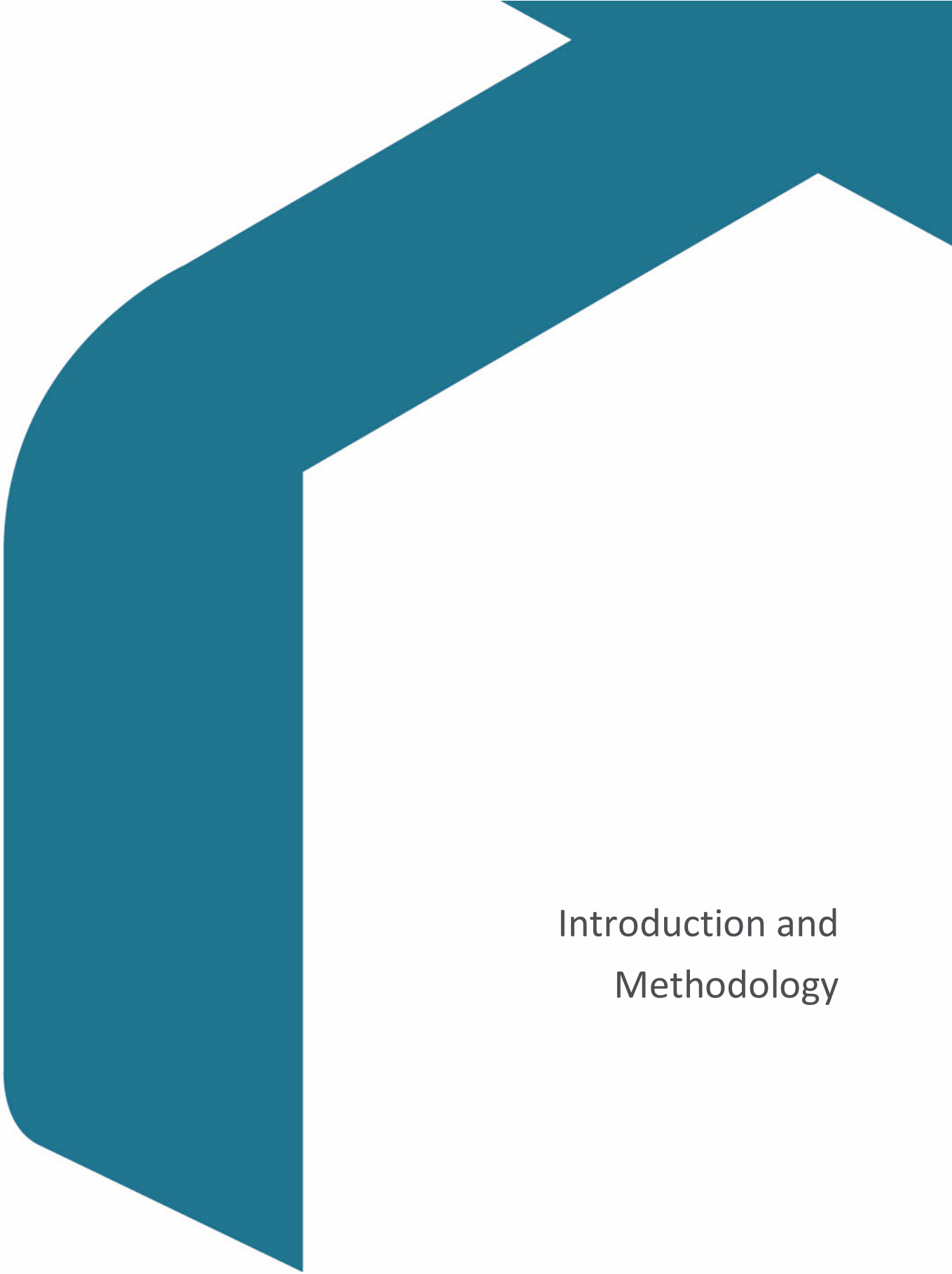
A range of passive design measures have been incorporated, where feasible, to optimise thermal comfort conditions and minimise the overheating risks. This is done through a combination of building fabric specifications, shading using overhangs and balconies, solar control glass (g-value of 0.43) and openable windows and skylights. Active design measures such as MVHR is also part of the design.

The results of the simulations indicate that under current climate conditions (Southampton, DSY1 2020s high emissions, 50<sup>th</sup> percentile), the Proposed Development passes the Part O1 and TM59 assessment criteria with the strategies mentioned above, indicating a good level of thermal comfort during summer periods.

An additional simulation was carried out using a future weather file (Southampton, DSY1 2050s high emissions, 50<sup>th</sup> percentile) to further test the robustness of the design. The results of the simulation indicate that measures will need to be taken to mitigate overheating in all residential units. It should be noted that a pass is not mandatory under the future weather scenario, but the overheating risk can be reduced in the future by incorporating measures such as night time ventilation and overhangs.

Communal corridors with communal heating pipework was also assessed using current and future weather files. According to the results of the simulation, mitigation measures will have to be adapted to reduce the risk of overheating in corridors. A pass is not mandatory for the corridors, but the overheating risk can be reduced by insulating pipework, HIUs, storage vessels and ceiling, circulating water at lower flow temperatures, minimizing pipe runs, more efficient control strategies and ventilating corridors and risers using actuated louvres or mechanical extract.

In relation to CIBSE TM59 requirements and Building Regulations Part O, Requirement O1, the Proposed Development meets compliance.

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.

## Introduction and Methodology

## 1.0 Introduction

This Overheating Analysis has been undertaken by SRE for the proposed 'Maple Place' Residential Development at 237 Chamberlayne Road, Eastleigh, (the Proposed Development) on behalf of Aspect (Eastleigh) Ltd (the Client).

Following the guidance of CIBSE TM59: 2017, and The Building Regulations 2010, Part O: 2022, 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 outputs from dynamic thermal simulation software IES-VE 2022, which is fully compliant with CIBSE Applications Manual AM11, and should be taken as an indication of the expected 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 Proposed Development at 237 Chamberlayne Road consists of the demolition of 2 no. existing structures (former Samson's Gym and The Crockery Arts & Workshop space) and replacing them with a three storey residential building. The Proposed Development consists of 3 no. 3 bedroom houses, 3 no. 2 bedroom apartments and 6 no. 1 bedroom apartments. The proposed development is located on the corner of Chamberlayne and Derby road at Eastleigh. Figure 1 shows the site plan of the Proposed development.



Figure 1 – Site plan of the Proposed Development at 237 Chamberlayne Road (FDG)

## 2.0 Methodology

### 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 for Southampton. A pass is required using the DSY1 2020s, high emissions, 50<sup>th</sup> percentile weather file. Other files including the more extreme DSY1 2050s weather file, should be used to further test designs of particular concern, but a pass is not mandatory.

### 2.2 CIBSE TM59: Design Methodology for the Assessment of Overheating Risk in Corridors

CIBSE TM59 states that the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them. The overheating test for corridors is based on the number of annual hours for which an operative temperature of 28 °C is exceeded. Whilst there is no mandatory target, if an operative temperature of 28 °C is exceeded for more than 3% of total annual hours, this should be flagged as a significant risk within the report.

## 2.3 Approved Document Building Regulations Part O

The approved document Building Regulations Part O 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:

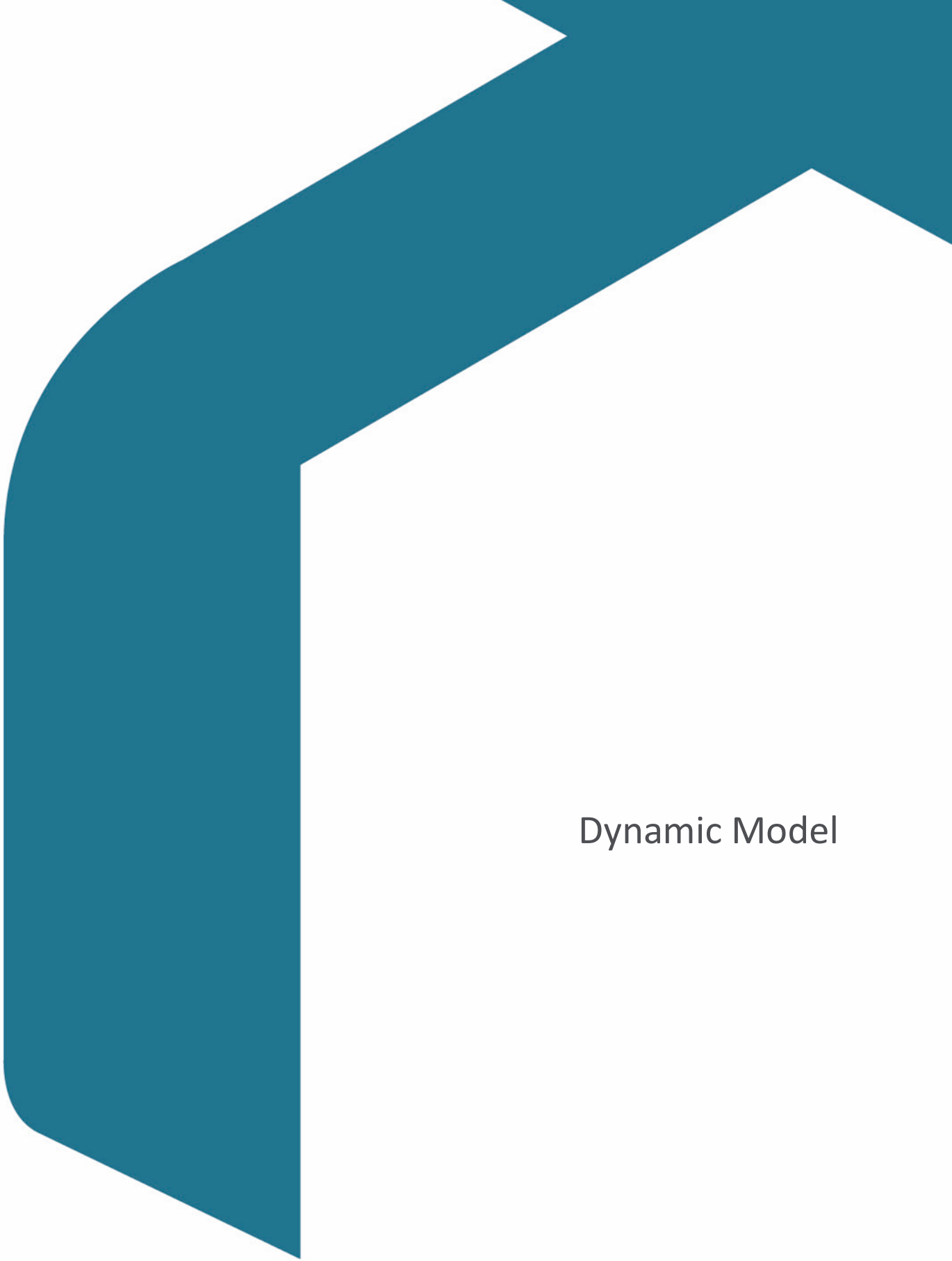
- a. The simplified method for limiting solar gains and providing a means of removing excess heat
- b. The dynamic thermal modelling method

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.

Based on Building Regulations Part O, mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it. The building should be constructed to meet requirement O1 using passive means as far as reasonably practicable. It should be demonstrated to the building control body that all practicable passive means of limiting unwanted solar gains and removing excess heat have been used first before adopting mechanical cooling. Any mechanical cooling (air-conditioning) is expected to be used only where requirement O1 cannot be met using openings.

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, then turns back to the left, forming a large, open 'C' shape. The line is solid and has a consistent thickness.

Dynamic Model

### 3.0 Dynamic Model

The dynamic thermal modelling has been carried out using IES-VE 2022. IES-VE is a fully dynamic analysis tool which is compliant with CIBSE Applications Manual AM11. The 3D thermal model of the proposed residential building has been created based on the architectural drawings provided by FDG.

The following images are taken from the 3D IES-VE model and show the full geometry of the Proposed Residence 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 possible to the design drawings and that glazing areas are accurately represented.

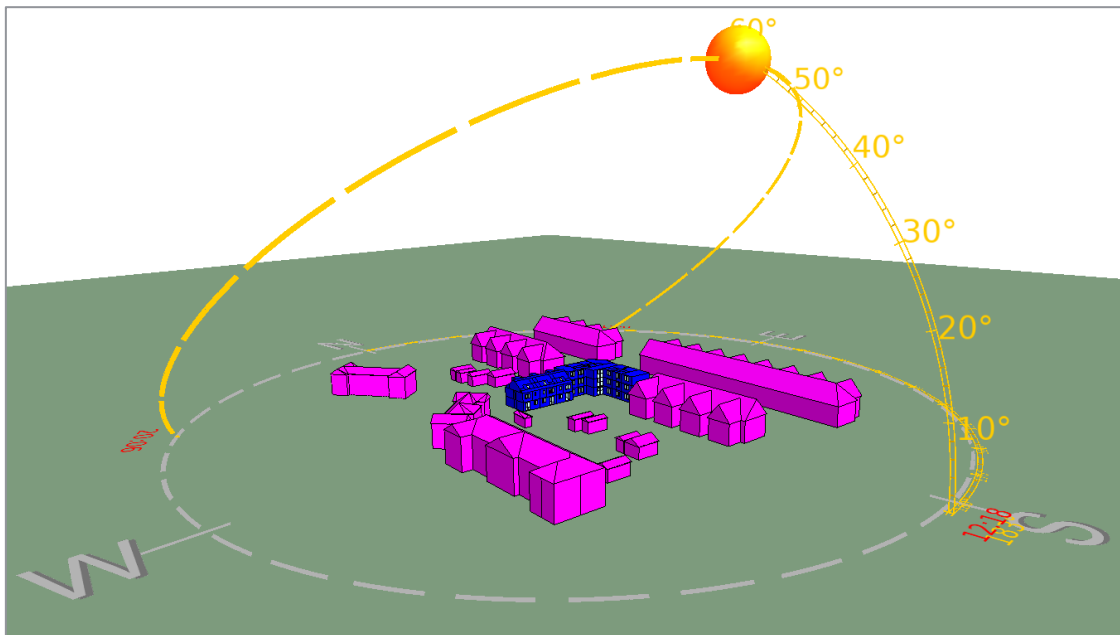


Figure 2 - 3D model of the Proposed Development in the IES-VE 2022 software, view from the Southwest

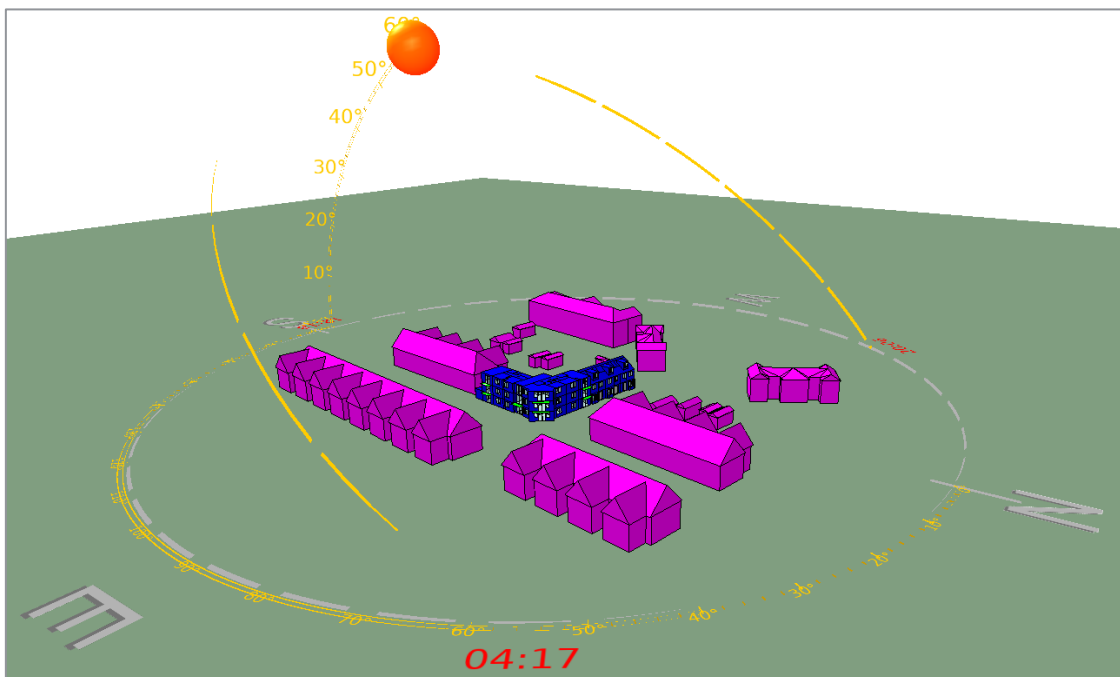


Figure 3 - 3D model of the Proposed Development in the IES-VE 2022 software, view from the Northeast

The buildings have been divided into different zones in relation to use. Appropriate profiles and internal gains have been assigned in all 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, store and hallways are outside the scope of this study. The assessed occupied spaces in the Proposed Development and their floor areas are listed below.

| Units              | Spaces                | Floor area (m2) |
|--------------------|-----------------------|-----------------|
| House 1            | Living                | 13.85           |
|                    | Kitchen & Dining      | 14.69           |
|                    | Study                 | 3.59            |
|                    | Bedroom 1             | 9.48            |
|                    | Bedroom 2             | 11.37           |
|                    | Bedroom 3             | 20.91           |
| House 2            | Living                | 14.61           |
|                    | Kitchen & Dining      | 15.25           |
|                    | Study                 | 3.59            |
|                    | Bedroom 1             | 10.06           |
|                    | Bedroom 2             | 12.06           |
|                    | Bedroom 3             | 21.79           |
| House 3            | Living                | 14.61           |
|                    | Kitchen & Dining      | 15.25           |
|                    | Study                 | 3.59            |
|                    | Bedroom 1             | 10.06           |
|                    | Bedroom 2             | 12.06           |
|                    | Bedroom 3             | 21.79           |
| 2 Bedroom Apt - GF | Living/Kitchen/Dining | 27.67           |
|                    | Study                 | 4.64            |
|                    | Bedroom 1             | 12.18           |
|                    | Bedroom 2             | 12.09           |
| 2 Bedroom Apt - FF | Living/Kitchen/Dining | 27.67           |

| Units                | Spaces                | Floor area (m2) |
|----------------------|-----------------------|-----------------|
|                      | Study                 | 4.64            |
|                      | Bedroom 1             | 12.18           |
|                      | Bedroom 2             | 12.09           |
| 2 Bedroom Apt - SF   | Living/Kitchen/Dining | 27.67           |
|                      | Study                 | 4.64            |
|                      | Bedroom 1             | 12.18           |
|                      | Bedroom 2             | 12.09           |
| 1 Bedroom Apt 1 - GF | Living/Kitchen/Dining | 24.49           |
|                      | Bedroom 1             | 12.68           |
| 1 Bedroom Apt 2 - GF | Living/Kitchen/Dining | 28.28           |
|                      | Bedroom 1             | 10.22           |
| 1 Bedroom Apt 1 - FF | Living/Kitchen/Dining | 24.49           |
|                      | Bedroom 1             | 12.68           |
| 1 Bedroom Apt 2 - FF | Living/Kitchen/Dining | 28.28           |
|                      | Bedroom 1             | 10.22           |
| 1 Bedroom Apt 1 - SF | Living/Kitchen/Dining | 24.49           |
|                      | Bedroom 1             | 12.68           |
| 1 Bedroom Apt 2 - SF | Living/Kitchen/Dining | 28.28           |
|                      | Bedroom 1             | 10.22           |

Table 1 - List of assessed occupied spaces and their floor area.

Figure 4 and Figure 5 indicates the thermal templates applied to each space type. Floor plans of the assessed spaces can be found in Appendix A.

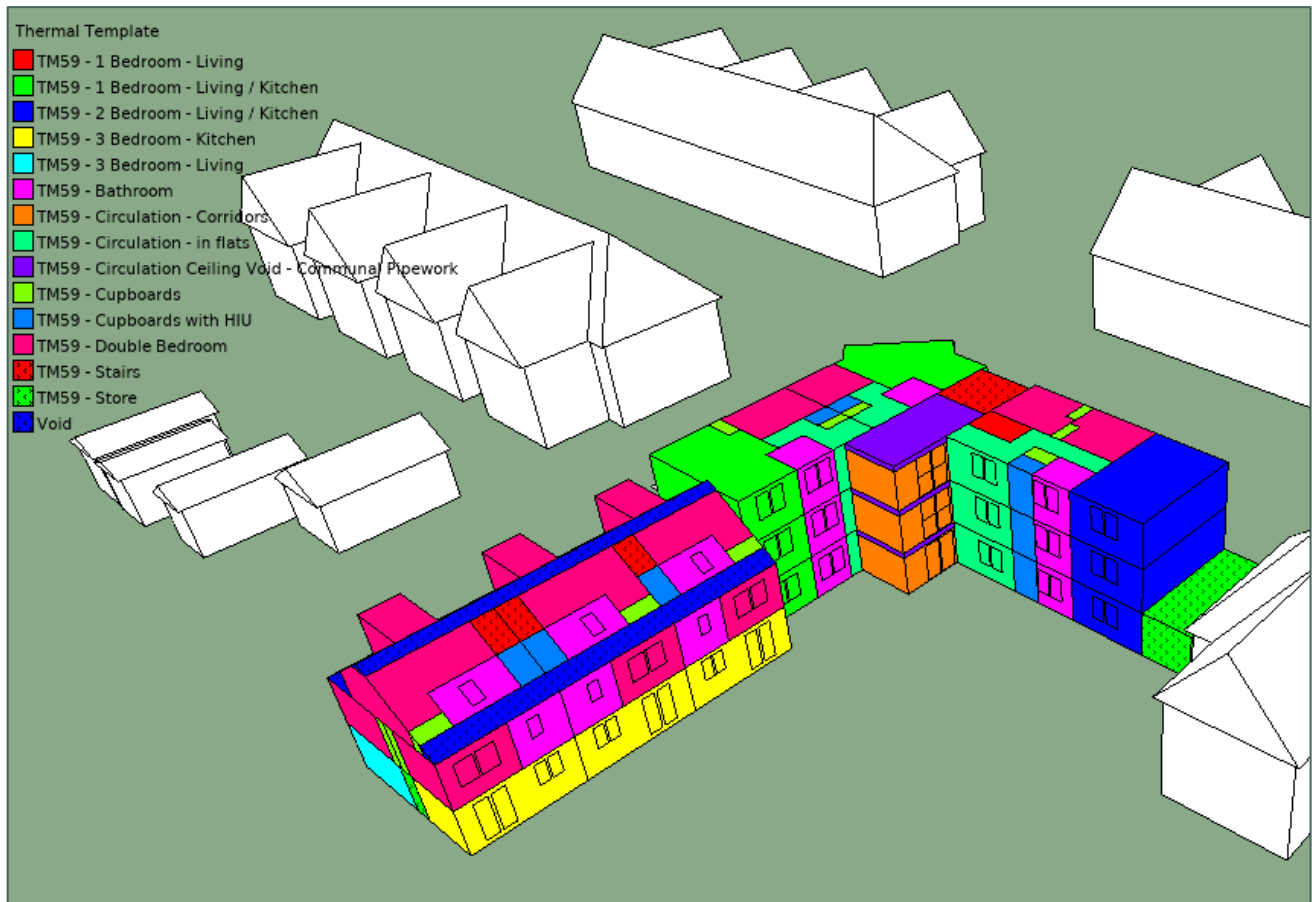


Figure 4 - Thermal zones of assessed spaces, view from Southwest

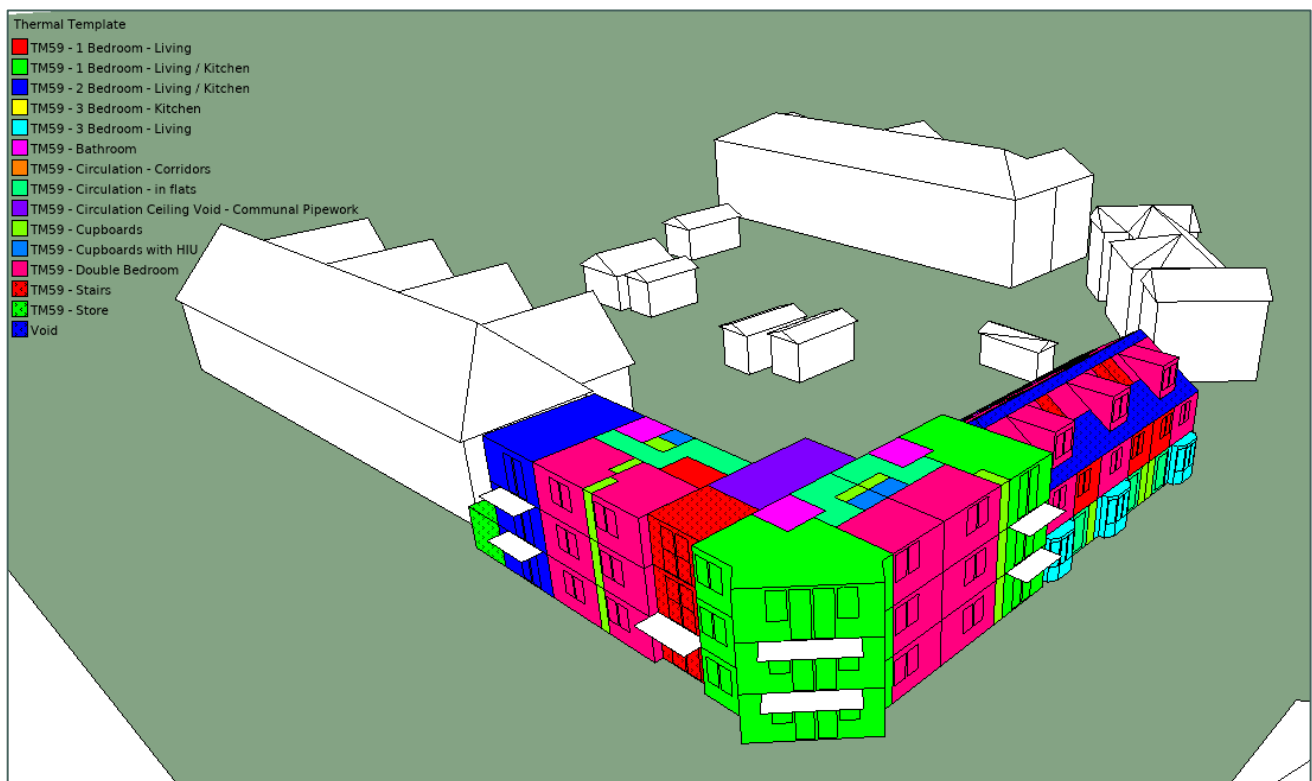


Figure 5 - Thermal zones of assessed spaces, view from Northeast.

### 3.1 Building Fabric

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

| Element                             | Proposed (U-value)                     |
|-------------------------------------|----------------------------------------|
| External Wall                       | 0.17                                   |
| Ground Floor                        | 0.08                                   |
| Pitched Roof                        | 0.09                                   |
| Flat Roof                           | 0.09                                   |
| Windows and Glazed Doors (Houses)   | 1.00 (G-value – 0.43) – Triple glazed  |
| Windows and Glazed Doors (Flats)    | 1.1 (G-value – 0.43) – Triple glazed   |
| External Doors                      | 1.20                                   |
| Air Tightness @ 50 N/m <sup>2</sup> | 3 (m <sup>3</sup> /hr/m <sup>2</sup> ) |

Table 2 - Construction details of the Proposed Residence.

### 3.2 Occupancy and internal gain profiles

Based on CIBSE Guide A and TM59, 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 lighting load and equipment are also included in the assessment, based on the methodology described in CIBSE TM59, which are summarised in Table 3.

| Usage                 | Equipment Peak Load (W) | Lighting Load (W/m <sup>2</sup> ) |
|-----------------------|-------------------------|-----------------------------------|
| Living/Kitchen/Dining | 450                     | 2                                 |
| Living                | 150                     | 2                                 |
| Kitchen               | 300                     | 2                                 |
| Double Bedroom        | 80                      | 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.



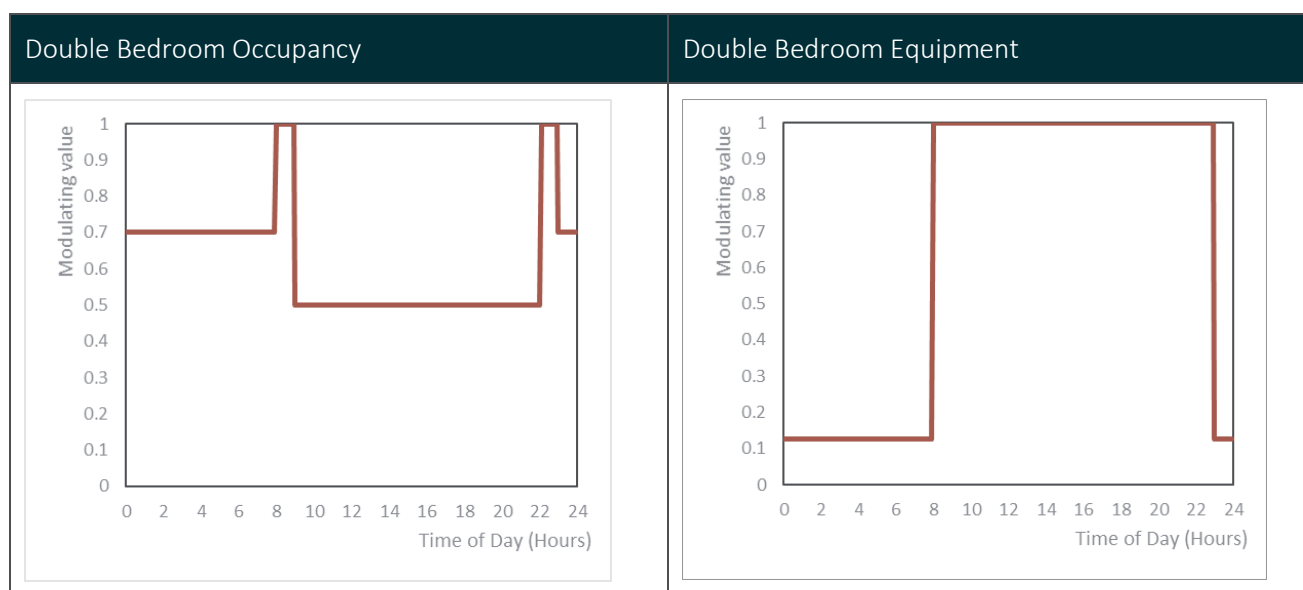


Table 4 - Occupancy and equipment profiles for the occupied space

These profiles represent real life occupancy patterns, ensuring 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.
- Kitchen and 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.

### 3.3 Air Exchange

Ventilation to the spaces will be provided through a whole house MVHR system with summer bypass. The MVHR systems are coupled with natural ventilation to provide additional ventilation and reduce the use of active strategies to mitigate the risk of overheating. The constant minimum flow rates required for the spaces to pass the overheating criteria are listed in the table below.

| Space                |                         | MVHR purge ventilation flow rate (l/s) |
|----------------------|-------------------------|----------------------------------------|
| House 2              | First floor - Bedroom 2 | 10                                     |
| 2 Bedroom Apt - GF   | Study                   | 30                                     |
|                      | Bedroom 1               | 25                                     |
|                      | Bedroom 2               | 25                                     |
| 2 Bedroom Apt - FF   | Study                   | 35                                     |
| 2 Bedroom Apt - FF   | Study                   | 40                                     |
| 1 Bedroom Apt 1 - GF | Bedroom                 | 30                                     |

| Space                |         | MVHR purge ventilation flow rate (l/s) |
|----------------------|---------|----------------------------------------|
| 1 Bedroom Apt 2 - GF | Bedroom | 25                                     |
| 1 Bedroom Apt 2 - FF | Bedroom | 10                                     |
| 1 Bedroom Apt 2 - SF | Bedroom | 10                                     |

Table 5 – Minimum flow rates required in various spaces.

A design air tightness of  $3 \text{ m}^3/\text{hr}/\text{m}^2$  @50 Pa which equates to an infiltration rate of 0.0535 ACH is applied in all areas.

### 3.4 Window Openings

The specification for the opening areas and angle is summarised in Table 6. Figure 6 and Figure 7 shows the opening types applied within the thermal comfort model. External doors are modelled as fixed shut. As the building is naturally ventilated, the windows on the upper floors are considered to be fully openable day and night.

Openable windows are specified for all occupied rooms in the Proposed Development and are modelled to be open during occupied hours when the internal temperature is above  $22^\circ\text{C}$  and when the internal temperature is higher than the external temperature. The equivalent area for natural ventilation and glazing areas are listed in Table 7. All side-hung windows are considered to have restrictors which can be by-passed to 90 degrees openable for ventilation purposes.

Windows and glazed doors have been modelled without their frames to provide an accurate representation of the solar gains within all assessed spaces.

| Opening category        | Openable area (%) | Max opening angle ( $^\circ$ ) |
|-------------------------|-------------------|--------------------------------|
| Fixed Windows           | -                 | -                              |
| Side Hung (Windows)     | 100               | 90                             |
| Side Hung (Glazed door) | 100               | 90                             |
| Top Hung                | 100               | 15                             |
| Top Hung (Skylight)     | 100               | 15                             |

Table 6 - Glazing specification - openable areas

| Units              | Spaces                | Glazing Area (m <sup>2</sup> ) | Equivalent Area <sup>1</sup> (m <sup>2</sup> ) |
|--------------------|-----------------------|--------------------------------|------------------------------------------------|
| House 1            | Living                | 2.957                          | 1.846                                          |
|                    | Kitchen & Dining      | 3.627                          | 3.762                                          |
|                    | Study                 | 1.254                          | 1.315                                          |
|                    | Bedroom 1             | 1.921                          | 2.014                                          |
|                    | Bedroom 2             | 1.249                          | 1.309                                          |
|                    | Bedroom 3             | 1.688                          | 1.769                                          |
| House 2            | Living                | 2.962                          | 1.848                                          |
|                    | Kitchen & Dining      | 3.623                          | 3.757                                          |
|                    | Study                 | 1.254                          | 1.315                                          |
|                    | Bedroom 1             | 1.921                          | 2.014                                          |
|                    | Bedroom 2             | 1.249                          | 1.309                                          |
|                    | Bedroom 3             | 1.688                          | 1.769                                          |
| House 3            | Living                | 2.957                          | 1.846                                          |
|                    | Kitchen & Dining      | 3.627                          | 3.762                                          |
|                    | Study                 | 1.254                          | 1.315                                          |
|                    | Bedroom 1             | 1.921                          | 2.014                                          |
|                    | Bedroom 2             | 1.249                          | 1.309                                          |
|                    | Bedroom 3             | 1.687                          | 1.769                                          |
| 2 Bedroom Apt - GF | Living/Kitchen/Dining | 4.990                          | 5.181                                          |
|                    | Study                 | 0                              | 0                                              |
|                    | Bedroom 1             | 1.850                          | 1.939                                          |
|                    | Bedroom 2             | 1.850                          | 1.939                                          |

<sup>1</sup> Equivalent area (Aeq) is a measure of the aerodynamic performance of an opening. It is the area of a sharp-edged circular orifice through which air would pass at the same volume flow rate, under an identical applied pressure difference, as through the opening under consideration. This is the effective area divided by the orifice discharge coefficient (Cd0) which assumes a clear sharp-edged orifice would have a coefficient of discharge (Cd) of 0.62. or  $A_{eff} / Cd0 = A_{eq}$

| Units                | Spaces                | Glazing Area (m <sup>2</sup> ) | Equivalent Area <sup>1</sup> (m <sup>2</sup> ) |
|----------------------|-----------------------|--------------------------------|------------------------------------------------|
| 2 Bedroom Apt - FF   | Living/Kitchen/Dining | 4.936                          | 5.125                                          |
|                      | Study                 | 0                              | 0                                              |
|                      | Bedroom 1             | 1.850                          | 1.939                                          |
|                      | Bedroom 2             | 1.850                          | 1.939                                          |
| 2 Bedroom Apt - SF   | Living/Kitchen/Dining | 4.712                          | 4.894                                          |
|                      | Study                 | 0                              | 0                                              |
|                      | Bedroom 1             | 1.850                          | 1.939                                          |
|                      | Bedroom 2             | 1.850                          | 1.939                                          |
| 1 Bedroom Apt 1 - GF | Living/Kitchen/Dining | 4.990                          | 5.181                                          |
|                      | Bedroom 1             | 1.850                          | 1.939                                          |
| 1 Bedroom Apt 2 - GF | Living/Kitchen/Dining | 7.558                          | 7.868                                          |
|                      | Bedroom 1             | 1.855                          | 1.945                                          |
| 1 Bedroom Apt 1 - FF | Living/Kitchen/Dining | 4.866                          | 5.053                                          |
|                      | Bedroom 1             | 1.855                          | 1.945                                          |
| 1 Bedroom Apt 2 - FF | Living/Kitchen/Dining | 7.804                          | 8.122                                          |
|                      | Bedroom 1             | 1.855                          | 1.945                                          |
| 1 Bedroom Apt 1 - SF | Living/Kitchen/Dining | 5.005                          | 5.196                                          |
|                      | Bedroom 1             | 1.850                          | 1.939                                          |
| 1 Bedroom Apt 2 - SF | Living/Kitchen/Dining | 7.808                          | 8.126                                          |
|                      | Bedroom 1             | 1.850                          | 1.939                                          |

Table 7 – List of glazing and equivalent opening areas

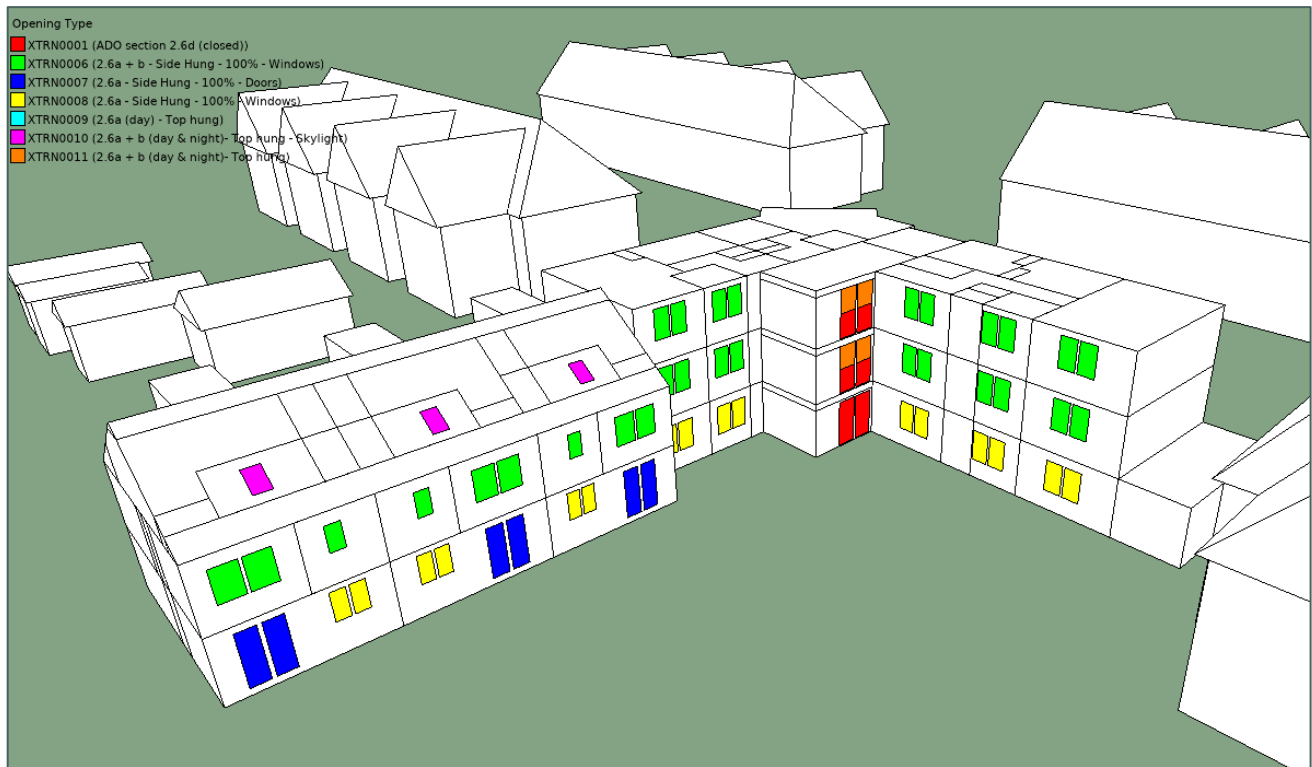


Figure 6 – Opening types – View from Southwest.

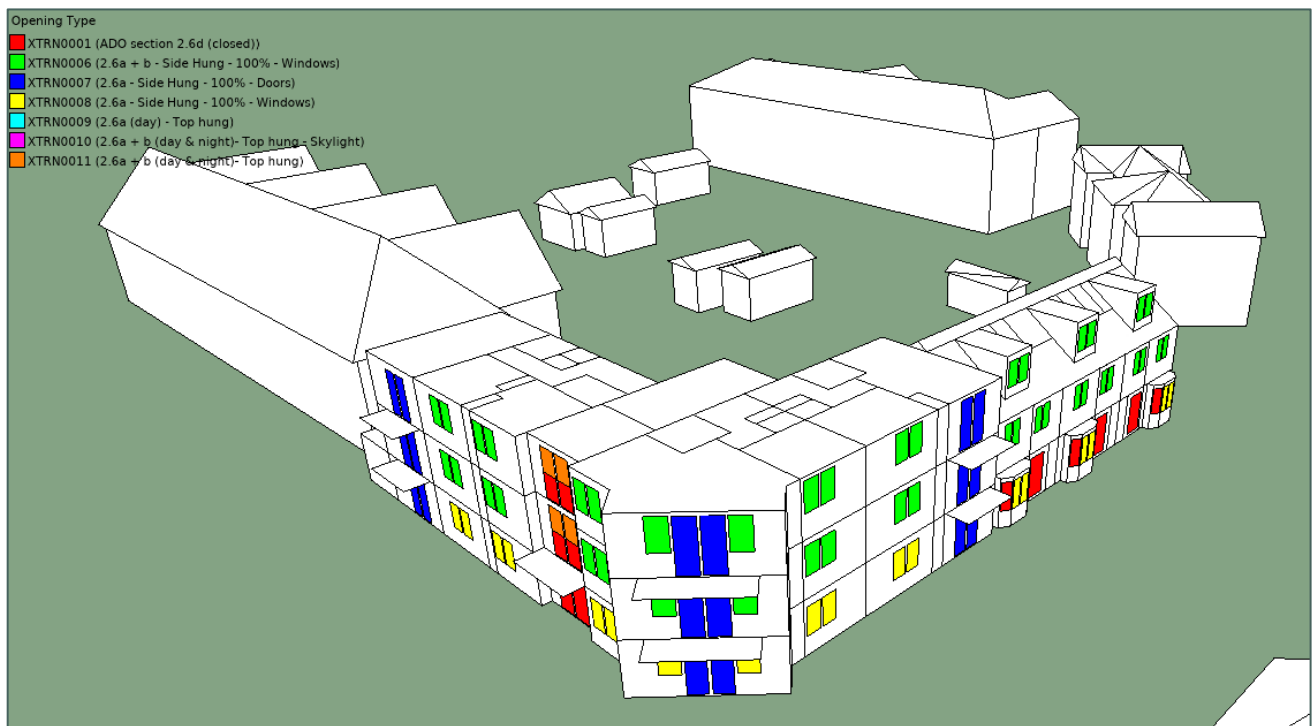


Figure 7 – Opening types – View from Northeast.

### 3.5 Shading devices

External balconies and overhangs have been modelled as per the design. Although internal blinds can be applied to all windows to reduce solar gains during the daytime, this has not been modelled as per Part O1 guidance.

### 3.6 Weather File

The thermal comfort analysis is conducted under both current and projected future climate conditions in accordance with CIBSE TM59 requirements, based on the below weather files:

Current condition:

- Southampton DSY1 2020s high emissions 50<sup>th</sup> percentile

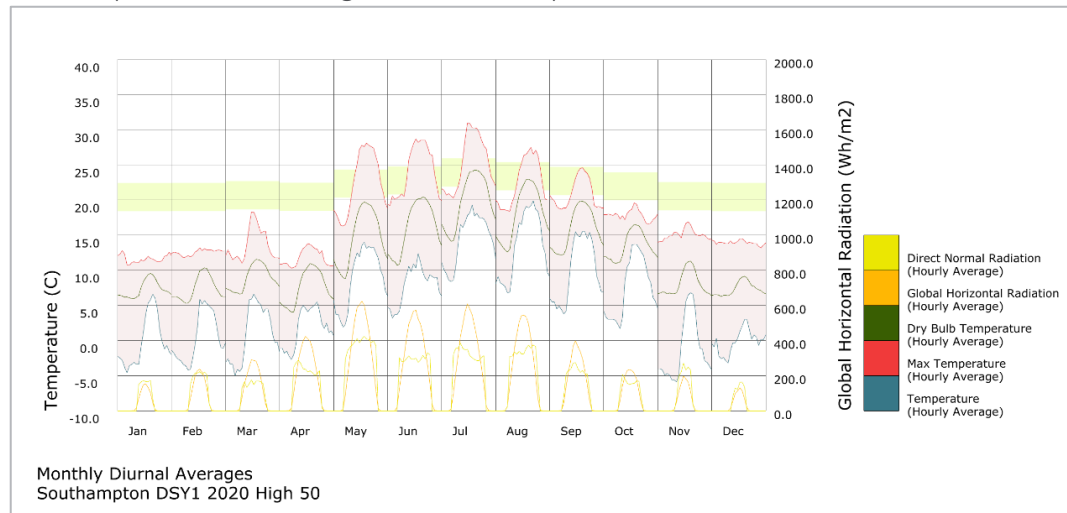


Figure 8 – Monthly diurnal averages, whole year, DSY1 2020, high emissions, 50<sup>th</sup> percentile weather file

Future condition:

- Southampton DSY1 2050s high emissions 50<sup>th</sup> 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.

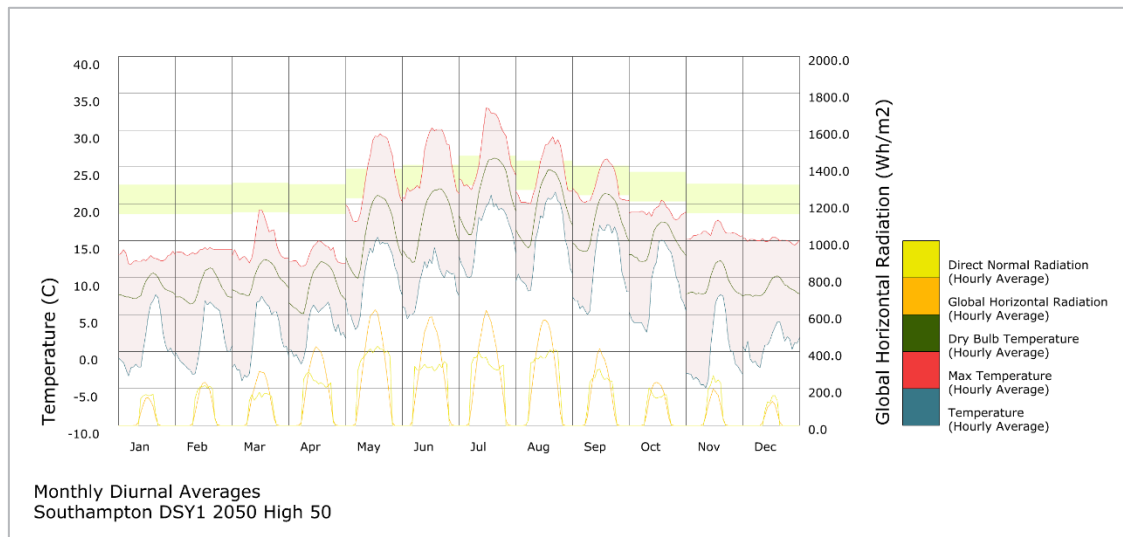


Figure 9 – Monthly diurnal averages, whole year, DSY1 2050, high emissions, 50<sup>th</sup> percentile weather file

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

## 4.0 Results

According to CIBSE TM59 and Part O, the overheating assessment has been undertaken for the summer period, from 1<sup>st</sup> May to 30<sup>th</sup> 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 3.0. Results for both the current and future weather conditions are presented in this section.

### 4.1 Current Weather File – 2020s DSY1

Results for current weather conditions using Southampton DSY1 2020s high emissions 50<sup>th</sup> percentile are presented in this section.

| Units              | Spaces                | Criterion 1<br>(% hours top-max $\geq$ 1K) | Criterion 2<br>(Night time<br>hours operative<br>temp. $\geq$ 26°C) | Pass /<br>Fail |
|--------------------|-----------------------|--------------------------------------------|---------------------------------------------------------------------|----------------|
| House 1            | Living                | 1.8                                        | -                                                                   | Pass           |
|                    | Kitchen & Dining      | 1.5                                        | -                                                                   | Pass           |
|                    | Study                 | 1.3                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.7                                        | 28                                                                  | Pass           |
|                    | Bedroom 2             | 0.4                                        | 5                                                                   | Pass           |
|                    | Bedroom 3             | 0.4                                        | 5                                                                   | Pass           |
| House 2            | Living                | 1.6                                        | -                                                                   | Pass           |
|                    | Kitchen & Dining      | 1.5                                        | -                                                                   | Pass           |
|                    | Study                 | 1.3                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.7                                        | 4                                                                   | Pass           |
|                    | Bedroom 2             | 0.6                                        | 7                                                                   | Pass           |
|                    | Bedroom 3             | 0.5                                        | 6                                                                   | Pass           |
| House 3            | Living                | 1.6                                        | -                                                                   | Pass           |
|                    | Kitchen & Dining      | 1.5                                        | -                                                                   | Pass           |
|                    | Study                 | 1.5                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.7                                        | 17                                                                  | Pass           |
|                    | Bedroom 2             | 0.4                                        | 6                                                                   | Pass           |
|                    | Bedroom 3             | 0.4                                        | 7                                                                   | Pass           |
| 2 Bedroom Apt - GF | Living/Kitchen/Dining | 0.8                                        | -                                                                   | Pass           |
|                    | Study                 | 1.6                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.2                                        | 23                                                                  | Pass           |
|                    | Bedroom 2             | 0.4                                        | 27                                                                  | Pass           |
| 2 Bedroom Apt - FF | Living/Kitchen/Dining | 1                                          | -                                                                   | Pass           |
|                    | Study                 | 2.5                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.4                                        | 4                                                                   | Pass           |
|                    | Bedroom 2             | 0.5                                        | 4                                                                   | Pass           |
| 2 Bedroom Apt - SF | Living/Kitchen/Dining | 1.1                                        | -                                                                   | Pass           |
|                    | Study                 | 2.6                                        | -                                                                   | Pass           |

| Units              | Spaces                | Criterion 1<br>(% hours top-max $\geq$ 1K) | Criterion 2<br>(Night time<br>hours operative<br>temp. $\geq$ 26°C) | Pass /<br>Fail |
|--------------------|-----------------------|--------------------------------------------|---------------------------------------------------------------------|----------------|
|                    | Bedroom 1             | 0.5                                        | 4                                                                   | Pass           |
|                    | Bedroom 2             | 0.5                                        | 4                                                                   | Pass           |
| 1 Bedroom Apt 1-GF | Living/Kitchen/Dining | 0.8                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.3                                        | 25                                                                  | Pass           |
| 1 Bedroom Apt 2-GF | Living/Kitchen/Dining | 0.8                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.4                                        | 30                                                                  | Pass           |
| 1 Bedroom Apt 1-FF | Living/Kitchen/Dining | 1                                          | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.4                                        | 5                                                                   | Pass           |
| 1 Bedroom Apt 2-FF | Living/Kitchen/Dining | 0.9                                        | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.6                                        | 4                                                                   | Pass           |
| 1 Bedroom Apt 1-SF | Living/Kitchen/Dining | 1                                          | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.5                                        | 6                                                                   | Pass           |
| 1 Bedroom Apt 2-SF | Living/Kitchen/Dining | 1                                          | -                                                                   | Pass           |
|                    | Bedroom 1             | 0.7                                        | 4                                                                   | Pass           |

Table 8 – Simulation results summary for occupied spaces – using the current weather file (DSY1 2020, High 50)

As demonstrated in the table above, all assessed rooms pass the assessment under the current weather file using a combination of passive and active design measures, thus satisfying TM59 requirements and complying with Part O Requirement O1. Summertime overheating is therefore unlikely to arise and building users will generally feel comfortable in summer periods. In the current weather scenario, the MVHR flow rates mentioned in Table 5 are adequate to bring all spaces under the comfort criteria.

| Location                | % hours operative<br>temperatures $>$<br>28°C | Pass / Fail |
|-------------------------|-----------------------------------------------|-------------|
| Corridor GF             | 8.6                                           | Fail        |
| Corridor FF             | 10.6                                          | Fail        |
| Corridor SF             | 11.3                                          | Fail        |
| Stair well (GF,FF & SF) | 7.4                                           | Fail        |

Table 9 – Overheating risk assessment of communal corridors – using the current weather file (DSY1 2020, High 50)

As seen in Table 9 corridor spaces fail to meet the assessment criteria. Whilst there is no mandatory target, an operative temperature of 28 °C exceeded for more than 3% of total annual hour is deemed a significant overheating risk based on CIBSE TM59 guidance. Therefore it is recommended that measures are adopted to mitigate the overheating risk. Following measures can be adopted to reduce overheating risk in corridors:

- Insulating pipework, ceilings, HIUs and storage vessels,
- Lower flow temperatures, following current best practice or with systems circulating water at low temperatures, such as “ambient loops”
- Minimizing pipe runs
- More efficient control strategies,
- Incorporating AOVs and ventilating corridors and risers using actuated louvres or mechanical extract.

## 4.2 Future Weather File – DSY1 2050

Results for future weather conditions using Southampton DSY1 2050 are presented in this section.

| Units              | Spaces                | Criterion 1<br>(% hours top-max>=1K) | Criterion 2<br>(Night time<br>hours operative<br>temp. >26°C) | Pass /<br>Fail |
|--------------------|-----------------------|--------------------------------------|---------------------------------------------------------------|----------------|
| House 1            | Living                | 5.2                                  | -                                                             | Fail           |
|                    | Kitchen & Dining      | 4.1                                  | -                                                             | Fail           |
|                    | Study                 | 3.9                                  | -                                                             | Fail           |
|                    | Bedroom 1             | 2                                    | 41                                                            | Fail           |
|                    | Bedroom 2             | 1.3                                  | 23                                                            | Pass           |
|                    | Bedroom 3             | 1.2                                  | 20                                                            | Pass           |
| House 2            | Living                | 5.2                                  | -                                                             | Fail           |
|                    | Kitchen & Dining      | 4.2                                  | -                                                             | Fail           |
|                    | Study                 | 4                                    | -                                                             | Fail           |
|                    | Bedroom 1             | 2                                    | 17                                                            | Pass           |
|                    | Bedroom 2             | 1.8                                  | 31                                                            | Pass           |
|                    | Bedroom 3             | 1.4                                  | 24                                                            | Pass           |
| House 3            | Living                | 5.1                                  | -                                                             | Fail           |
|                    | Kitchen & Dining      | 4                                    | -                                                             | Fail           |
|                    | Study                 | 4.2                                  | -                                                             | Pass           |
|                    | Bedroom 1             | 2                                    | 31                                                            | Pass           |
|                    | Bedroom 2             | 1.3                                  | 26                                                            | Pass           |
|                    | Bedroom 3             | 1.2                                  | 23                                                            | Pass           |
| 2 Bedroom Apt - GF | Living/Kitchen/Dining | 3.1                                  | -                                                             | Fail           |
|                    | Study                 | 5                                    | -                                                             | Fail           |
|                    | Bedroom 1             | 1.1                                  | 85                                                            | Fail           |
|                    | Bedroom 2             | 1.4                                  | 94                                                            | Fail           |
| 2 Bedroom Apt - FF | Living/Kitchen/Dining | 3.4                                  | -                                                             | Fail           |
|                    | Study                 | 5                                    | -                                                             | Fail           |
|                    | Bedroom 1             | 1.6                                  | 17                                                            | Pass           |
|                    | Bedroom 2             | 1.7                                  | 17                                                            | Pass           |
| 2 Bedroom Apt - SF | Living/Kitchen/Dining | 3.6                                  | -                                                             | Fail           |
|                    | Study                 | 5                                    | -                                                             | Fail           |
|                    | Bedroom 1             | 1.7                                  | 17                                                            | Pass           |
|                    | Bedroom 2             | 1.9                                  | 16                                                            | Pass           |
| 1 Bedroom Apt 1-GF | Living/Kitchen/Dining | 2.6                                  | -                                                             | Pass           |
|                    | Bedroom 1             | 1.1                                  | 92                                                            | Fail           |
| 1 Bedroom Apt 2-GF | Living/Kitchen/Dining | 2.6                                  | -                                                             | Pass           |
|                    | Bedroom 1             | 1.5                                  | 101                                                           | Fail           |
| 1 Bedroom Apt 1-FF | Living/Kitchen/Dining | 2.8                                  | -                                                             | Pass           |
|                    | Bedroom 1             | 1.1                                  | 18                                                            | Pass           |

| Units              | Spaces                | Criterion 1<br>(% hours top-max $\geq$ 1K) | Criterion 2<br>(Night time<br>hours operative<br>temp. $>26^{\circ}\text{C}$ ) | Pass /<br>Fail |
|--------------------|-----------------------|--------------------------------------------|--------------------------------------------------------------------------------|----------------|
| 1 Bedroom Apt 2-FF | Living/Kitchen/Dining | 2.9                                        | -                                                                              | Pass           |
|                    | Bedroom 1             | 1.9                                        | 17                                                                             | Pass           |
| 1 Bedroom Apt 1-SF | Living/Kitchen/Dining | 3.2                                        | -                                                                              | Fail           |
|                    | Bedroom 1             | 1.6                                        | 20                                                                             | Pass           |
| 1 Bedroom Apt 2-SF | Living/Kitchen/Dining | 3.3                                        | -                                                                              | Fail           |
|                    | Bedroom 1             | 2                                          | 17                                                                             | Pass           |

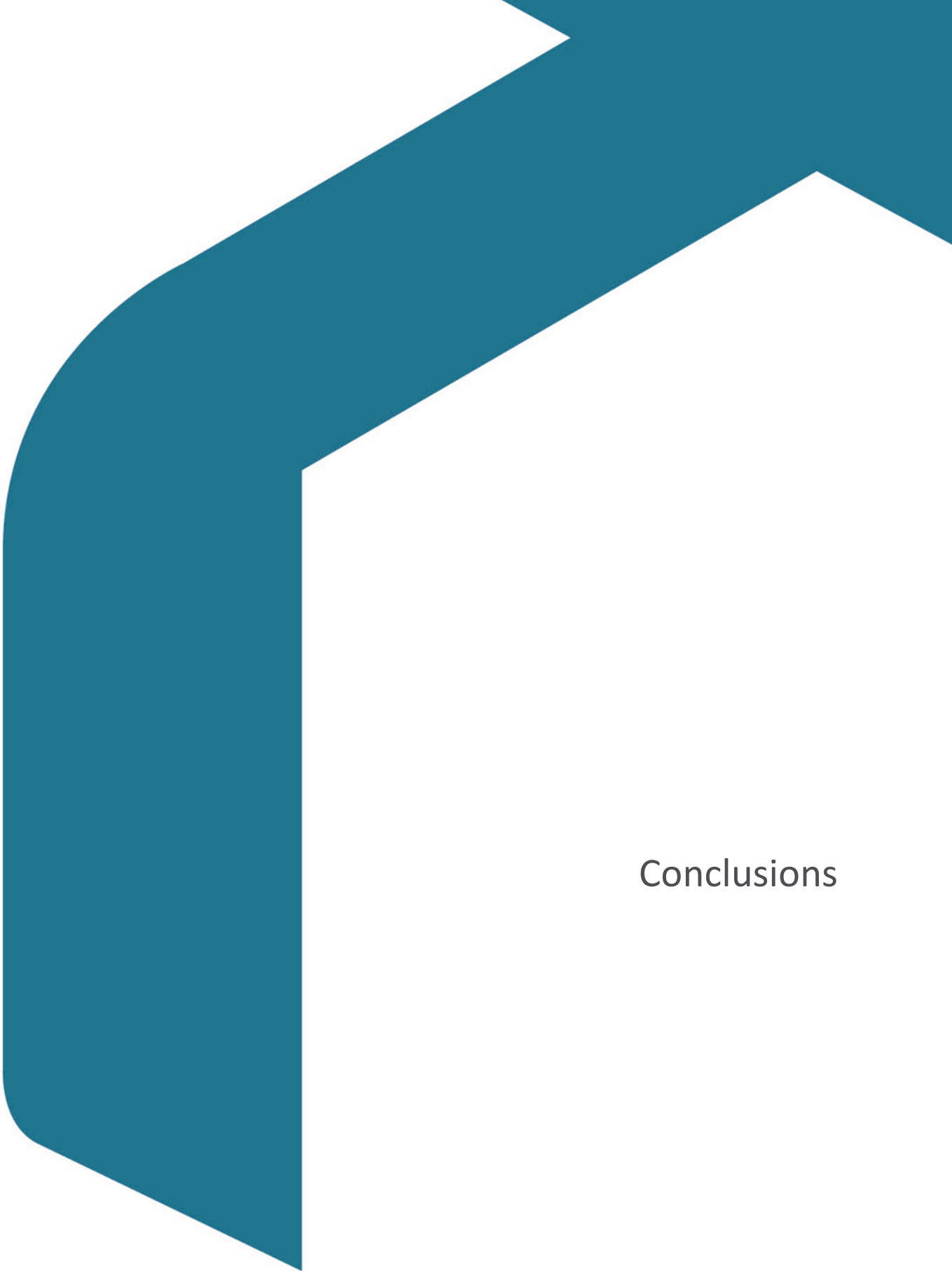
Table 10 – Simulation results summary for occupied spaces – using the future weather file (DSY1 2050, High 50)

As demonstrated in the table above, only certain spaces meet the assessment criteria. In the future weather scenario, MVHR will have to operate at an increased flow rate to bring all spaces under comfort criteria. The flow rates required to bring each spaces under comfort conditions will have to be determined. It should be noted that a pass under the future weather conditions is not compulsory. However, designing for future weather conditions can ensure that the building will be resilient to the future climate changes.

| Location                | % hours operative<br>temperatures $> 28^{\circ}\text{C}$ | Pass / Fail |
|-------------------------|----------------------------------------------------------|-------------|
| Corridor GF             | 30.1                                                     | Fail        |
| Corridor FF             | 32.2                                                     | Fail        |
| Corridor SF             | 34                                                       | Fail        |
| Stair well (GF,FF & SF) | 27.5                                                     | Fail        |

Table 11 – Overheating risk assessment of communal corridors – using the future weather file (DSY1 2050, High 50)

Table 11 shows the assessment results of the communal corridors using the future weather file. This shows the significance of adopting measures to reduce overheating risks to adapt to various climatic conditions.

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, then turns back to the left, forming a large, open 'C' shape. The right side of the 'C' is a straight vertical line. The overall shape is reminiscent of a stylized letter 'C' or a partial circle.

Conclusions

## 5.0 Conclusions

This Overheating Analysis has been undertaken by SRE for the proposed 'Maple Place' Residential Development at 237 Chamberlayne Road, Eastleigh, in order to assess the risks of overheating and the thermal comfort conditions in the occupied spaces.

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

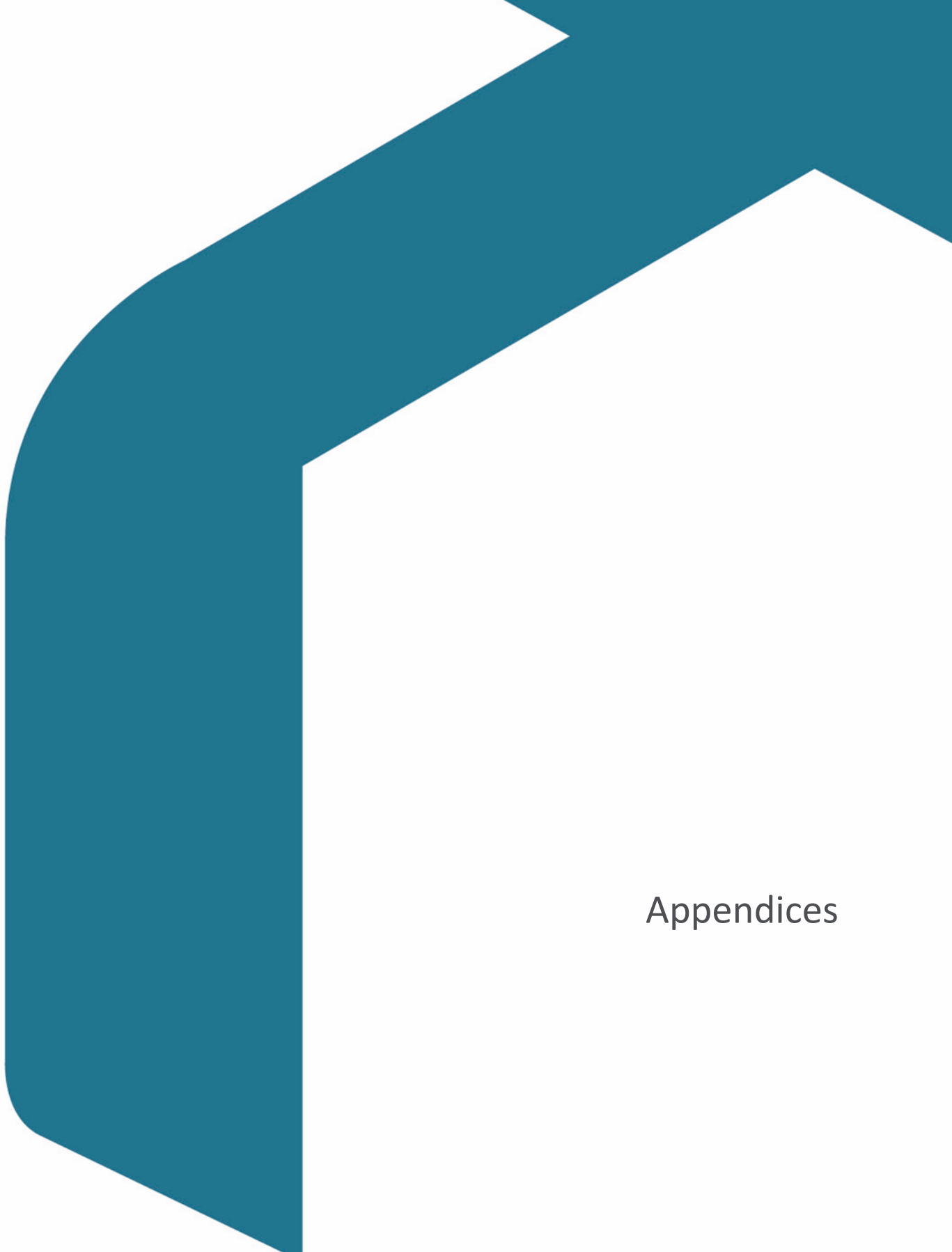
- High performance building fabric.
- Solar control glass (g-value of 0.43)
- Mixed mode ventilation via openable windows, skylights and MVHR.
- Shading devices like balconies and overhangs

The results of the simulations indicate that under current climate conditions (Southampton DSY1 2020s high emissions, 50<sup>th</sup> percentile), the Proposed Development passes the assessment criteria using passive strategies mentioned above, indicating a good level of thermal comfort during summer periods.

An additional simulation for the same was carried out using a future weather file (Southampton DSY1 2050s high emissions, 50<sup>th</sup> percentile) to further test the robustness of the design. The results of the simulation indicate that other measures will have to be investigated to bring all spaces under comfort criteria. It should be noted that a pass is not mandatory under the future weather scenario, but is reported to acknowledge the issues that will arise in the future and take the required measures. All the results are documented in this report.

Communal corridors with communal heating pipework was also assessed using current and future weather files. According to the results of the simulation, mitigation measures will have to be incorporated to reduce the risk of overheating in corridors. A pass is not mandatory for the corridors, but results are reported to identify the risks that may rise and investigate measures to avoid the same.

Results from the simulation indicate that a thermally comfortable environment can be expected within the Proposed Residence with the proposed design considerations. In relation to CIBSE TM59 requirements and Building Regulations Part O, Requirement O1, the Proposed Development meets the assessment criteria.

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 document.

## Appendices

## Appendix A – Site Plan, Floor Plans, Elevations and Sections

## Site Plan



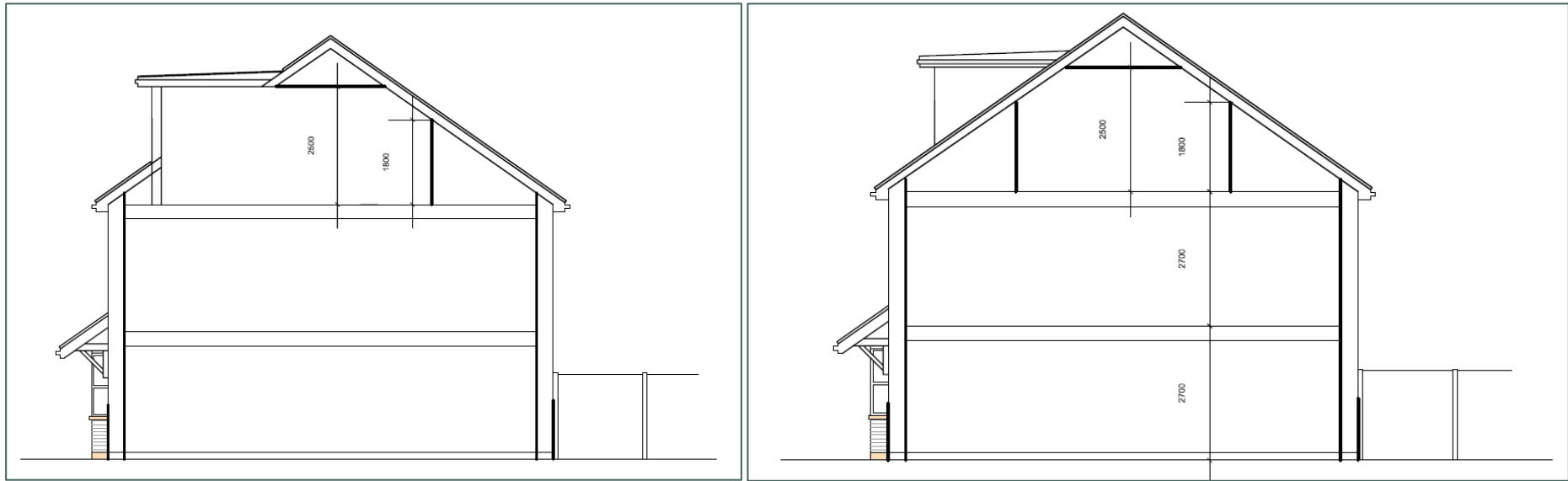
Floor Plans



## Elevations



Sections





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