QUEENSBERRY DESIGN LTD.
ENGINEERING, SUSTAINABILITY & ARCHITECTURAL CONSULTANTS

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APPROVED
OVERHEATING COMPETENCY SCHEME MEMBER

Kingston House Bridge Hampton

Part O - Overheating Risk, Thermal Model CIBSE TM59:2017 Report

Ref: QD2069-01

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Contents

Image courtesy of Fluent architectural design services.

Disclaimer

This report is based on the information provided by the client. Should this information prove to be inaccurate, or the original design specification change the findings and conclusions of this report will be invalidated. This report includes simulation results for the estimated thermal performance of the building (part of the building) using detailed modelling methods. Within the calculations, assumptions are made based on NCM defaults and practical industry standards that may not reflect the actual building. Although Queensberry Design takes great care in producing a high-quality simulation model, variables in building construction and external factors outside the CIBSE TM52 & TM59 metric requirements will affect the actual performance of the building. It is therefore the responsibility of the designers and construction team to construct the building appropriately.

1.0 Executive Summary

A detailed dynamic thermal model of the proposed apartment block at ***Kingston House Bridge Development,*** produced using Design Builder Energy Plus. The model has been used to simulate a selection of the highest-risk plots within the proposed development. The purpose of the simulation is to determine that the buildings satisfy the requirements of the thermal comfort metrics CIBSE TM59:2017, accounting for the limitations of Building Regulation Part O. The building specification inputs are detailed within section 6 of this report, and the full results of the simulation model are illustrated in section 7 of this report.

1.1 Results - 2020's DSY1 weather scenario

Simulation models have been completed for a sample of worst-case apartments. Assessed under the methodology of CIBSE TM59:217 accounting for the limitations of Building Regulation Part O, all high-risk units can comply based on the ventilation strategy, and proposed mitigation measures incorporated into the design. All inputs used for this scenario can be found in section 6 of this report.

Proposed Window Details: **1.30 W/m2K**
Ground floor G-Value 0.3
Mid floor G-Value 0.63
Top floor G-Value 0.35
Proposed additional Mitigation: **Purge Ventilation 4 ACH to all Ground Floor bedrooms.**

Table 1 – 2020's DSY 1 Simulation Results, Sample units (CIBSE TM59:2017)

House Type / Plot	Criteria A (%)	Criteria B (hr)	Pass / Fail
Ground Floor (Apartment 01)	Pass	Pass	Pass
Ground Floor (Apartment 07)	Pass	Pass	Pass
Ground Floor (Apartment 10)	Pass	Pass	Pass
Mid Floor (Apartment 26)	Pass	Pass	Pass
Mid Floor (Apartment 32)	Pass	Pass	Pass
Mid Floor (Apartment 35)	Pass	Pass	Pass
Mid Floor (Apartment 36)	Pass	Pass	Pass
Top Floor (Apartment 66)	Pass	Pass	Pass
Top Floor (Apartment 69)	Pass	Pass	Pass
Top Floor (Apartment 70)	Pass	Pass	Pass

2.0 Introduction

This report had been produced to assess the design stage proposals ***Kingston House Bridge Development,*** against the overheating criteria outlined by CIBSE TM59:2017 accounting for the limitations of Building Regulation Part O. The calculations have been prepared by Queensberry Design. The outcome of the overheating analysis is intended to advise the design team by providing an estimated performance of the building, allowing them to make informed design decisions to minimise overheating risk within the building.

("Map data ©2023 Google")

3.0 Overheating Criteria

The most recognised methodology for assessing thermal comfort in domestic spaces is CIBSE TM59:2017. The guidance document is available online for further information.

3.1 CIBSE TM59:2017

CIBSE TM59:2017 provides a methodology for the assessment of overheating risk in domestic buildings. This is predominantly designed for flats/apartments, as these are deemed to be high risk, but can also be applied to Houses. Compliance is based on passing criterion A&B:

- Criterion A - For living rooms, kitchens and bedrooms: The number of hours during which temperature is greater than or equal to one degree (K) during the period May to September inclusive shall not be more than 3% of occupied hours.
- Criterion 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 annual hours. (Note: 1% of the annual hours between 22:00 and 07:00 for bedrooms is 32 hours, so 33 or more hours above 26 °C will be recorded as a fail).

3.2 Approved Document O: Overheating (TM59 limitations)

Compliance with Part O can be shown by using one of the following two methods:

1. The Simplified Method, as set out within Section 1 of the Approved Document O.
2. The Dynamic Thermal Modelling Method, as set out within Section 2 of the Approved Document O.

The CIBSE TM59 criteria for The Dynamic Thermal Modelling Method has been in use since 2017. The Part O document mandates certain limitations to be included with the TM59 methodology.

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

- Start to open when the internal temperature exceeds 22°C.
- Be fully open when the internal temperature exceeds 26°C.
- Start to close when the internal temperature falls below 26°C.
- Be fully closed when the internal temperature falls below 22°C.

At night (11pm-8am), windows should be assumed to be fully open if:

- The opening is on the first floor or above and not easily accessible.
- The internal temperature exceeds 23°C at 11pm.

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

- In the day, windows, patio doors and balcony doors should be modelled as open, if this can be done securely.
- 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.

4.0 Modelling Software

To carry out the thermal simulations, Queensberry Design Ltd has modelled the building in an appropriate Dynamic Simulation software: Design Builder Energy Plus version 7.1.3.015

The DSM model can be used to provide:

- Overheating analysis (this report)
- Energy consumption prediction
- Heating and Cooling Load prediction
- Thermal Fluid Dynamics Assessment
- Building Compliance Assessment (Building Regulations Part-L and EPC)

5.0 3D Generated Models

A three-dimensional thermal model of the Apartments has been produced based on information provided by the client/architect or otherwise stated in this report. Where specific information is provided building fabric, occupancy densities, profiles, and small power gains were based on the TM59 profiles and NCM assumptions. Specific lighting, heating and ventilation are as per the information provided (see section 6).

5.2 Sample Units

A sample of high-risk apartments has been selected for simulation. Sample apartments have been selected based on the following criteria:

All Ground floor units for security reasons. South-West facing Mid floor units and 50% of Top floor units.

- Ground Floor (Apartment 01) - 3 Bedroom, West facing.
- Ground Floor (Apartment 07) - 1 Bedroom, South facing.
- Ground Floor (Apartment 10) - 2 Bedroom, South and West facing.
- Mid Floor (Apartment 26) - 2 Bedroom, West facing.
- Mid Floor (Apartment 32) - 1 Bedroom, South facing.
- Mid Floor (Apartment 35) - Studio, South and West facing.
- Mid Floor (Apartment 36) - 1 Bedroom, West facing.
- Top Floor (Apartment 66)- 1 Bedroom, South facing.
- Top Floor (Apartment 69)- Studio, South and West facing.
- Top Floor (Apartment 70)- 1 Bedroom, West facing.

6.0 Summary of Model Inputs

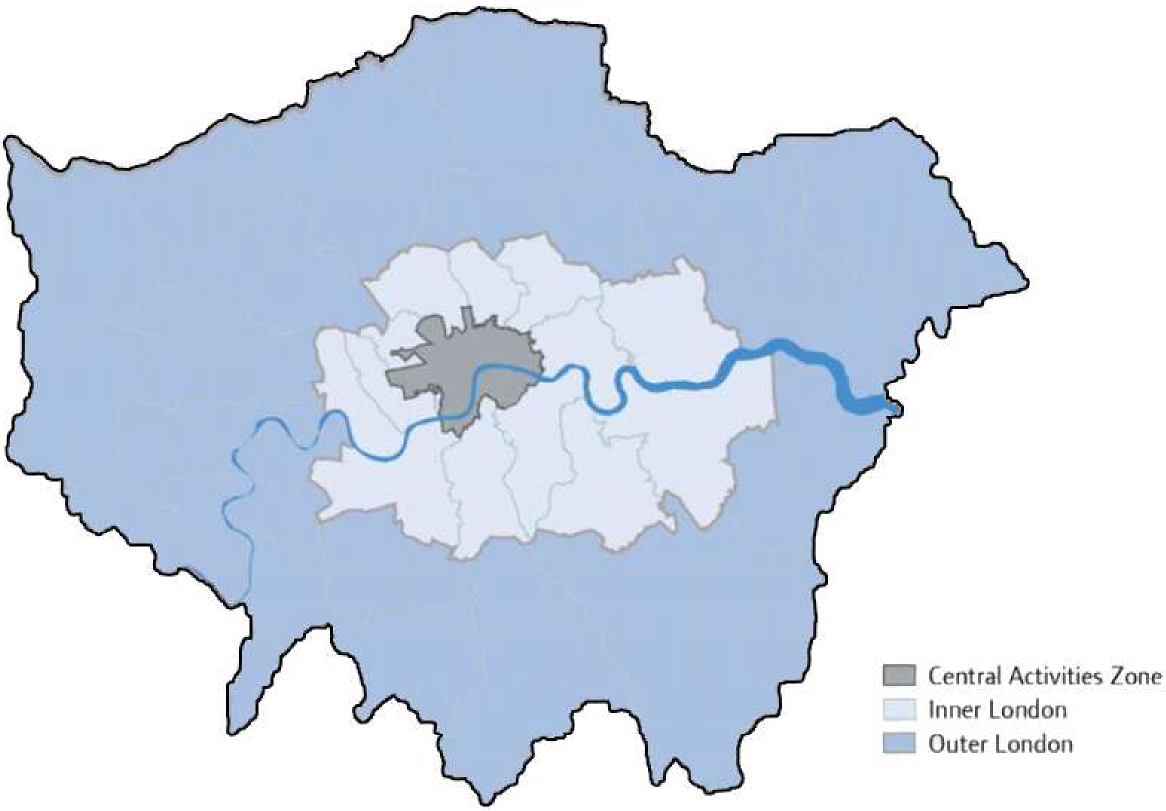
6.1 Location Data

Building type: Residential
Building Location: Hampton
Orientation: Building Entrance Faces North
Latitude: 51.24° North
Longitude: 0.18° West
Weather file: DSY 1 (Design Summer Year) 2020's, high emissions, 50% percentile scenario.

6.2 Weather Data Report

In accordance with TM59 the DSY1 weather file used for the simulation model is based on the site location, as shown on the map below. There are three weather files for London, each representing different areas:

- Central Activity Zone: London Weather Central
- Inner London: London Heathrow weather file
- Outer London: London Gatwick weather file



6.3 Building Fabric

Fabric U-vales are based on preliminary information provided.

Table 2 – Building Fabric		
Element	**Construction**	**U-Value**
Main External Wall	Cavity Wall construction	**0.20 W/m2K**
Flat Roof	Concrete deck Construction	**0.14 W/m2K**
Ground Floor	Concrete, medium density 150mm, ESP insulation 250mm, Screed 75mm	**0.13 W/m2K**
Entrance Doors		**1.60 W/m2K**
Table 3 – Glazing Specification		
Ground Floor Windows	G-Value 0.30	**1.30 W/m2K**
Mid Floor Windows	G-Value 0.63	**1.30 W/m2K**
Top Floor Windows	G-Value 0.35	**1.30 W/m2K**

Thermal Bridge: Accredited Construction Details.

6.4.1 Building Services:

- ***Heating and hot waters***: Communal air source heat pumps with indoor units in each flat connected to a medium temperature loop connected to common chiller units on the roof of each block.
- ***Lighting:*** For Domestic areas, In the absence of a project-specific lighting design inputs are based on CIBSE TIM59 guidance 5.2:
  - *"For the purposes of the assessment, lighting energy is assumed to be proportional to floor area, and lighting loads are measured in W/m2. From 6pm to 11pm, 2 W/m2 should be assumed as the default for an efficient new-build home."*
  - *It is assumed that Communal corridor lighting will be equipped with PIR sensors.*
- ***Ventilation***: Domestic ventilation to each apartment is decentralised Mechanical Ventilation with heat recovery (MVHR). No product extract rates are available, so rates are based on minimum Part F ventilation rates (excluding individual bedroom ventilation):
  - Kitchens – 0.013m^3/s
  - Bathroom – 0.008m^3/s
  - WC's – 0.006m^3/s
- ***Bedrooms:*** Ground Floor Bedrooms will need to be served by a mechanical purge ventilation system to provide 4AC/HR to ensure the requirements of TM59 are satisfied.

6.5 Internal Heat Gains

The simulation software automatically calculates the solar gains based on the building orientation, window openings, and glazing specification.

As no project-specific schedules are available for this development and no equipment gain information has not been provided by the design team, default schedules for inputs are being used as per CIBSE TM59 methodology Table 2 (see appendix 10.1).

Communal corridor pipework heat gains are based on default heat loss from pipework set out in the domestic building services compliance guide 2013. Pipework assumed 22mm.

6.6 Air Infiltration Rate

The air permeability of the building envelope must conform to the standard set by the criterion of Part L, namely a maximum air permeability of 8 m3h-1m2 at 50 Pa. It is proposed that the air permeability of this development will be significantly less than the maximum value. The airtightness crack template is set to Good in the simulation model.

Airflow within the building is aided by the opening of internal doors. Doors have been assigned to be left open in the daytime but have been assumed closed at night.

6.7 Window Openings

This assessment is based on all ground-floor windows and patio doors being fully openable, and all upper windows being openable up to 650mm from the internal wall finish, 50mm allowance for the window handle see appendix 10.3 for the assumed window openings. All windows are projected to be opened manually by the end-user when the internal temperature exceeds 22-24°C. AD Part O dictates that ground-floor bedroom windows cannot be opened at night within the simulation model. The manual opening is modelled in tandem with the occupancy profiles prescribed by CIBSE TM59, with Part O rules applied. In reality, rooms will be unoccupied at unexpected times, and it is important that the design team consider ventilation for unoccupied periods.

Enhance protection from falling measures are required for all upper floor windows that are openable as part of the overall ventilation and overheating strategy. See Approved Document Part O section 3.8 for more details. For the purpose of this assessment, all openable windows that are within 1100mm of the Finished floor level will require internal guarding that meets the standard of AD Part O.

First-floor balconies could be considered easily accessible as defined in Approved Document Part O. It is advised that all first-floor balconies are at least 3.5m high at the outer edge. Failure to do so will result in the first-floor balcony doors/windows being considered closed at night, this would result in a requirement for additional mechanical purge ventilation providing a minimum of 4AC/HR.

7. Results and Simulation Outcomes – 2020's Weather Data

7.1 Simulation Baseline Results

Based on the natural ventilation strategy, with MVHR the simulation model has been completed for a sample of units, assessed under the methodology of CIBSE TM59:217. All inputs used for this scenario can be found in section 6 of this report, including mechanical purge ventilation to bedrooms (4>ACH). The results below show all worst-case sample plots pass criteria A and B set by CIBSE TM59:2017.

Table 4 – 2020's DSY 1 Initial Simulation Results, Sample units (CIBSE TM59:2017)

Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Ground Floor (Apartment 01) – Living Kitchen	0.89	N/A	Pass
Ground Floor (Apartment 01) – Bedroom 1	0.3	29	Pass
Ground Floor (Apartment 01) – Bedroom 2	0.71	29	Pass
Ground Floor (Apartment 01) – Bedroom 3	0.98	30.67	Pass
Ground Floor (Apartment 07) – Living Kitchen	0.55	N/A	Pass
Ground Floor (Apartment 07) – Bedroom 1	0.28	20	Pass
Ground Floor (Apartment 10) – Living Kitchen	0.62	N/A	Pass
Ground Floor (Apartment 10) – Bedroom 1	1.09	29.33	Pass
Ground Floor (Apartment 10) – Bedroom 2	1.02	30.83	Pass
Mid Floor (Apartment 26) – Living Kitchen	2.91	N/A	Pass
Mid Floor (Apartment 26) – Bedroom 1	0.37	19.83	Pass
Mid Floor (Apartment 26) – Bedroom 2	1.71	20.17	Pass
Mid Floor (Apartment 32) – Living Kitchen	0.62	N/A	Pass
Mid Floor (Apartment 32) – Bedroom 1	0.48	26.83	Pass
Mid Floor (Apartment 35) – Studio	0.59	14	Pass
Mid Floor (Apartment 36) – Living Kitchen	1	N/A	Pass
Mid Floor (Apartment 36) – Bedroom 1	1.58	11.17	Pass
Top Floor (Apartment 66) – Living Kitchen	0.84	N/A	Pass
Top Floor (Apartment 66) – Bedroom 1	0.16	31.67	Pass
Top Floor (Apartment 69) – Studio	0.37	17.17	Pass
Top Floor (Apartment 70) – Living Kitchen	0.61	N/A	Pass
Top Floor (Apartment 70) – Bedroom 1	0.74	12.67	Pass

7.3 Corridors Baseline Results 2020's

Corridors have been tested under the advisory TM59 overheating criteria. (Internal temperatures are advised not to exceed 28°C for more than 3% of annual hours). There is no mandatory requirement to meet the overheating requirement for communal corridors, however, the developer should consider installing ventilation to reduce overheating to any failing zones.

Table 5 – 2020's DSY 1 Simulation Results for Corridors (CIBSE TM59:2017)		
Zone	**Exceedance 28° (%)**	**Pass / Fail**
GF-Access	0	Pass
GF-Core	0.56	Pass
GF-CorridorE	1.18	Pass
GF-StairwellE	0.2	Pass
GF-CorridorW	0	Pass
GF-StairwellW	0.12	Pass
MF-Core	1.78	Pass
MF-CorridorE	5.23	Fail
MF-CorridorW	0.62	Pass
MF-StairwellE	0.68	Pass
MF-StariwellW	0.54	Pass
MF-Core	8.78	Fail
MF-CorridorE	10.18	Fail
MF-StairwellE	0.81	Pass

8. CIBSE TM59– Extreme conditions DSY 2 and DSY 3

Additional simulations have been run using extreme conditions DSY 2 and DSY 3 weather data files to demonstrate projected building performance under these scenarios. Calculations for confirm for DSY2 that most rooms will fail the overheating criteria defined by CIBSE TM59:2017, with a few exceptions (see table 6). Calculations for DSY3 confirm that almost all fall short of the overheating criteria (see table 7). Further recommendations have been made to mitigate the potential for future overheating.

Weather Data / Simulation Results

The weather data used is London Gatwick 2020's, high emissions, 50% percentile scenario.

Extreme conditions:
DSY 2
DSY 3

Further recommendations
The following additional advisory recommendations have been made to reduce potential future overheating risks based on extreme weather scenarios. Advisory mitigation measures should be considered by the developer for installation prior to occupation or for future retrofit.

Low – G glazing throughout:
To reduce the projected solar gains to living rooms and kitchens the developer should consider installing the same low g-value glazing as proposed to the bedrooms, such as Pilkington Suncool to the bedroom windows (see appendix 10.3 for details).

Externals Overhead shading devices:
The most effective way to reduce summer heat gain through windows is to provide external shading that prevents sunlight before it hits the glass. Overhead shading devices 1-2m, such as eaves, awnings, pergolas and louvres can regulate solar gains throughout the year, without requiring any user effort, particularly to the south facade.

External Side shading devices:
East and west facade often have more need for vertical fins to avoid the low-angled sun, 0.5-1.5m in length. Overhead or side window shading should be considered for initial installation or for the potential for future retrofit.

Mechanical:
For instances of severe overheating risk, the developer should consider the potential future installation of mechanical cooling or passive ventilation to combat the future rise in temperatures and the likely hood that design measures will be insufficient to reduce overheating risk completely.

Table 6 – DSY 2 Simulation Results (CIBSE TM59:2017)				
Zone		**Criteria A (%)**	**Criteria B (hr)**	**Pass / Fail**
GF1	APT07XBedroom1	1.33	37.17	Fail
GF1	APT07XLivingKitchen	2.67	N/A	Pass
GF1	APT10XBedroom1	2.78	56.67	Fail
GF1	APT10XBedroom2	2.65	65.67	Fail
GF1	APT10XLivingKitchen	3.20	N/A	Fail
GF	APT01XBedroom1	1.68	62.83	Fail
GF	APT01XBedroom2	2.40	61.17	Fail
GF	APT01XBedroom3	2.71	61.67	Fail
GF	APT01XCorridor	2.45	N/A	Pass
GF	APT01XLivingKitchen	3.87	N/A	Fail
MF	APT32XBedroom1	1.83	40.50	Fail
MF	APT32XLivingKitchen	3.40	N/A	Fail
MF	APTX26XBedroom1	2.05	38.67	Fail
MF	APTX26XBedroom2	3.53	33.67	Fail
MF	APTX26XLivingDinning	6.09	N/A	Fail
MF	APTX35XStudio	2.54	19.67	Pass
MF	APTX36XBedroom1	3.13	16.50	Fail
MF	APTX36XLivingDinning	3.89	N/A	Fail
TF	APT66XBedroom1	0.85	48.83	Fail
TF	APT66XLivingKitchen	3.61	N/A	Fail
TF	APTX69XStudio	1.64	29.50	Pass
TF	APTX70XBedroom1	2.44	19.17	Pass
TF	APTX70XLivingDinning	3.25	N/A	Fail

Table 7 – DSY 3 Simulation Results (CIBSE TM59:2017)				
Zone		**Criteria A (%)**	**Criteria B (hr)**	**Pass / Fail**
GF1	APT07XBedroom1	1.70	60.17	Fail
GF1	APT07XLivingKitchen	3.69	N/A	Fail
GF1	APT10XBedroom1	3.56	76.33	Fail
GF1	APT10XBedroom2	3.38	92.33	Fail
GF1	APT10XLivingKitchen	3.94	N/A	Fail
GF	APT01XBedroom1	2.04	87.17	Fail
GF	APT01XBedroom2	3.10	81.17	Fail
GF	APT01XBedroom3	3.52	83.50	Fail
GF	APT01XCorridor	2.80	N/A	Pass
GF	APT01XLivingKitchen	4.53	N/A	Fail
MF	APT32XBedroom1	3.01	61.17	Fail
MF	APT32XLivingKitchen	5.35	N/A	Fail
MF	APTX26XBedroom1	2.28	54.50	Fail
MF	APTX26XBedroom2	4.14	50.67	Fail
MF	APTX26XLivingDinning	7.56	N/A	Fail
MF	APTX35XStudio	2.63	35.50	Fail
MF	APTX36XBedroom1	3.34	28.17	Fail
MF	APTX36XLivingDinning	5.20	N/A	Fail
TF	APT66XBedroom1	1.49	71.50	Fail
TF	APT66XLivingKitchen	5.60	N/A	Fail
TF	APTX69XStudio	1.76	40.67	Fail
TF	APTX70XBedroom1	2.64	38.33	Fail
TF	APTX70XLivingDinning	4.49	N/A	Fail

9. Conclusions

A detailed dynamic thermal model of the proposed ***Kingston House Bridge Development*** has been produced using Design Builder Energy Plus. The model has been used to simulate a selection of the highest-risk flats within the proposed development.

The objective of the simulation is to determine if the building satisfies the requirements of the thermal comfort metrics CIBSE TM59:2017. A full set of results of the simulation model are illustrated in section 7 of this report.

9.1 Results Summary

Results show based on a simple of the worst-case apartments compliance with the overheating criteria as defined by CIBSE TM59:2017, weather file 2020's DSY1, can be achieved.

9.2 Advisory Recommendations

All high-risk units can comply based on the natural ventilation strategy and ground floor bedrooms purge ventilation (>4ACH). However advisory recommendations have been made to future-proof the building and reduce any minor overheating risk for DSY 2 and DSY 3 extreme weather scenarios. These recommendations include external shading and for instances of severe overheating risk installation of mechanical cooling.

Table 1 – 2020's DSY 1 Simulation Results, Sample units (CIBSE TM59:2017)

House Type / Plot	Criteria A (%)	Criteria B (hr)	Pass / Fail
Ground Floor (Apartment 01)	Pass	Pass	Pass
Ground Floor (Apartment 07)	Pass	Pass	Pass
Ground Floor (Apartment 10)	Pass	Pass	Pass
Mid Floor (Apartment 26)	Pass	Pass	Pass
Mid Floor (Apartment 32)	Pass	Pass	Pass
Mid Floor (Apartment 35)	Pass	Pass	Pass
Mid Floor (Apartment 36)	Pass	Pass	Pass
Top Floor (Apartment 66)	Pass	Pass	Pass
Top Floor (Apartment 69)	Pass	Pass	Pass
Top Floor (Apartment 70)	Pass	Pass	Pass

Provided the proposed house type design and construction specification is followed, the MVHR ventilation proposals, and additional purge ventilation combined with natural ventilation effectively remove the heat gains in these spaces and replenish minimum fresh air to the occupants as such that the building fulfils the TM59:2017 criteria.

10. Appendix

10.1 Occupancy and Equipment gain Description

Data source CIBSE TM59: Design methodology for the assessment of overheating risk in homes.

Supplementary information on profile development

Table 2 Occupancy and equipment gain descriptions

Unit/ room type	Occupancy	Equipment load
Studio	2 people at all times	Peak load of 450 W from 6 pm to 8 pm*. 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room/kitchen	1 person from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
1-bedroom apartment: living room	1 person at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
1-bedroom apartment: kitchen	1 person at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
2-bedroom apartment: living room/kitchen	2 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200 W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
2-bedroom apartment: living room	2 people at 75% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
2-bedroom apartment: kitchen	2 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm Base load of 50 W for the rest of the day
3-bedroom apartment: living room/kitchen	3 people from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 450 W from 6 pm to 8 pm 200W from 8 pm to 10 pm 110 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 85 W for the rest of the day
3-bedroom apartment: living room	3 people at 5% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 150 W from 6 pm to 10 pm 60 W from 9 am to 6 pm and from 10 pm to 12 pm Base load of 35 W for the rest of the day
3-bedroom apartment: kitchen	3 people at 25% gains from 9 am to 10 pm; room is unoccupied for the rest of the day	Peak load of 300 W from 6 pm to 8 pm base load of 50 W for the rest of the day
Double bedroom	2 people at 70% gains from 11 pm to 8 am 2 people at full gains from 8 am to 9 am and from 10 pm to 11 pm 1 person at full gain in the bedroom from 9 am to 10 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during the sleeping hours
Single bedroom (too small to accommodate double bed)	1 person at 70% gains from 11 pm to 8 am 1 person at full gains from 8 am to 11 pm	Peak load of 80 W from 8 am to 11 pm Base load of 10 W during sleeping hours
Communal corridors	Assumed to be zero	Pipework heat loss only; see section 3.1 above

* All times in GMT

10.2 Example low-G Glazing specification

PILKINGTON

NSG GROUP

Glass Range for Architects and Specifiers

Technical Information Datasheet

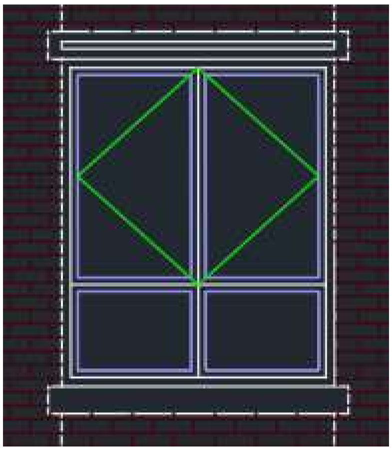
Table 1 – Performance Data Pilkington **Insulight**™ Sun with 6 mm Pilkington **Optifloat**™ Clear Inner Pane.

Product Description	Light		Solar Radiant Heat				Shading Coefficient			U_g-value (W/m²K)	Unit Maximum Sizes†		
Outer Pane	Transmittance	Reflectance	Direct Transmittance	Reflectance	Absorptance	Total Transmittance (g-value)	Short Wavelength	Long Wavelength	Total	Argon (90%)	Annealed (mm)	Toughened (mm)	Descriptive Code
Pilkington **Insulight**™ Sun (with 6 mm Pilkington **Optifloat**™ Clear inner pane and 16 mm 90% argon filled cavity – unless otherwise indicated)													
Pilkington **Suncool**™													
6 mm 70/40	0.70	0.10	0.38	0.28	0.34	0.42	0.44	0.04	0.48	1.1	2500 x 1500	4000 x 2000	70/42
6 mm 70/35	0.69	0.16	0.34	0.35	0.31	0.37	0.39	0.04	0.43	1.0	2500 x 1500	4000 x 2000	69/37
6 mm 66/33	0.65	0.16	0.32	0.35	0.33	0.36	0.37	0.04	0.41	1.0	2500 x 1500	4000 x 2000	65/36
6 mm 60/31	0.59	0.11	0.28	0.32	0.40	0.32	0.32	0.05	0.37	1.0	2500 x 1500	4000 x 2000	59/32
6 mm Silver 50/30	0.49	0.39	0.28	0.43	0.29	0.31	0.32	0.04	0.36	1.0	2500 x 1500	4000 x 2000	49/31
6 mm Blue 50/27	0.49	0.19	0.25	0.35	0.40	0.28	0.29	0.03	0.32	1.1	2500 x 1500	4000 x 2000	49/28
6 mm 50/25	0.49	0.18	0.24	0.33	0.43	0.27	0.28	0.03	0.31	1.0	2500 x 1500	4000 x 2000	49/27
6 mm 40/22	0.39	0.20	0.19	0.35	0.46	0.23	0.22	0.04	0.26	1.1	2500 x 1500	4000 x 2000	39/23
6 mm 30/17	0.30	0.25	0.15	0.37	0.48	0.18	0.17	0.04	0.21	1.1	2500 x 1500	4000 x 2000	30/18
Pilkington **Suncool**™ OW (with 6 mm Pilkington **Optiwhite**™ inner pane and 16 mm 90% argon filled cavity)													
6 mm 70/40	0.73	0.10	0.44	0.39	0.17	0.45	0.51	0.01	0.52	1.1	2500 x 1500	4000 x 2000	73/45
6 mm 70/35	0.73	0.16	0.38	0.47	0.15	0.39	0.44	0.01	0.45	1.0	2500 x 1500	4000 x 2000	73/39
6 mm 66/33	0.61	0.17	0.36	0.47	0.17	0.37	0.41	0.02	0.43	1.0	2500 x 1500	4000 x 2000	69/37
6 mm Blue 50/27	0.52	0.20	0.28	0.46	0.26	0.29	0.32	0.01	0.33	1.1	2500 x 1500	4000 x 2000	52/29
6 mm 50/25	0.52	0.19	0.27	0.44	0.29	0.28	0.31	0.01	0.32	1.0	2500 x 1500	4000 x 2000	52/28
6 mm 40/22	0.41	0.21	0.22	0.46	0.32	0.24	0.25	0.03	0.28	1.1	2500 x 1500	4000 x 2000	41/24
Pilkington **Eclipse Advantage**™													
6 mm Clear	0.60	0.29	0.47	0.22	0.31	0.55	0.54	0.09	0.63	1.6	2500 x 1500	4000 x 2000	60/55
6 mm Blue-Green	0.51	0.21	0.31	0.13	0.56	0.37	0.36	0.07	0.43	1.6	2500 x 1500	4000 x 2000	51/37
6 mm Bronze	0.34	0.13	0.28	0.11	0.61	0.35	0.32	0.08	0.40	1.6	2500 x 1500	4000 x 2000	34/35
6 mm Grey	0.29	0.10	0.24	0.09	0.67	0.31	0.28	0.08	0.36	1.6	2500 x 1500	4000 x 2000	29/31
6 mm EverGreen	0.43	0.17	0.22	0.10	0.68	0.27	0.25	0.06	0.31	1.6	2500 x 1500	4000 x 2000	43/27
6 mm Arctic Blue	0.35	0.13	0.21	0.09	0.70	0.27	0.24	0.07	0.31	1.6	2500 x 1500	4000 x 2000	35/27
6 mm Pilkington **Solar-E**™	0.53	0.11	0.38	0.10	0.52	0.45	0.44	0.08	0.52	1.5	2500 x 1500	4000 x 2000	53/45

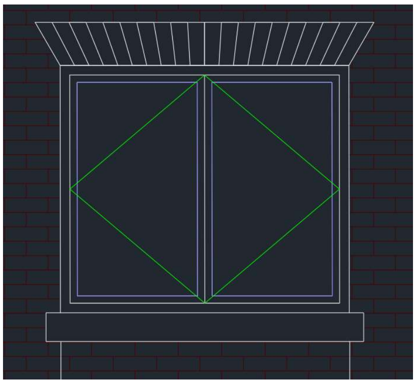
The above performance data has been determined in accordance with BS EN 410 and BS EN 673.
† Maximum unit sizes are for guidance only. These are not recommended for glazing sizes. For further information please consult with the processor.
For other glass combinations, cavities, gases and thicknesses please visit Pilkington Spectrum at www.pilkington.co.uk /spectrum
For performance data relating to other Pilkington products please refer to our product specific literature.
The primary performance data (e.g. U value, g value, etc.) for Pilkington **Suncool**™ Pro T is the same as that of the corresponding annealed Pilkington **Suncool**™, but there may be slight differences in the secondary performance data (e.g. solar reflectance). Full performance data for Pilkington **Suncool**™ Pro T is available via www.pilkington.co.uk/spectrum

10.3 Assumed Window Openings

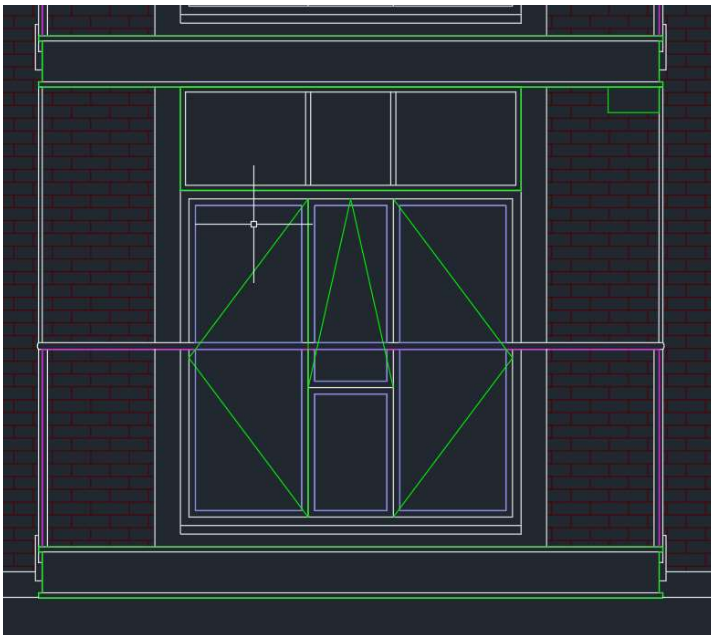
Type 1 (upper floor)



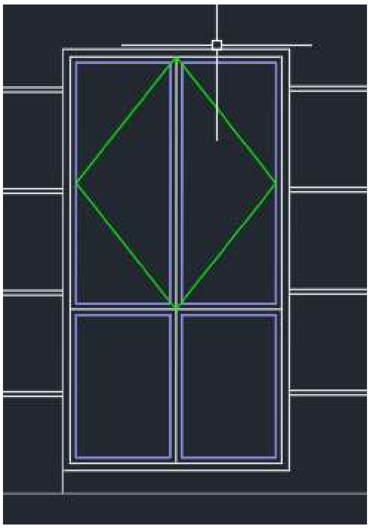
Type 2 (upper floor)



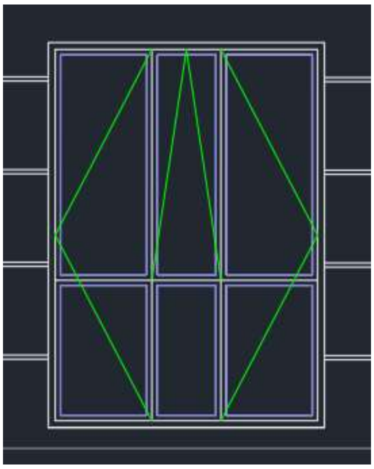
Type 3 (upper floor)



Type 4 (Ground floor)



Type 5 (Ground floor)



Type 6 (Ground floor)