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Overheating Assessment

Potters Bar

12618

Part O, CIBSE TM59:2017 and CIBSE TM52:2013

Document No.
12618-WCL-ZZ-ZZ-ST-SS-003

Prepared for
Chase New Homes

Date
02 July 2026

Status and Stage
P02/Planning

Document Control

Author Name	Checker Name	Date	Revision	Comments
Amy Webb	Ellen Huelin	18.06.2026	P01	Preliminary issue for comment
Molly Dovey	Ellen Huelin	02.07.2026	P02	Updated to comments

Contents

Executive Summary

This overheating report has been prepared by Whitecode Consulting Ltd on behalf of the applicant Chase New Homes to assess the overheating risk for the proposed residential units at the Potters Bar development.

The proposed development lies in the Hertsmere Borough and therefore the local plan is the Hertsmere Local Plan 2012-2027.

Part O of the Building Regulations applies to all projects commencing construction after 15th June 2023. The aim of requirement O1 is to protect the health and welfare of occupants of the building by reducing the occurrence of high indoor temperatures. This is met through designing and constructing the building to achieve both of the following.

a. Limiting unwanted solar gains in summer.

b. Providing an adequate means of removing excess heat from the indoor environment.

The scheme will need to demonstrate compliance with CIBSE TM59 methodology for predicting overheating.

The following criteria is set out in CIBSE Technical Memorandum 59 – Design methodology for the assessment of overheating risk in homes (TM59:2017), for predominantly naturally ventilated rooms. Compliance is based on passing **both** criteria below.

Criterion 1 - for living rooms, kitchens and bedrooms

- A limit is set for the number of hours that the operative temperature can exceed the maximum adaptive temperature. A temperature difference greater than or equal to 1K shall not exceed **3%** of the occupied hours of a typical summer (1st May to 30th September).

Criterion 2 - for bedrooms only

- To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours (1% of the annual hours between 10pm to 7am for bedrooms is **32 hours**).

Homes which have restricted window openings, due to noise or pollution reasons, must be assessed against the CIBSE fixed temperature test.

CIBSE fixed temperature test

- All occupied rooms should not exceed an operative temperature of 26°C for more than **3%** of the annual occupied hours

CIBSE TM59:2017 recommends that the risk of summer overheating is assessed in common areas where community heating pipework runs through them. There is no mandatory target to meet for common areas, but if an internal operative temperature of 28°C is exceeded for more than 3% of the total annual hours then this should be identified. 3% of the total annual hours is 262 hours.

All rooms and common areas sampled are compliant when improving shading levels and adding purge ventilation:

Simulation	Compliance with CIBSE TM59
Block A (with purge fans to apartments)	70 / 70 Rooms Pass
Block B (with purge fans to apartments)	79 / 79 Rooms Pass
Block D (with purge fans to apartments)	29 / 29 Rooms Pass
Block E (with purge fans to apartments + upgrades in Section 5)	70 / 70 Rooms Pass

Results are shown in Appendices A and B.

Integrated Environmental Solutions Virtual Environmental (IES VE) software, version 2025.2.0.0, was used to assess the dwellings using the latest CIBSE Design Summer Year (DSY1) weather file for London Gatwick, for the 2020s, high emissions, 50% percentile scenario.

1.0 Introduction

The purpose of this report is to investigate the potential overheating risk for the proposed development located at Potters Bar, and make recommendations where compliance is not achieved. The requirements are highlighted below.

1.1. Planning Policy and Regulation

CIBSE TM59:2017 compliance is now regulatory within the newly released Part O of the Building Regulations. Planning applications approved after 15th June 2022, and all projects commencing construction after 15th June 2023 will need to demonstrate compliance with CIBSE TM59 methodology for predicting overheating.

Part O refers to TM59 for guidance when carrying out thermal modelling of a dwelling but goes on to set limits against the identified risk that the design methodology produces. A key difference between TM59 and Part O is that the new regulation will not allow for the effect of internal blinds to be considered when assessing the risk of overheating, nor will dynamic shading be deemed acceptable. Only fixed and passive shading devices are compliant. Additionally, there are slightly different requirements on how the openings should be modelled.

The results of the Part O assessment has implications on window design, openings and MEP design.

The National Planning Policy Framework (NPPF) was updated in February 2025, which re-emphasises the Government's commitment to sustainable development and states the need for planning authorities to take an approach based on integrating the four aims of sustainable development.

1.2. Overheating in dwellings

There are many factors that determine indoor summer temperatures in dwellings in the UK. These factors include the following:

Current modelling-based evidence suggests that the South of the UK is likely to face the largest risk of indoor overheating. It was suggested that comfort targets will not be met in naturally ventilated buildings in London by the middle of the century without some form of mechanical cooling unless some additional adaption measures are carried out (CIBSE 2005). In contrast, it was estimated that Manchester and Edinburgh buildings will only encounter minor overheating problems within the same time frame.

An unintended consequence of improved building fabric of newly built dwellings may be an increased risk of overheating. Newly constructed highly insulated dwellings were found to have the potential to be at higher risk of overheating than older, less insulated dwellings.

There are a variety of methods that can be used to reduce the risk of indoor overheating and are split into what can be regulated and what cannot be regulated. These are shown in the tables below:

What can be regulated	
Air movement	Moving air feels a couple of degrees cooler than still air.
Insulation	Insulation is usually connected with winter warmth, but just as a thermos flask can keep drinks either hot or cold, insulated walls can help homes stay cool. However, insulation won't cool dwellings down if they overheat.
Shading	Strong sunlight through glazing can heat up dwellings. Awnings and internal or external shutters on south and west facing glazing provide shade.
Cooling devices	Evaporative coolers and air conditioners can be installed relatively cheaply. However, unlike the passive measures above, these require power, thereby increasing the carbon footprint of the dwelling and contributing to climate change. They also pump waste heat into their surroundings, making the surrounding area even hotter.
Low energy	Use low energy light bulbs and appliances.
Ventilation	Replacing the warm air in dwellings with cooler air.
Roofs	As with walls, insulation can help keep dwellings cool in summer. Improving loft insulation is one method, but green roofs are also an option. These use a base layer on which plants can grow, creating biodiversity space for plants and animals and providing a layer of roof insulation.
Outside	Water features help keep surroundings cool by evaporation, and trees provide shade in the summer. Deciduous trees are best, as the leaves drop off in the winter, allowing extra light into your home.
Glazing	Reducing the g-value of the glazing to reduce the amount of sunlight that can pass through

What cannot be regulated	
Reducing heat gain	Heat doesn't just come from the sun. Home devices and appliances such as televisions, computers and light bulbs also make a significant contribution. Turning the kitchen fan on while cooking will help.
Windows	Open windows when it's cooler outside than inside, especially at night.
Curtains and blinds	Close curtains, blinds or shutters during the day, or use awnings to shade the glazing.
Fans	Use desk or ceiling fans to create a cooling breeze.

1.3. TM59 Thermal Design Criteria

The following criteria is set out in CIBSE Technical Memorandum 59 – Design methodology for the assessment of overheating risk in homes (TM59:2017), for predominantly naturally ventilated rooms. Compliance is based on passing both criteria below.

Criterion 1 - for living rooms, kitchens and bedrooms

- A limit is set for the number of hours that the operative temperature can exceed the maximum adaptive temperature. A temperature difference greater than or equal to 1K shall not exceed **3%** of the occupied hours of a typical summer (1st May to 30th September).

Criterion 2 - for bedrooms only

- To guarantee comfort during the sleeping hours the operative temperature in the bedroom from 10pm to 7am shall not exceed 26°C for more than 1% of annual hours (1% of the annual hours between 10pm to 7am for bedrooms is **32 hours**).

CIBSE TM59:2017 states that "the inclusion of corridors in the overheating analysis is mandatory where community heating pipework runs through them". There is no mandatory target to meet for common areas, but if an internal operative temperature of 28°C is exceeded for more than 3% of the total annual hours then this should be identified. 3% of the total annual hours is 262 hours.

1.4. Cooling Hierarchy

The cooling hierarchy has been followed to reduce the demand for cooling. The following categories have been considered:

1. Minimising internal heat generation through energy-efficient design – minimised heat distribution infrastructure within the buildings.
2. Reducing the amount of heat entering the building during summer – the location, proportion and specification of the glazing should aim to balance natural light and 'beneficial' solar gain whilst ensuring that levels of heat gain are not excessive.
3. Use of thermal mass and high ceilings to manage heat within the building – higher thermal mass construction enables heat to be absorbed in the day and then released at night; however, a balance must be struck. Lightweight structures without the energy-absorption potential are often at risk of overheating.
4. Passive ventilation – providing openable windows to allow natural ventilation and nighttime cooling to comply with Part F of the Building Regulations. Low-temperature air from external is allowed into the building during the night and circulates throughout the building cooling the building fabric.
5. Mechanical ventilation – this can be used to make use of free cooling when the outside air temperature is below that in the building during summer months, through the use of a summer by-pass on the MVHR. Due to acoustic reasons purge fans have been specified.

The glazing will have a g-value of 0.40 and there will be dual-aspect dwellings where possible.

1.5. Home User Guide

The overheating mitigation strategy is supported by occupant guidance provided in the Tenant's Handbook (Home Users Guide), which aligns with the standards set out in Approved Document O.

Key overheating measures outlined in the guide include:

- Use of natural ventilation: Instructions on how and when to open windows to maximise airflow while considering external factors such as noise and pollution.
- Solar gain management: Guidance on using internal blinds or curtains to reduce heat from direct sunlight.
- Night purging: Advice on safely ventilating the home during cooler night-time hours to remove accumulated heat.
- Appliance use: Recommendations to limit internal heat gains by using heat-generating appliances (e.g., ovens, dryers) during cooler parts of the day.
- Passive cooling strategies: Encouragement to use cross-ventilation and shading techniques to maintain comfort without relying on mechanical cooling.
- Mechanical ventilation measures: Clear instructions on how to use mechanical ventilation systems effectively, including when to switch between boost and trickle modes, how to maintain airflow during warmer periods, and ensuring filters are kept clean to support optimal performance.

This supports the overall overheating strategy and contributes to occupant wellbeing and energy efficiency.

2. The Development

The proposed development is described as follows:

Partial demolition of existing buildings (with retention of existing two-storey car park and substation) and redevelopment of the site to provide a mixed-use development comprising residential apartments (Class C3) and flexible commercial floorspace (Class E) across 4 Blocks and associated internal roads, parking, drainage, landscaping, amenity space and associated works.

The creation of four residential blocks (A, B, D & E) located around central courtyards and ranging between 4 – 15 storeys in height.

Figure 2.1: *Potters Bar Development site plan*

2.1. Site Constraints

An acoustic report completed by Cass Allen has been undertaken for the site which identifies the facades that have noise levels which exceed the Part O requirement for allowing windows in bedrooms to be open overnight. Facades that exceed the noise levels acceptable under Part O will be assumed shut overnight for occupant comfort. Areas that do not exceed the acoustic levels over a nighttime period are assumed to be openable overnight.

In addition, any ground floor dwellings will be required to be closed overnight due to security issues.

The risk from falling has been considered in line with Part O. The proposal is to introduce inward opening windows to allow for windows to be fully extended without exceeding the external stroke length of 650mm from the internal face of the wall.

The transom heights are required to be greater than 1.1m, otherwise guarding is required. From reviewing the elevations provided by AFK Architects the sills are in line with this requirement and therefore all openable glazing can be utilised within the overheating mitigation strategy.

3. Orientation

The orientation of the building can have a big effect on the solar gains within a dwelling. South facing facades are more likely to overheat in the summer months as they are subject to the sun for longer periods of the day. East and West facades also are subject to the sun, the East facing in the morning, and the West in the afternoon. This means that they are also subject to solar gain during the day. The North façade will have little exposure to the sun; therefore, will not suffer from solar gains. The sun path diagram below confirms the above:

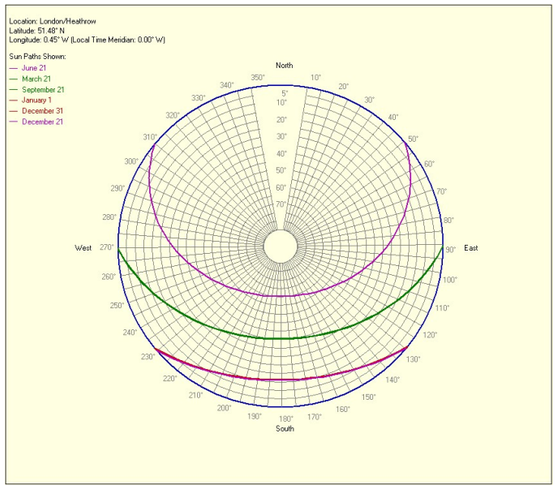


Figure 3.1 Sun-path Diagram

4. The Model

A dynamic 3D model of the development was produced using Integrated Environmental Solutions Virtual Environment (IES VE) software, version 2025.2.0.0. The model includes a range of factors that could have an impact on the building's performance, including building fabric, orientation, local shade, and adjacent buildings.

Templates files defined by CIBSE TM59 were applied to the zones in the model to account for occupancy patterns, internal gains, and air exchanges.

The first stage of building the model was to produce a 2D template of each floor being assessed. The templates were created using floor plans issued by AFK Architects.

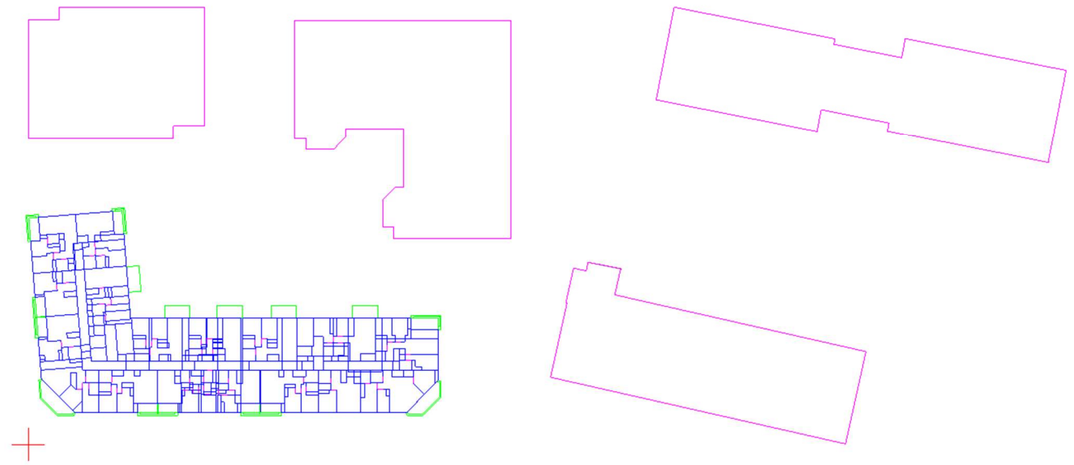
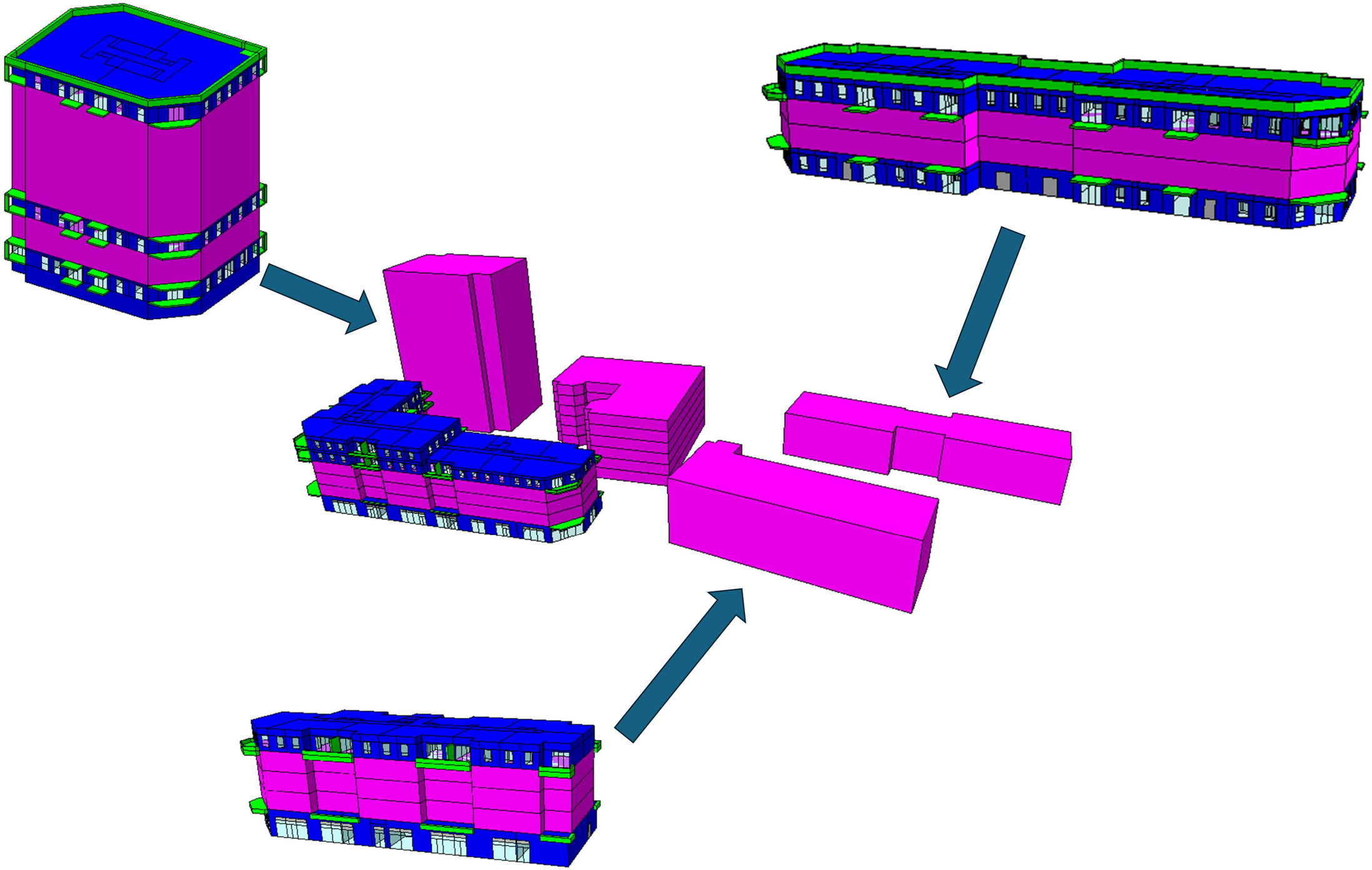


Figure 4.1 2D Layout

The next stage was to use the templates in IES VE and elevations issued by AFK Architects to create the 3D model of each floor culminating in the complete model as shown below:



4.1. Building Fabric

The thermal model was developed using the building fabric specification proposed within the Energy Strategy at planning;

Element	SFS Thermal Transmittance (W/m^2K)	Brick and Block Thermal Transmittance (W/m^2K)
Exposed Floor	0.13	0.13
Ground Floor	0.10	0.10
External Wall	0.15	0.18
Common Areas	0.18	0.18
Roof	0.11	0.11
Glazing (including frame)	1.20 (with 20% frame factor)	1.20 (with 20% frame factor)
Internal Front Doors	1.20	1.20

Table 4.1 *Building Fabric U-values*

The glazing g-value is 0.40. This is further explained in Section 5.0. This allows it to let a good amount of solar gain into the rooms, without causing a large overheating effect. Any lower could affect lighting levels in the room, and cause for more artificial lighting to be used. The building's thermal mass is assessed and factored into the calculations. It has been found that although the building does absorb the heat into the structure, this offsets temperatures when the building becomes cooler at a later stage.

4.2. Mechanical ventilation

It is proposed that the dwellings will be specified with Mechanical Ventilation with Heat Recovery (MVHR) with purge fans to aid with overheating.

The purge flow rates are required to apartments, set to activate once the temperature internally exceeds 23ºC. When not in boost there will be standard MVHR flow rates in-line with Part F.

4.3. Purge Ventilation

Purge ventilation provision is required in each habitable room to comply with Part F of the Building Regulations. This should be capable of extracting a minimum of 4ach-1, per room directly to outside. The 4ach-1 is a minimum air change rate set out in the Building Regulations and is likely to be exceeded in reality through the opening of glazing.

4.4. Natural Ventilation

The IES VE software also incorporates opening glazing into the calculations with the use of Macroflo. Although the Building Regulations give a fixed air change rate, the Macroflo software allows for all variables such as area of openable glazing, distance glazing can open and external conditions. This gives more accurate results regarding natural ventilation.

Part O requires that CIBSE TM59:2017 is used in conjunction the Building Regulation and has set the following conditions for occupancy and when glazing and internal doors can be assumed to be open:

When a room is occupied during the day (8am to 11pm), openings should be modelled to do all 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.

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, 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.

Internal doors within the dwellings are assessed to be fully open when the occupants are assumed to be awake (6am to 10pm).

4.5. Window Opening Summary

The table below summarises the window opening assumed within the dynamic simulation:

	Opening	
	Openable Angle	Profile applied
Internal doors	90	Open from 6am – 10pm Closed overnight
Bedroom glazing (windows and doors) impacted by acoustics	90*	ADO.Section_26a Closed overnight due to acoustic constraints
Bedroom glazing (windows and doors) not impacted by acoustics	90*	ADO.Section_26ab Openable both day and night
Living room glazing (windows and doors)	90*	ADO.Section_26ab Openable both day and night
Level 0 + 1 glazing (both living and bedrooms)	90*	ADO.Section_26c Openable day only

Table 4.4 *Opening Angles for Each Window Type*

**windows are inward opening and can therefore be fully opened during hot periods without breaching the 'risk of falling' requirements set out in Part O.*

4.6. Infiltration

Infiltration is the uncontrolled exchange of air between inside a building and outside through cracks, porosity, and other unintentional openings in the building, caused by the pressure difference effects of the wind and/or stack effect. Infiltration has been assumed 0.15ach.

4.7. Occupancy profiles and internal equipment gains

CIBSE TM59:2017 sets out proposed people and internal equipment gains that should be used for dynamic simulations, when assessing the risk of overheating in homes. The proposed gains are shown in Tables 5.2 and 5.3 below:

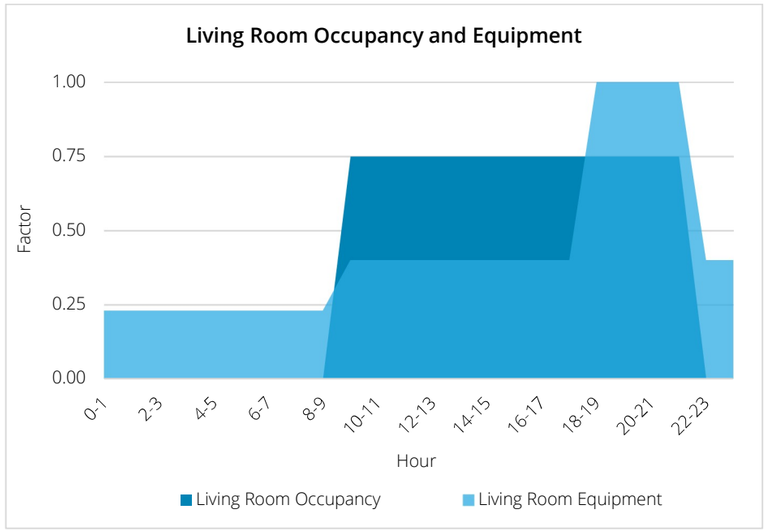
Dwelling Type and Room:	People Gains:		
	No. of People:	Sensible Peak Load (W):	Latent Peak Load (W):
Single bedroom	1	75	55
Double bedroom	2	150	110
Studio	2	150	110
PBSA Studio	1	75	55
1 bed – living and kitchens	1	75	55
2 bed – living and kitchens	2	150	110
3 bed – living and kitchens	3	225	165

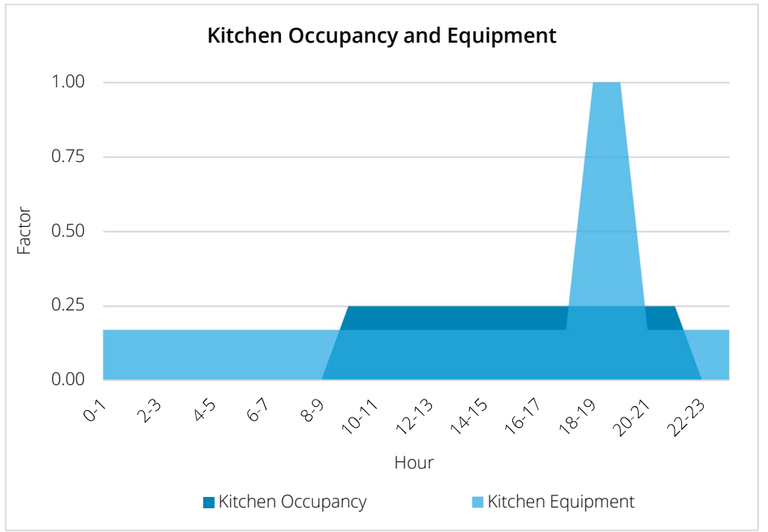
Table 4.7 *People Gains for Each Room Type*

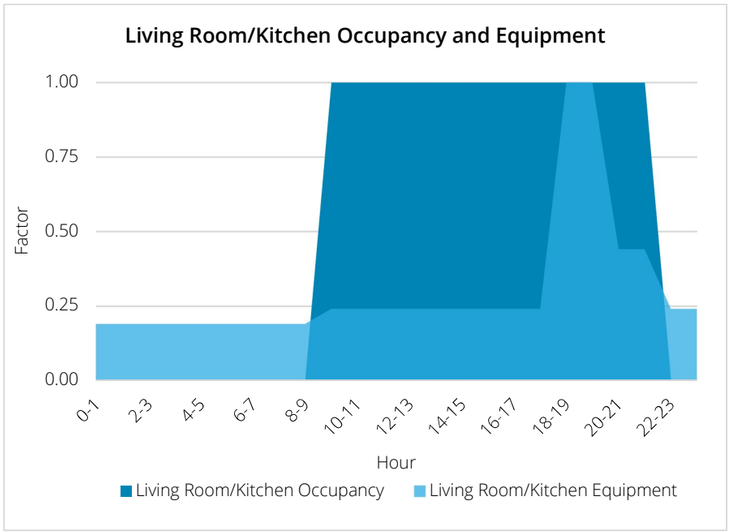
Description:	Room Type:						
	Single Bedroom	Double Bedroom	Living & Kitchen	Living Room	Kitchen	Common Area	Studio
Equipment gains (W)	80	80	450	150	300	N/A	450
Lighting profile (W/m^2)	2	2	2	2	2	2	2

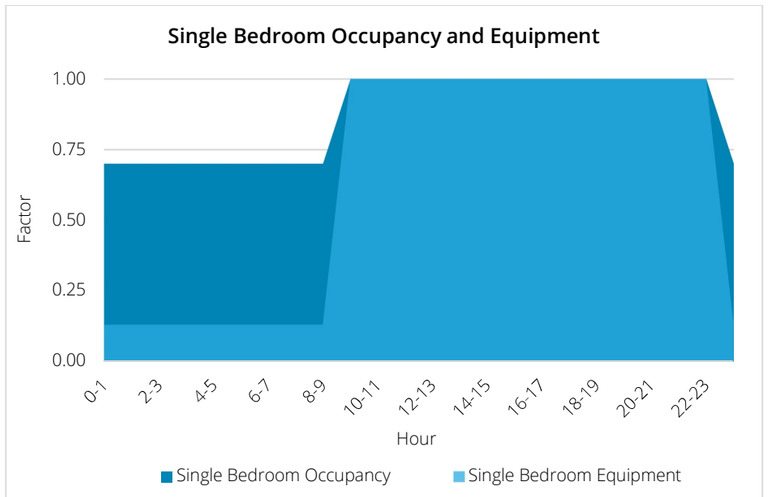
Table 4.8 *Equipment Gains & Lighting Profile*

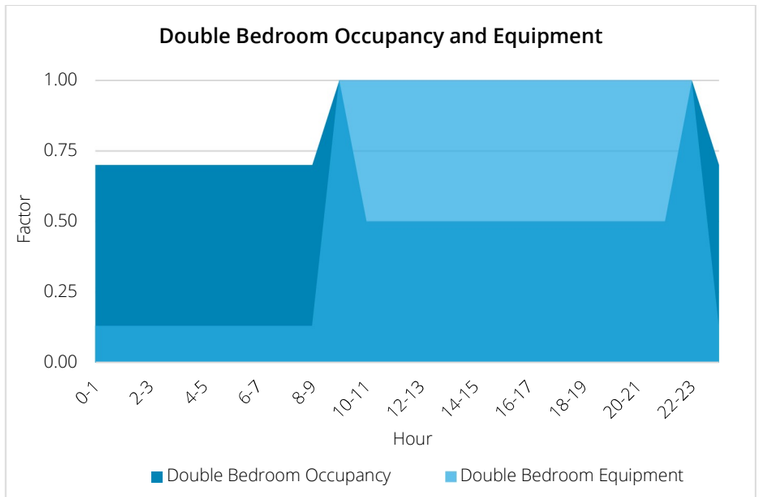
The following graphs show the time periods and factors that are to be applied for the people and internal gains for each room type:

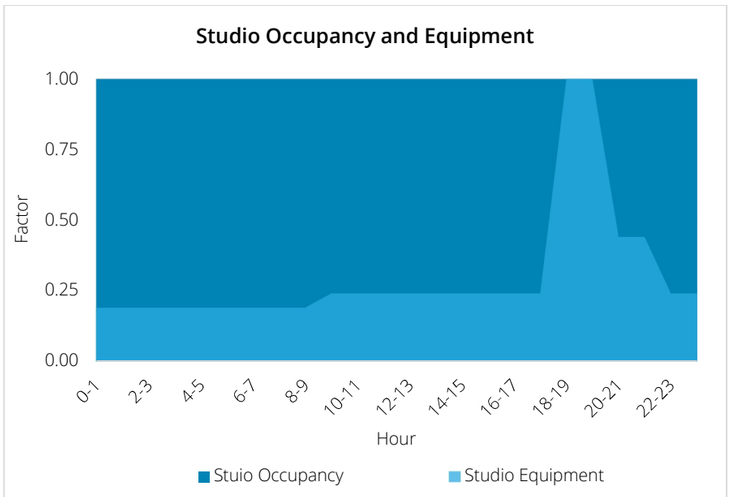












4.8. Shading and obstructions

Radiant heat from the sun passes through glass and is absorbed by building elements and furnishings which re-radiates heat back into the space. Re-radiated heat has a longer wavelength and cannot pass back through the glass as easily, thus trapping the radiant heat causing heat gains in the dwelling.

A g-value of 0.40 has been assumed, which reduces the solar gains through the glazing. Shading and obstructions have been added to the model.

4.8. Weather files

CIBSE released a new set of weather files for London in the middle of 2016. This included weather sets for three Design Summer Years (DSY) – 1976, 1989 and 2003. The current DSY1 is 1989 which represents a moderately warm summer. 1976 (DSY2) is a more extreme year with a long period of persistent warmth and 2003 (DSY3) is another extreme year which has a more intense single warm spell.

CIBSE Technical Memorandum 49, 2014 – Design Summer Years for London, provides guidance for which weather files are to be used. The current DSY (1989) is suitable for assessing buildings under the current climate.

Data from three weather stations have been examined and are available for use in simulation. London Heathrow Airport (LHR) is a representative of intermediate urban and suburban locations. London LHR Airport (GTW) and London Weather Centre (LWC) provide representative sites for rural and inner urban locations, respectively. As the proposed development is in a suburban location outside of London, the London Gatwick weather profile will be applied.

CIBSE TM59:2017 and TM52:2013 requires the DSY most appropriate to the location of the development to be used, for the 2020s with high emissions and 50% percentile scenario. The 2020s period is of particular interest as this relates to the period 2011-2040, which is the period we are now in. The 50% percentile changes are viewed as the ‘best guess’ level of change.

The results are shown in the appendices.

5. Strategy to Comply and Results

The Potters Bar development has acoustic constraints which require bedroom windows to be shut overnight. Mechanical Ventilation with Heat Recovery (MVHR) with purge fans have been trialed and have shown compliance, therefore have been proposed to mitigate overheating risk.

The purge boosted flow rates required to comply with Part O:

- 50 l/s per Living/Kitchen
- 50 l/s per Bedroom

The purge flow rates are required to activate once the temperature internally exceeds 23ºC. When not in boost there will be standard MVHR flow rates in-line with Part F.

Acoustic Constraints & Addition of Purge Ventilation – Criterion 1 and 2

Below shows the results for this simulation:

Simulation	Compliance with CIBSE TM59
Block A Initial Simulation	70 / 70 Rooms Pass
Block B Initial Simulation	79 / 79 Rooms Pass
Block D Initial Simulation	29 / 29 Rooms Pass
Block E Initial Simulation	69 / 70 Rooms Pass

Block E results show that a plot type on the top floor was non-compliant due to solar gains. Upgrades were suggested to the architect and client and as a result opaque panels have been added to this top floor plot to reduce the solar gains.

Figure 5.1 *Opaque Panel Locations*

As a result, all rooms sampled are compliant when improving shading levels (as above) and adding purge ventilation:

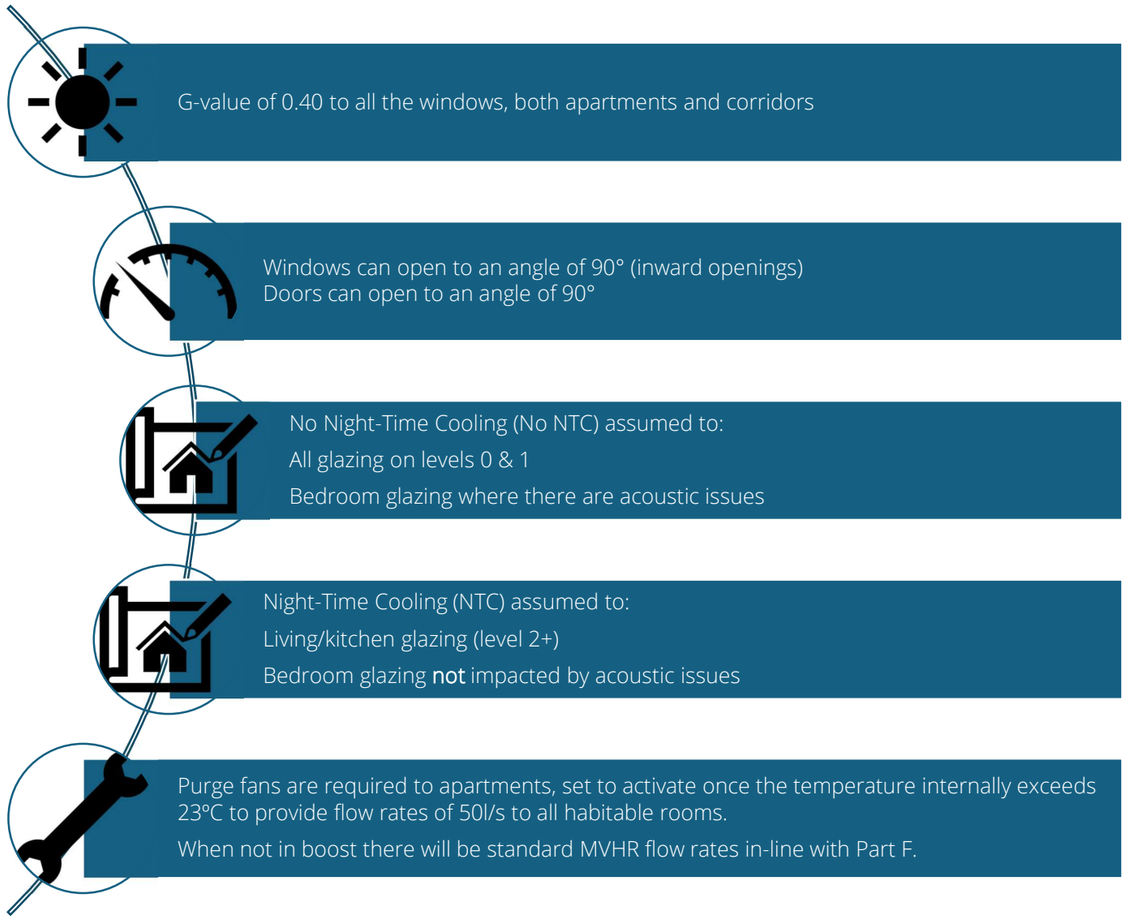
Simulation	Compliance with CIBSE TM59
Block A (with purge fans to apartments)	70 / 70 Rooms Pass
Block B (with purge fans to apartments)	79 / 79 Rooms Pass
Block D (with purge fans to apartments)	29 / 29 Rooms Pass
Block E (with purge fans to apartments + upgrades in Section 5)	70 / 70 Rooms Pass

Common Areas

CIBSE TM59:2017 recommends that the risk of summer overheating is assessed in common areas where community heating pipework runs through them. There is no mandatory target to meet for common areas, but if an internal operative temperature of 28°C is exceeded for more than 3% of the total annual hours then this should be identified. 3% of the total annual hours is 262 hours.

Whilst there is no communal heating system proposed, the spaces have been investigated as best practice. All sampled corridors are compliant without mechanical ventilation, while the apartments achieve compliance through purge fans.

Strategy to comply with CIBSE TM59 Criteria and Part O



6. Conclusion

The results of the overheating analysis show that when using the details outlined in this report and summarised opposite, all zones comply with the criteria set by CIBSE TM59 and Part O under the DSY1 LGW weather file. The strategy aims to minimise the risk of overheating through the installation of solar control glazing, opaque panels and purge fans due to the acoustic constraints.

This report has been completed for the purpose of protecting health and welfare. The comfort of building occupants cannot be guaranteed, even in compliant spaces, all the time. This type of modelling provides an assessment of comfort compliance based on bulk air modelling. i.e., each space is considered idealised and the air in that space is perfectly mixed. This assessment does not assess placement of space features such as windows or openings in relation to airflow patterns within a space or localised discomfort issues.

Appendix A – Acoustic Overheating Results (with purge fan + upgrades discussed in Section 5.0)

Room Name:	Criteria 1	Criteria 2	Pass/Fail
BA.01.01 Bed 1	1.4	14	PASS
BA.01.01 Living Kitchen	1.8		PASS
BA.01.05 Bed 1	0.8	15	PASS
BA.01.05 Living kitchen	1.3		PASS
BA.01.06 Bed 1	1.1	15	PASS
BA.01.06 Bed 2	1.5	4	PASS
BA.01.06 Living kitchen	1.4		PASS
BA.01.07 Bed 1	0	15	PASS
BA.01.07 Living Kitchen	1.1		PASS
BA.01.08 Bed 1	1.7	12	PASS
BA.01.08 Bed 2	1.8	13	PASS
BA.01.08 Living Kitchen	1.3		PASS
BA.01.08 Store	2.2		PASS
BA.01.09 Studio	1.1	17	PASS
BA-01-02 Bed 1	1.1	14	PASS
BA-01-02 Bed 2	1	15	PASS
BA-01-02 Bed 3	1.9	3	PASS
BA-01-02 Living Kitchen	2		PASS
BA-01-03 Bed 1	0.8	15	PASS
BA-01-03 Bed 2	0.8	14	PASS
BA-01-03 Living Kitchen	1.2		PASS
BA-01-04 Bed 1	0.7	15	PASS
BA-01-04 Bed 2	0.7	14	PASS
BA-01-04 Living Kitchen	1.6		PASS
BA-06-01 Bed 1	1.1	14	PASS
BA-06-01 Living Kitchen	1.3		PASS
BA-06-02 Bed 1	0.6	14	PASS
BA-06-02 Bed 2	0.7	14	PASS
BA-06-02 Bed 3	0.7	12	PASS
BA-06-02 Living Kitchen	1.1		PASS
BA-06-03 Bed 1	0.5	13	PASS
BA-06-03 Bed 2	0.6	14	PASS
BA-06-03 Living Kitchen	1		PASS
BA-06-04 Bed 1	0.5	14	PASS
BA-06-04 Bed 2	0.5	14	PASS
BA-06-04 Living Kitchen	0.8		PASS
BA-06-05 Bed 1	0.5	14	PASS
BA-06-05 Living Kitchen	0.7		PASS
BA-06-06 Bed 1	0.7	14	PASS
BA-06-06 Bed 2	1	13	PASS
BA-06-06 Living Kitchen	1		PASS
BA-06-07 Bed 1	0.7	14	PASS
BA-06-07 Living Kitchen	1.2		PASS
BA-06-08 Bed 1	1.6	12	PASS
BA-06-08 Bed 2	0.6	19	PASS
BA-06-08 Living Kitchen	1.9		PASS
BA-06-09 Studio	0.7	8	PASS
BA-14-01 Bed 1	1.1	14	PASS
BA-14-01 Living Kitchen	1.5		PASS
BA-14-02 Bed 1	0.6	13	PASS
BA-14-02 Bed 2	0.7	13	PASS
BA-14-02 Bed 3	0.7	12	PASS
BA-14-02 Living Kitchen	1.1		PASS
BA-14-03 Bed 1	0.5	13	PASS
BA-14-03 Bed 2	0.6	13	PASS
BA-14-03 Living Kitchen	1		PASS
BA-14-04 Bed 1	0.6	13	PASS
BA-14-04 Bed 2	0.5	14	PASS
BA-14-04 Living Kitchen	0.9		PASS
BA-14-05 Bed 1	0.6	14	PASS
BA-14-05 Living Kitchen	0.9		PASS
BA-14-06 Bed 1	0.8	15	PASS
BA-14-06 Bed 2	1	12	PASS
BA-14-06 Living Kitchen	1		PASS
BA-14-07 Bed 1	0.8	15	PASS
BA-14-07 Living Kitchen	1.4		PASS
BA-14-08 Bed 1	1.7	12	PASS
BA-14-08 Bed 2	0.7	18	PASS
BA-14-08 Living Kitchen	2.9		PASS
BA-14-09 Studio	1	9	PASS
B.04.01 - Bed 1	0.4	18	PASS
B.04.01 - Bed 2	0.6	17	PASS
B.04.01 - Living/Kitchen	1		PASS
B.04.02 - Bed 1	0.5	17	PASS
B.04.02 - Bed 2	0.6	17	PASS
B.04.02 - Living/Kitchen	1		PASS
B.04.03 - Bed 1	0.8	21	PASS

Room Name:	Criteria 1	Criteria 2	Pass/Fail
B.04.03 - Bed 2	0.9	19	PASS
B.04.03 - Living/Kitchen	1.2		PASS
B.04.04 - Bed 1	0.6	17	PASS
B.04.04 - Living/Kitchen	0.9		PASS
B.04.05 - Bed 1	0.7	17	PASS
B.04.05 - Living/Kitchen	1		PASS
B.04.06 - Bed 1	0.6	17	PASS
B.04.06 - Bed 2	0.5	14	PASS
B.04.06 - Living/Kitchen	0.7		PASS
B.04.07 - Bed 1	0.6	19	PASS
B.04.07 - Bed 2	0.7	19	PASS
B.04.07 - Living/Kitchen	0.9		PASS
B.04.08 - Bed 1	0.7	20	PASS
B.04.08 - Bed 2	0.7	19	PASS
B.04.08 - Living/Kitchen	0.9		PASS
B.04.09 - Bed 1	0.7	18	PASS
B.04.09 - Living/Kitchen	1.1		PASS
B.04.10 - Bed 1	0.7	21	PASS
B.04.10 - Bed 2	0.7	20	PASS
B.04.10 - Living/Kitchen	1.1		PASS
B.04.11 - Bed 1	0.7	18	PASS
B.04.11 - Living/Kitchen	0.7		PASS
B.04.12 - Bed 1	0.6	18	PASS
B.04.12 - Bed 2	0.6	17	PASS
B.04.12 - Bed 3	0.8	12	PASS
B.04.12 - Living/Kitchen	1.1		PASS
B.04.13 - Bed 1	0.6	16	PASS
B.04.13 - Bed 2	0.9	16	PASS
B.04.13 - Bed 3	0.8	12	PASS
B.04.13 - Living/Kitchen	1.2		PASS
B.04.14 - Bed 1	0.8	18	PASS
B.04.14 - Bed 2	1.1	17	PASS
B.04.14 - Living/Kitchen	1.6		PASS
B.04.15 - Bed 1	0.7	18	PASS
B.04.15 - Bed 2	1.1	17	PASS
B.04.15 - Living/Kitchen	1.2		PASS
B.04.16 - Bed 1	0.6	18	PASS
B.04.16 - Bed 2	0.8	18	PASS
B.04.16 - Living/Kitchen	1		PASS
B.04.17 - Bed 1	0.5	18	PASS
B.04.17 - Bed 2	0.6	16	PASS

Room Name:	Criteria 1	Criteria 2	Pass/Fail
B.04.17 - Living/Kitchen	0.8		PASS
B.05.01 - Bed 1	0.4	18	PASS
B.05.01 - Bed 2	0.5	16	PASS
B.05.01 - Living/Kitchen	1.1		PASS
B.05.02 - Bed 1	0.5	15	PASS
B.05.02 - Bed 2	0.6	15	PASS
B.05.02 - Living/Kitchen	1		PASS
B.05.03 - Bed 1	0.8	19	PASS
B.05.03 - Bed 2	0.9	17	PASS
B.05.03 - Living/Kitchen	1.5		PASS
B.05.04 - Bed 1	0.7	17	PASS
B.05.04 - Living/Kitchen	1.4		PASS
B.05.05 - Bed 1	0.7	16	PASS
B.05.05 - Living/Kitchen	1.4		PASS
B.05.06 - Bed 1	0.6	17	PASS
B.05.06 - Bed 2	0.7	14	PASS
B.05.06 - Living/Kitchen	1.2		PASS
B.05.07 - Bed 1	0.7	18	PASS
B.05.07 - Bed 2	0.7	18	PASS
B.05.07 - Living/Kitchen	1		PASS
B.05.08 - Bed 1	0.7	18	PASS
B.05.08 - Living/Kitchen	1.1		PASS
B.05.09 - Bed 1	0.7	18	PASS
B.05.09 - Bed 2	0.7	17	PASS
B.05.09 - Living/Kitchen	1.1		PASS
B.05.10 - Bed 1	0.6	14	PASS
B.05.10 - Bed 2	1	13	PASS
B.05.10 - Living/Kitchen	1.5		PASS
B.05.11 - Bed 1	0.5	17	PASS
B.05.11 - Bed 2	0.7	15	PASS
B.05.11 - Living/Kitchen	0.9		PASS
D.04.01 - Bed 1	1.2	18	PASS
D.04.01 - Bed 2	1.1	18	PASS
D.04.01 - Bed 3	1.4	14	PASS
D.04.01 - Living/Kitchen	1.4		PASS
D.04.02 - Bed 1	1.2	18	PASS
D.04.02 - Bed 2	1.1	18	PASS
D.04.02 - Bed 3	1.4	16	PASS
D.04.02 - Living/Kitchen	1.6		PASS
D.04.03 - Bed 1	0.7	20	PASS
D.04.03 - Bed 2	0.8	20	PASS

Room Name:	Criteria 1	Criteria 2	Pass/Fail
D.04.03 - Living/Kitchen	0.9		PASS
D.04.04 - Bed 1	0.7	18	PASS
D.04.04 - Living/Kitchen	1.3		PASS
D.04.05 - Bed 1	0.7	18	PASS
D.04.05 - Bed 2	0.8	20	PASS
D.04.05 - Living/Kitchen	1.2		PASS
D.04.06 - Bed 1	0.7	18	PASS
D.04.06 - Living/Kitchen	1.2		PASS
D.04.07 - Bed 1	0.7	17	PASS
D.04.07 - Bed 2	0.8	19	PASS
D.04.07 - Living/Kitchen	1.2		PASS
D.04.08 - Bed 1	1	18	PASS
D.04.08 - Bed 2	1	17	PASS
D.04.08 - Bed 3	1.2	12	PASS
D.04.08 - Living/Kitchen	1.3		PASS
D.04.09 - Bed 1	1.1	18	PASS
D.04.09 - Bed 2	1.2	18	PASS
D.04.09 - Bed 3	1.4	13	PASS
D.04.09 - Living/Kitchen	1.1		PASS
E.00.01 - Bed 1	0.6	12	PASS
E.00.01 - Bed 2	0.8	10	PASS
E.00.01 - Living/Kitchen	1.5		PASS
E.00.02 - Bed 1	0.5	10	PASS
E.00.02 - Bed 2	0.7	10	PASS
E.00.02 - Bed 3	1.3	6	PASS
E.00.02 - Living/Kitchen	1.5		PASS
E.00.03 - Bed 1	0.5	12	PASS
E.00.03 - Bed 2	0.6	10	PASS
E.00.03 - Living/Kitchen	1.3		PASS
E.00.04 - Bed 1	0.5	10	PASS
E.00.04 - Living/Kitchen	0.9		PASS
E.00.05 - Bed 1	0.3	10	PASS
E.00.05 - Bed 2	0.5	10	PASS
E.00.05 - Living/Kitchen	0.9		PASS
E.00.06 - Bed 1	0.3	12	PASS
E.00.06 - Bed 2	0.5	9	PASS
E.00.06 - Living/Kitchen	0.8		PASS
E.00.07 - Bed 1	0.5	9	PASS
E.00.07 - Living/Kitchen	0.8		PASS
E.00.08 - Bed 1	0.5	10	PASS
E.00.08 - Bed 2	0.6	9	PASS

Room Name:	Criteria 1	Criteria 2	Pass/Fail
E.00.08 - Living/Kitchen	1.6		PASS
E.00.09 - Bed 1	0.7	10	PASS
E.00.09 - Bed 2	0.8	10	PASS
E.00.09 - Bed 3	1.3	6	PASS
E.00.09 - Living/Kitchen	2.1		PASS
E.00.10 - Bed 1	0.5	12	PASS
E.00.10 - Bed 2	0.8	10	PASS
E.00.10 - Living/Kitchen	1.1		PASS
E.03.01 - Bed 1	0.9	14	PASS
E.03.01 - Living/Kitchen	2.5		PASS
E.03.02 - Bed 1	0.6	13	PASS
E.03.02 - Bed 2	1.1	14	PASS
E.03.02 - Bed 3	1.3	9	PASS
E.03.02 - Living/Kitchen	1.9		PASS
E.03.03 - Bed 1	0.7	16	PASS
E.03.03 - Bed 2	0.8	14	PASS
E.03.03 - Living/Kitchen	1.6		PASS
E.03.04 - Bed 1	0.7	14	PASS
E.03.04 - Living/Kitchen	1.7		PASS
E.03.05 - Bed 1	0.6	17	PASS
E.03.05 - Bed 2	0.8	14	PASS
E.03.05 - Living/Kitchen	1.6		PASS
E.03.06 - Bed 1	0.8	15	PASS
E.03.06 - Bed 2	1.1	15	PASS
E.03.06 - Living/Kitchen	1.5		PASS
E.03.07 - Bed 1	0.8	15	PASS
E.03.07 - Bed 2	1.1	14	PASS
E.03.07 - Living/Kitchen	2.8		PASS
E.03.08 - Bed 1	0.8	15	PASS
E.03.08 - Bed 2	1.1	14	PASS
E.03.08 - Living/Kitchen	2.9		PASS
E.03.09 - Bed 1	0.8	15	PASS
E.03.09 - Bed 2	1.1	13	PASS
E.03.09 - Living/Kitchen	1.5		PASS
E.03.10 - Bed 1	0.5	17	PASS
E.03.10 - Bed 2	0.8	14	PASS
E.03.10 - Living/Kitchen	1.6		PASS
E.03.11 - Bed 1	0.7	14	PASS
E.03.11 - Living/Kitchen	1.5		PASS
E.03.12 - Bed 1	0.6	14	PASS
E.03.12 - Bed 2	0.7	14	PASS

Room Name:	Criteria 1	Criteria 2	Pass/Fail
E.03.12 - Living/Kitchen	2.2		PASS
E.03.13 - Bed 1	0.7	13	PASS
E.03.13 - Bed 2	1.1	13	PASS
E.03.13 - Bed 3	1.4	9	PASS
E.03.13 - Living/Kitchen	2		PASS
E.03.14 - Bed 1	0.9	15	PASS
E.03.14 - Living/Kitchen	2.5		PASS

Appendix B – Common Area Overheating Results

	Internal Temperatures >28°C				
Level/Room Name:	No. of hours >28°C	>1% of annual hours	>2% of annual hours	>3% of annual hours	Pass/Fail to CIBSE TM59:2017
01 CAC 1	38	No	No	No	PASS
01 CAC 2	19	No	No	No	PASS
01 CAC 3	20	No	No	No	PASS
06 CAC 2	0	No	No	No	PASS
06 CAC 3	0	No	No	No	PASS
06 CAC 4	8	No	No	No	PASS
06 CAC 1	0	No	No	No	PASS
14 CAC 2	0	No	No	No	PASS
14 CAC 3	0	No	No	No	PASS
14 CAC 4	11	No	No	No	PASS
14 CAC 1	2	No	No	No	PASS
B.00 - Lobby 1	0	No	No	No	PASS
B.00 - Lobby 2	0	No	No	No	PASS
B.00 - Lobby 3	180	Yes	Yes	No	PASS
B.00 - Lobby 4	36	No	No	No	PASS
B.00 - Riser Lobby 1	0	No	No	No	PASS
B.00 - Riser Lobby 2	0	No	No	No	PASS
B.00 - Staircore 1	0	No	No	No	PASS
B.00 - Staircore 2	0	No	No	No	PASS
B.04 - CAC 1	14	No	No	No	PASS
B.04 - CAC 2	39	No	No	No	PASS
B.04 - CAC 3	57	No	No	No	PASS
B.04 - Lift/ Staircore Lobby 1	0	No	No	No	PASS
B.04 - Lift/ Staircore Lobby 2	0	No	No	No	PASS
B.04 - Staircore 1	0	No	No	No	PASS
B.04 - Staircore 2	0	No	No	No	PASS
B.05 - CAC 1	9	No	No	No	PASS
B.05 - CAC 2	13	No	No	No	PASS
B.05 - Lift/ Staircore Lobby 1	0	No	No	No	PASS
B.05 - Staircore 1	0	No	No	No	PASS
D.00 - Riser Lobby	143	Yes	No	No	PASS
D.00 - Staircore	0	No	No	No	PASS
D.04 - CAC 1	0	No	No	No	PASS
D.04 - CAC 2	0	No	No	No	PASS
D.04 - Lift/ Staircore Lobby	0	No	No	No	PASS
D.04 - Staircore	0	No	No	No	PASS
E.00 - CAC 1	0	No	No	No	PASS
E.00 - CAC 2	0	No	No	No	PASS
E.00 - CAC 3	0	No	No	No	PASS
E.00 - CAC 4	0	No	No	No	PASS
E.00 - CAC 5	0	No	No	No	PASS
E.00 - CAC 6	0	No	No	No	PASS
E.00 - Lobby 1	125	Yes	No	No	PASS
E.00 - Lobby 2	122	Yes	No	No	PASS
E.00 - Staircore 1	51	No	No	No	PASS
E.00 - Staircore 2	0	No	No	No	PASS
E.03 - CAC 1	76	No	No	No	PASS
E.03 - CAC 2	38	No	No	No	PASS
E.03 - CAC 3	84	No	No	No	PASS
E.03 - CAC 4	85	No	No	No	PASS
E.03 - CAC 5	37	No	No	No	PASS
E.03 - CAC 6	79	No	No	No	PASS
E.03 - Staircore 1	0	No	No	No	PASS
E.03 - Staircore 2	0	No	No	No	PASS

WHITECODE
CONSULTING

26-27 THE HILL, NORTHFLEET, GRAVESEND, KENT, DA11 9EU
TEL: 01322 289977 E-mail: design@whitecode.co.uk Website: www.whitecode.co.uk

WHITECODE CONSULTING LTD registered in England & Wales with company number 03004480