

Overheating Assessment and Analysis

Omega Works 2

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Overheating Assessment and Analysis Omega Works 2

Introduction

Consolux M&E Consulting has been appointed to undertake an overheating analysis of the Omega Works 2 scheme in order to provide design stage guidance and maximise occupant comfort levels. Consequently, thermal modelling has been undertaken to demonstrate TM59 requirements. The current proposal is to minimise overheating risk by following the Cooling Hierarchy.

Building Summary

The Omega Works 2 scheme consists of 2 blocks which include commercial units on the ground floor and residential apartments above.

Planning Context

This report complies with national guidance of conservation of fuel and power and all relevant overheating assessment publications, such as CIBSE's TM48, TM52 and TM59. The thermal model was created using DesignBuilder, one of the software approved by the UK government for DSM.

Methodology

The methodology used within this report has been to establish the thermal comfort levels in the occupied spaces through using dynamic simulation modelling. All assumptions in the modelling are provided in the model inputs section of this report.

The report will analyse all living spaces (as per CIBSE TM59). The areas that are at high risk of overheating will be analysed in this report. These dwellings have the following characteristics:

- Large glazing areas
 - Topmost floor
 - South orientation
 - Single aspect
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Criteria for Defining Overheating

According to the CIBSE TM59: 2017 – Design methodology for the assessment of overheating risk in homes, to reduce the risk of overheating the space must comply with the following criteria:

- a. For living rooms, kitchen, and bedrooms: the number of hours during which ΔT is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3 per cent of occupied hours (Same as Criterion 1 of TM52).
- b. For bedrooms only: to guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10 pm to 7 am shall not exceed 26 °C for more than 1% of the annual hours (1% of the annual hours between 22:00 and 07:00)

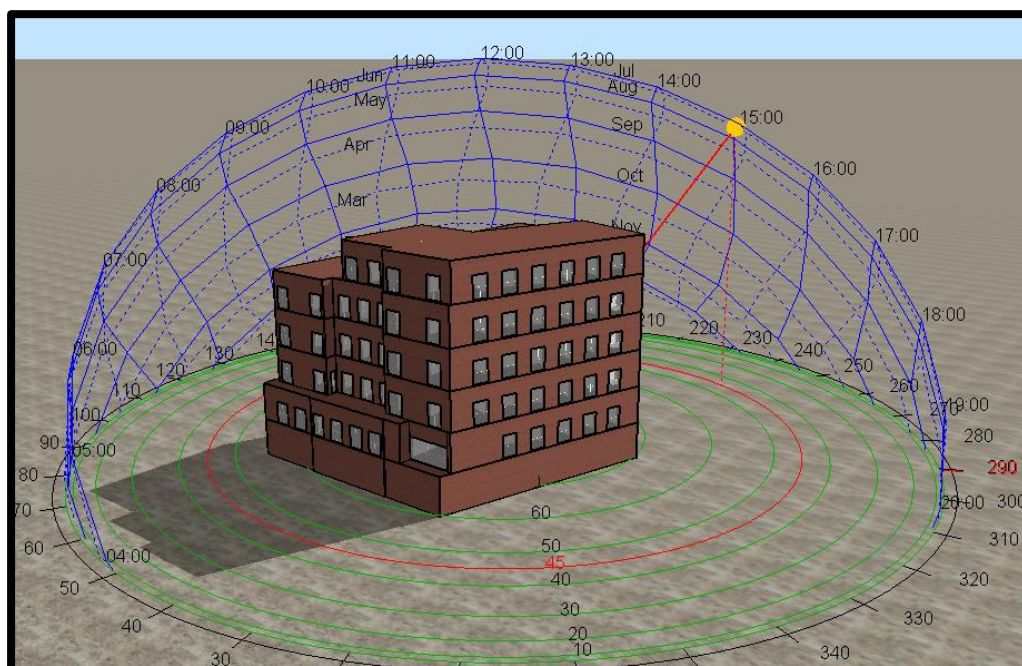
According to the Approved Document O, the requirements to reduce the risk of overheating are below:

1. Reasonable provision must be made in respect of a dwelling, institution or any other building containing one or more rooms for residential purposes, other than a room in a hotel ("residences") to—
 - (a) limit unwanted solar gains in summer;
 - (b) provide an adequate means to remove heat from the indoor environment.
 2. In meeting the obligations in paragraph—
 - (a) account must be taken of the safety of any occupant, and their reasonable enjoyment of the residence; and
 - (b) mechanical cooling may only be used where insufficient heat is capable of being removed from the indoor environment without it.
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Simulation Software

An overheating analysis has been undertaken using Dynamic Simulation Modelling, Design Builder 7.0.0.102 has been employed for this. Design Builder is a DCLG approved simulation environment that complies with the requirements of CIBSE Guide A. A screenshot of the model is shown below.



Weather Files

The simulation has been conducted on the building with an orientation at 315 degrees, using London Gatwick Design Summer Years (DSY), as provided by CIBSE. The simulation to be used for compliance is DSY1 2020 High 50, London, in accordance with TM59 requirements.

Building Fabric U-Values

Element	Proposed U-value ($\text{W.m}^{-2}.\text{K}^{-1}$) L1A
External walls	0.18
Ground floors	0.15
Roof	0.11
Windows	1.3 (G-Value 0.5)
Air Permeability	3 @ 50Pa($\text{m}^3/\text{h}.\text{m}^2$)

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Internal Gains

Gain Source	Living / Kitchen
Lighting	2 W.m ⁻²
Equipment	450W (18:00-20:00) 200W (20:00-22:00) 110W (09:00-18:00 & 22:00-00:00) 35W Base load for rest of the day.
Occupancy	2 People at 75% gains from 9am-10pm, room is unoccupied for the rest of the day.
Occupancy Sensible/Latent	75/55 W/person
Gain Source	Double Bedrooms
Lighting	2 W.m ⁻²
Equipment	80 W (08:00-23:00) 10W (23:00-08:00)
Occupancy	2 people at 70% gains from 11pm to 8am 2 people at full gains from 8am to 9am and from 10pm to 11pm 1 person at full gains in the bedroom from 9am to 10pm
Occupancy Sensible/Latent	75/55 W/person

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Cooling Hierarchy

Major development proposals should reduce potential overheating and reliance on air conditioning systems and demonstrate this in accordance with the following cooling hierarchy:

1. Minimise internal heat generation through energy efficient design;
2. Reduce the amount of heat entering a building in summer through shading, albedo, fenestration, insulation and green roofs and walls;
3. Manage the heat within the building through exposed internal thermal mass and high ceilings;
4. Passive ventilation;
5. Mechanical ventilation;
6. Active cooling systems (ensuring they are the lowest carbon options).

Cooling Strategy

No mechanical cooling will be applied.

Windows

Glazing will be a crucial aspect to ensure thermal comfort of the occupied spaces. Windows were modelled with a g-value of 0.5.

Shading

No fixed external shading included in the model.

Natural Ventilation Rates

All openable windows have been modelled with a 50% openable area and all balcony doors were modelled as fully openable.

In alignment with Approved Document Part O, all windows will be modelled as starting to open at an internal temperature of 22°C, fully open at 26°C, then starting to close when the internal temperature falls below 26°C and closed when below 22°C.

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.

When a ground floor or easily accessible room is unoccupied, both of the following apply.

- i. In the day, the windows, patio doors and balcony doors should be modelled as open, if this can be done securely.
 - ii. At night, windows, patio doors and balcony doors should be modelled as closed.
- An entrance door should be included, which should be shut all the time.

Mechanical Ventilation Rates

Mechanical ventilation is designed as continuous MEV system, with boosted extract rates of 8l/s for bathrooms and 13l/s for kitchens. No further mechanical ventilation is to be included.

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Overview of Results

According to the CIBSE TM52 – The limits of thermal comfort: avoiding overheating in European buildings (2013) and CIBSE Guide A – Environmental Design (2015), to reduce the risk of overheating the space must comply with at least two of the following three criteria:

- The first criterion sets a limit for the number of hours that the operative temperature can exceed the threshold comfort temperature (upper limit of the range of comfort temperature) by 1 K or more during the occupied hours of a typical non-heating season (1 May to 30 September).
- The second criterion deals with the severity of overheating within any one day, which can be as important as its frequency, the level of which is a function of both temperature rise and its duration. This criterion sets a daily limit for acceptability.
- The third criterion sets an absolute maximum daily temperature for a room, beyond which the level of overheating is unacceptable.

The tables below show the results of compliance to TM59.

In order to comply with TM59 assessment of overheating risk in homes,

Criterion A – Same as criterion 1 for TM52.

Criterion B - For bedrooms only: The operative temperature in bedrooms from 10 pm to 7 am shall not exceed 26°C for more than 1% of the hours (3% for mechanically ventilated homes).

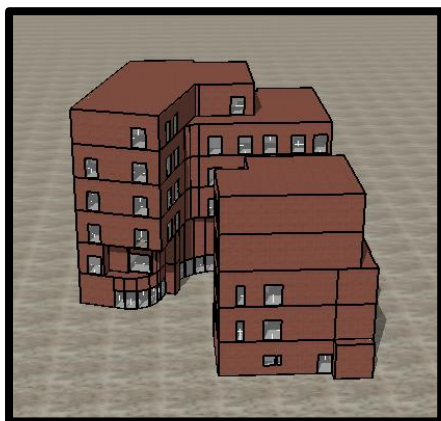


Figure 1 North West Elevation Block A



Figure 2 North East Elevation Block A

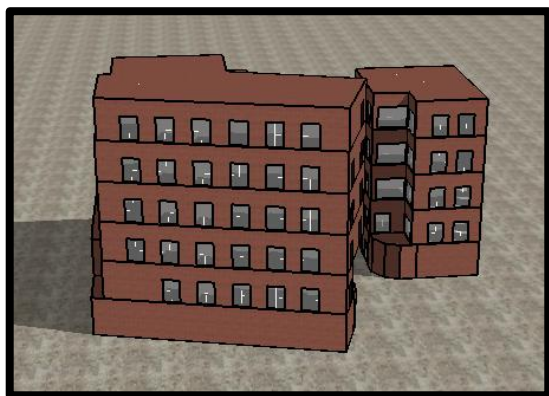


Figure 3 South West Elevation Block A

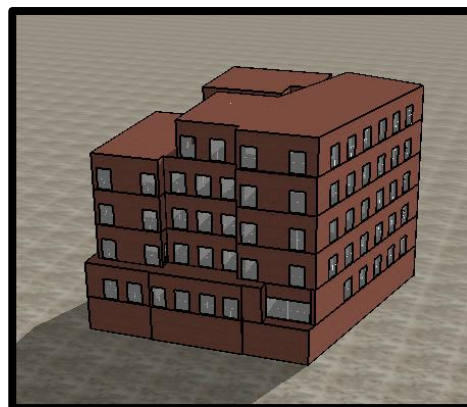


Figure 4 South East Elevation Block A

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TM59 Simulation Results

In order to assess the overheating within the building with 2020 weather data, all floors were modelled, to reflect general issues which may arise. Detailed below are the results from the simulated model. The below shows the data using the 2020 Weather file, a g-value of 0.5 and openable windows.

CIBSE TM59 dataset:

Block	Zone	Criterion A (%)	Criterion B (hr)	Pass/Fail
01XFirstFloor1	Unit01XBedroom1	2.77	12.5	Pass
01XFirstFloor1	Unit01XBedroom2	1.59	25.5	Pass
01XFirstFloor1	Unit01XLiving	1.87	N/A	Pass
01XFirstFloor1	Unit02XBedroom	0.47	11	Pass
01XFirstFloor1	Unit02XLiving	2.04	N/A	Pass
01XFirstFloor2	Unit03XBedroom1	0.7	22	Pass
01XFirstFloor2	Unit03XBedroom2	0.14	19.5	Pass
01XFirstFloor2	Unit03XLiving	2.61	N/A	Pass
01XFirstFloor2	Unit04XBedroom	0.45	21	Pass
01XFirstFloor2	Unit04XLiving	1.04	N/A	Pass
02XSecondFloor1	Unit05XBedroom1	2.75	10.5	Pass
02XSecondFloor1	Unit05XBedroom2	2.59	24.5	Pass
02XSecondFloor1	Unit05XLiving	1.54	N/A	Pass
02XSecondFloor1	Unit06XBedroom	0.4	7.5	Pass
02XSecondFloor1	Unit06XLiving	2.61	N/A	Pass
02XSecondFloor2	Unit07XBedroom1	1.29	17	Pass
02XSecondFloor2	Unit07XBedroom2	0.11	19	Pass
02XSecondFloor2	Unit07XLiving	2.18	N/A	Pass
02XSecondFloor2	Unit08XBedroom1	0.08	19	Pass
02XSecondFloor2	Unit08XBedroom2	0.4	21.5	Pass
02XSecondFloor2	Unit08XLiving	0.99	N/A	Pass
02XSecondFloor2	Unit09XBedroom	0	22.5	Pass
02XSecondFloor2	Unit09XLiving	0.73	N/A	Pass
02XSecondFloor2	Unit10XBedroom1	0.14	12.5	Pass
02XSecondFloor2	Unit10XBedroom2	0	17	Pass
02XSecondFloor2	Unit10XBedroom3	0	18	Pass
02XSecondFloor2	Unit10XLiving	0.91	N/A	Pass
02XSecondFloor2	Unit11XBedroom1	0.86	30.5	Pass
02XSecondFloor2	Unit11XBedroom2	0.85	22.5	Pass
02XSecondFloor2	Unit11XLiving	2.61	N/A	Pass
02XSecondFloor2	Unit12XBedroom	0.85	20.5	Pass
02XSecondFloor2	Unit12XLiving	1.59	N/A	Pass
03XThirdFloor1	Unit13XBedroom	2.6	12.5	Pass
03XThirdFloor1	Unit13XLiving	1.19	N/A	Pass

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03XThirdFloor1	Unit14XBedroom	0.38	7.5	Pass
03XThirdFloor1	Unit14XLiving	1.29	N/A	Pass
03XThirdFloor2	Unit15XBedroom1	1.21	16.5	Pass
03XThirdFloor2	Unit15XBedroom2	0.1	18.5	Pass
03XThirdFloor2	Unit15XLiving	2.74	N/A	Pass
03XThirdFloor2	Unit16XBedroom1	0.07	19	Pass
03XThirdFloor2	Unit16XBedroom2	0.37	21	Pass
03XThirdFloor2	Unit16XLiving	0.89	N/A	Pass
03XThirdFloor2	Unit17XBedroom	0	18	Pass
03XThirdFloor2	Unit17XLiving	0.51	N/A	Pass
03XThirdFloor2	Unit18XBedroom1	0.11	15.5	Pass
03XThirdFloor2	Unit18XBedroom2	0	13	Pass
03XThirdFloor2	Unit18XBedroom3	0	13.5	Pass
03XThirdFloor2	Unit18XLiving	0.84	N/A	Pass
03XThirdFloor2	Unit19XBedroom1	0.86	29.5	Pass
03XThirdFloor2	Unit19XBedroom2	1.23	26.5	Pass
03XThirdFloor2	Unit19XLiving	2.87	N/A	Pass
03XThirdFloor2	Unit20XBedroom	0.93	21.5	Pass
03XThirdFloor2	Unit20XLiving	1.59	N/A	Pass
04XFourthFloor1	Unit21XBedroom	2.93	9.5	Pass
04XFourthFloor1	Unit21XLiving	2.1	N/A	Pass
04XFourthFloor1	Unit22XBedroom	1.03	6.5	Pass
04XFourthFloor1	Unit22XLiving	1.97	N/A	Pass
04XFourthFloor2	Unit23XBedroom1	0.99	14.5	Pass
04XFourthFloor2	Unit23XBedroom2	0.1	18.5	Pass
04XFourthFloor2	Unit23XLiving	2.87	N/A	Pass
04XFourthFloor2	Unit24XBedroom1	0.08	19.5	Pass
04XFourthFloor2	Unit24XBedroom2	0.41	22	Pass
04XFourthFloor2	Unit24XLiving	0.89	N/A	Pass
04XFourthFloor2	Unit25XBedroom	0	20	Pass
04XFourthFloor2	Unit25XLiving	0.51	N/A	Pass
04XFourthFloor2	Unit26XBedroom1	0.18	16.5	Pass
04XFourthFloor2	Unit26XBedroom2	0.03	14.5	Pass
04XFourthFloor2	Unit26XBedroom3	0	15	Pass
04XFourthFloor2	Unit26XLiving	1.19	N/A	Pass
04XFourthFloor2	Unit27XBedroom1	1.29	28	Pass
04XFourthFloor2	Unit27XBedroom2	2.12	24.5	Pass
04XFourthFloor2	Unit27XLiving	2.7	N/A	Pass
04XFourthFloor2	Unit28XBedroom	1.69	22	Pass
04XFourthFloor2	Unit28XLiving	1.64	N/A	Pass

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05XFifthFloor	Unit29XBedroom1	0.81	20	Pass
05XFifthFloor	Unit29XBedroom2	0.42	20	Pass
05XFifthFloor	Unit29XBedroom3	2.1	20	Pass
05XFifthFloor	Unit29XLiving	2.73	N/A	Pass
05XFifthFloor	Unit30XBedroom1	0.45	20	Pass
05XFifthFloor	Unit30XBedroom2	0.99	20.5	Pass
05XFifthFloor	Unit30XLiving	1.39	N/A	Pass
05XFifthFloor	Unit31XBedroom1	0.18	18.5	Pass
05XFifthFloor	Unit31XLiving	1.24	N/A	Pass
05XFifthFloor	Unit32XBedroom2	0.64	6.5	Pass
05XFifthFloor	Unit32XLiving	1.9	N/A	Pass
01XFirstFloor1	Unit01XBedroom1	2.77	12.5	Pass
01XFirstFloor1	Unit01XBedroom2	1.59	25.5	Pass
01XFirstFloor1	Unit01XLiving	1.87	N/A	Pass
01XFirstFloor1	Unit02XBedroom	0.47	11	Pass
01XFirstFloor1	Unit02XLiving	2.04	N/A	Pass
01XFirstFloor2	Unit03XBedroom1	0.7	22	Pass
01XFirstFloor2	Unit03XBedroom2	0.14	19.5	Pass
01XFirstFloor2	Unit03XLiving	2.61	N/A	Pass
01XFirstFloor2	Unit04XBedroom	0.45	21	Pass
01XFirstFloor2	Unit04XLiving	1.04	N/A	Pass
02XSecondFloor1	Unit05XBedroom1	2.75	10.5	Pass
02XSecondFloor1	Unit05XBedroom2	2.59	24.5	Pass
02XSecondFloor1	Unit05XLiving	1.54	N/A	Pass
02XSecondFloor1	Unit06XBedroom	0.4	7.5	Pass
02XSecondFloor1	Unit06XLiving	2.61	N/A	Pass
02XSecondFloor2	Unit07XBedroom1	1.29	17	Pass
02XSecondFloor2	Unit07XBedroom2	0.11	19	Pass
02XSecondFloor2	Unit07XLiving	2.18	N/A	Pass
02XSecondFloor2	Unit08XBedroom1	0.08	19	Pass
02XSecondFloor2	Unit08XBedroom2	0.4	21.5	Pass
02XSecondFloor2	Unit08XLiving	0.99	N/A	Pass
02XSecondFloor2	Unit09XBedroom	0	22.5	Pass
02XSecondFloor2	Unit09XLiving	0.73	N/A	Pass
02XSecondFloor2	Unit10XBedroom1	0.14	12.5	Pass
02XSecondFloor2	Unit10XBedroom2	0	17	Pass
02XSecondFloor2	Unit10XBedroom3	0	18	Pass
02XSecondFloor2	Unit10XLiving	0.91	N/A	Pass
02XSecondFloor2	Unit11XBedroom1	0.86	30.5	Pass
02XSecondFloor2	Unit11XBedroom2	0.85	22.5	Pass

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02XSecondFloor2	Unit11XLiving	2.61	N/A	Pass
02XSecondFloor2	Unit12XBedroom	0.85	20.5	Pass
02XSecondFloor2	Unit12XLiving	1.59	N/A	Pass
03XThirdFloor1	Unit13XBedroom	2.6	12.5	Pass
03XThirdFloor1	Unit13XLiving	1.19	N/A	Pass
03XThirdFloor1	Unit14XBedroom	0.38	7.5	Pass
03XThirdFloor1	Unit14XLiving	1.29	N/A	Pass
03XThirdFloor2	Unit15XBedroom1	1.21	16.5	Pass
03XThirdFloor2	Unit15XBedroom2	0.1	18.5	Pass
03XThirdFloor2	Unit15XLiving	2.74	N/A	Pass
03XThirdFloor2	Unit16XBedroom1	0.07	19	Pass
03XThirdFloor2	Unit16XBedroom2	0.37	21	Pass
03XThirdFloor2	Unit16XLiving	0.89	N/A	Pass
03XThirdFloor2	Unit17XBedroom	0	18	Pass
03XThirdFloor2	Unit17XLiving	0.51	N/A	Pass
03XThirdFloor2	Unit18XBedroom1	0.11	15.5	Pass
03XThirdFloor2	Unit18XBedroom2	0	13	Pass
03XThirdFloor2	Unit18XBedroom3	0	13.5	Pass
03XThirdFloor2	Unit18XLiving	0.84	N/A	Pass
03XThirdFloor2	Unit19XBedroom1	0.86	29.5	Pass
03XThirdFloor2	Unit19XBedroom2	1.23	26.5	Pass
03XThirdFloor2	Unit19XLiving	2.87	N/A	Pass
03XThirdFloor2	Unit20XBedroom	0.93	21.5	Pass
03XThirdFloor2	Unit20XLiving	1.59	N/A	Pass
04XFourthFloor1	Unit21XBedroom	2.93	9.5	Pass
04XFourthFloor1	Unit21XLiving	2.1	N/A	Pass
04XFourthFloor1	Unit22XBedroom	1.03	6.5	Pass
04XFourthFloor1	Unit22XLiving	1.97	N/A	Pass
04XFourthFloor2	Unit23XBedroom1	0.99	14.5	Pass
04XFourthFloor2	Unit23XBedroom2	0.1	18.5	Pass
04XFourthFloor2	Unit23XLiving	2.87	N/A	Pass
04XFourthFloor2	Unit24XBedroom1	0.08	19.5	Pass
04XFourthFloor2	Unit24XBedroom2	0.41	22	Pass
04XFourthFloor2	Unit24XLiving	0.89	N/A	Pass
04XFourthFloor2	Unit25XBedroom	0	20	Pass
04XFourthFloor2	Unit25XLiving	0.51	N/A	Pass
04XFourthFloor2	Unit26XBedroom1	0.18	16.5	Pass
04XFourthFloor2	Unit26XBedroom2	0.03	14.5	Pass
04XFourthFloor2	Unit26XBedroom3	0	15	Pass
04XFourthFloor2	Unit26XLiving	1.19	N/A	Pass

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04XFourthFloor2	Unit27XBedroom1	1.29	28	Pass
04XFourthFloor2	Unit27XBedroom2	2.12	24.5	Pass
04XFourthFloor2	Unit27XLiving	2.7	N/A	Pass
04XFourthFloor2	Unit28XBedroom	1.69	22	Pass
04XFourthFloor2	Unit28XLiving	1.64	N/A	Pass
05XFifthFloor	Unit29XBedroom1	0.81	20	Pass
05XFifthFloor	Unit29XBedroom2	0.42	20	Pass
05XFifthFloor	Unit29XBedroom3	2.1	20	Pass
05XFifthFloor	Unit29XLiving	2.73	N/A	Pass
05XFifthFloor	Unit30XBedroom1	0.45	20	Pass
05XFifthFloor	Unit30XBedroom2	0.99	20.5	Pass
05XFifthFloor	Unit30XLiving	1.39	N/A	Pass
05XFifthFloor	Unit31XBedroom1	0.18	18.5	Pass
05XFifthFloor	Unit31XLiving	1.24	N/A	Pass
05XFifthFloor	Unit32XBedroom2	0.64	6.5	Pass
05XFifthFloor	Unit32XLiving	1.9	N/A	Pass

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Conclusions

The analysis has responded to CIBSE TM59 & Approved Document O requirements relating to overheating.

The report has set out how the occupied spaces perform against strict thermal comfort standards for overheating.

The results indicate the building shows no risk of overheating based on the parameters outlined. This is due to the orientating and shading from adjacent buildings

The results include a 0.5 g-value for all glazing and openable windows for natural ventilation