



QUEENSBERRY DESIGN LTD.
ENGINEERING, SUSTAINABILITY & ARCHITECTURAL CONSULTANTS



Apartments

26-28 Brownlow Road, Haringey, London

Overheating Risk, Thermal Model CIBSE TM59:2017 Report

Ref: QD1716 REV B

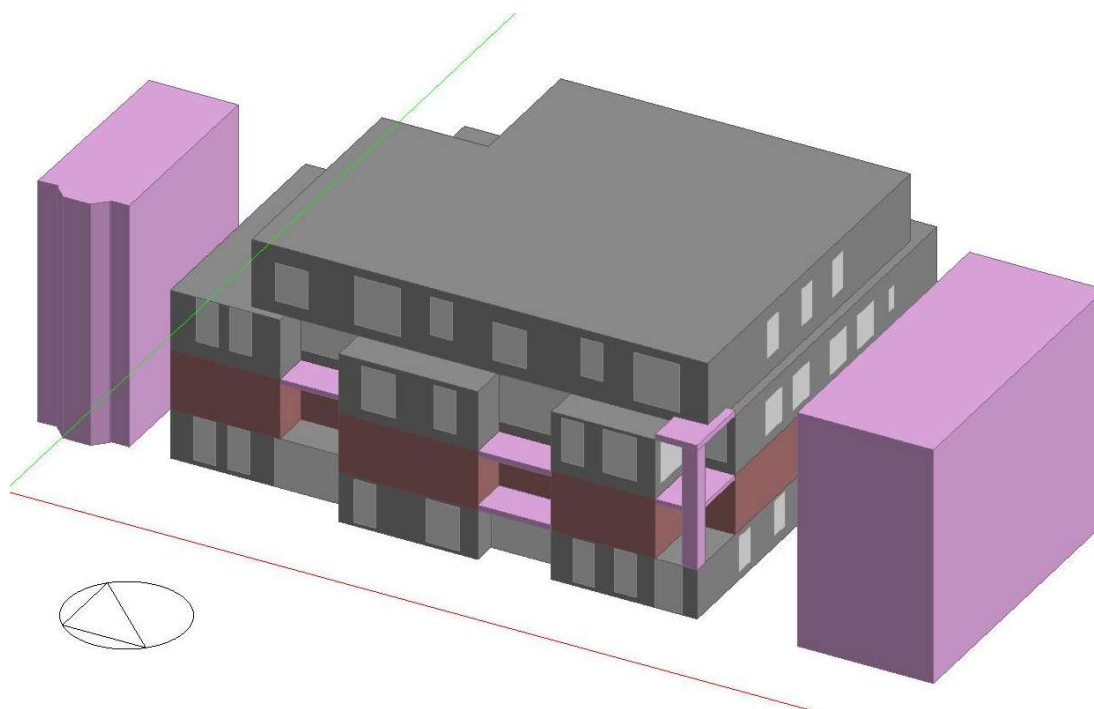
REV C – Additional text added at client's request.

Date: 18th August 2023

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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 take 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. This report pre-dates Building Regulation Approved Document Part O and is based on the CIBSE TM59:2017 and not the limitations set by Part O.

Executive Summary

A detailed dynamic thermal model of the proposed **Brownlow Road Apartment** building has been produced using Design Builder Energy Plus. The model has been used to simulate a selection of the highest risk apartments within the proposed development. The purpose of the simulation is to determine that the building satisfies the requirements of the thermal comfort metrics CIBSE TM59:2017. The building specification inputs are detailed within section 6 of this report, and full results of the simulation model are illustrated in section 7 of this report.

1.1 CIBSE TM59 Results - 2020's weather scenario

Simulation models have been completed for a sample of worst-case apartments. Assessed under the methodology of CIBSE TM59:2017. 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. A sample of all corridor spaces pass the CIBSE TM59 criteria, with none exceeding 28°C for more than 3% of annual hours.

2020 DSY 1 Overheating Mitigation:

Glazing Specification: **1.10 W/m²K – G-Value 0.21 – Bedroom windows G-Value 0.17 #**

Ventilation System: **Nilan Compact S MVHR – Minimum flow rates:**

Bedrooms 20 l/s Kitchen 20 l/s Bathroom 10l/s

Table 1 – 2020's DSY1 Simulation Results, Sample units (CIBSE TM59:2017)			
House Type / Plot	Criteria A (%)	Criteria B (hr)	Pass / Fail
Ground Floor (Unit 04)	Pass	Pass	Pass
Ground Floor (Unit 05)	Pass	Pass	Pass
Ground Floor (Unit 06)	Pass	Pass	Pass
Mid Floor (Unit 16)	Pass	Pass	Pass
Mid Floor (Unit 17)	Pass	Pass	Pass
Mid Floor (Unit 18)	Pass	Pass	Pass
Top Floor (Unit 21)	Pass	Pass	Pass
Top Floor (Unit 22)	Pass	Pass	Pass
Top Floor (Unit 23)	Pass	Pass	Pass

G value of 0.17 to openings marked on the attached plan with a * on plans see appendix 10.4. All other glazing will have a 'g' value of 0.21.

Since the original Overheating Assessment was prepared in 2020 the Applicant has further refined the design and the specification has been influenced by the availability of appropriate products in the market. In addition, revisions have been made to the TM59 software and the attached Assessment is based on the latest version.

1.2 Developer Commitments

This Overheating Assessment sets out a ventilation specification to achieve a DSY1 using the 2020s weather files together with enhanced specifications to meet DSY2 and DSY3 using the 2020s weather files as well as the DSY1 scenario using the 2050s weather files (section 8).

The developer confirms the ventilation specification proposed will be as set out for the DSY3 scenario using the 2020s weather files. This specification also meets the requirements of the DSY1 scenario using the 2050s weather files.

To achieve a pass using the 2080s weather files passive methods to prevent overheating will not be sufficient and comfort cooling will be required. This can be accommodated within the proposed heating and ventilation system and no communal ductwork or pipework will be required.

1.3 Planning justification

Condition 15(a):

Prior to above ground works, an updated Overheating Report modelling future weather files shall be submitted to and approved by the Local Planning Authority. The submission shall assess the future overheating risk and demonstrate how the risks can be mitigated prior to occupation, or as part of a retrofit plan. This assessment will be based on the Overheating Risk Thermal Model CIBSE TM59:2017 Report by Queensberry Design Ltd (dated 27th November 2020). It shall include:

- *Further modelling of units modelled and the overheating risk with the 2050s and 2080s weather files;*
This is provided within this TM59 Overheating Assessment.
- *Modelling of mitigation measures required to pass future weather files, clearly setting out which measures will be delivered before occupation and which measures will form part of the retrofit plan;*
The baseline specification will meet the DSY1, 2 & 3 scenarios for the 2020s weather files and the DSY1 scenario for the 2050s weather files. To meet the requirements of the 2080s weather files passive measures will be insufficient, and comfort cooling will be required. This can be accommodated within the proposed heating/ventilation system.
- *Confirmation that the retrofit measures can be integrated within the design (e.g., if there is space for pipework to allow the retrofitting of cooling and ventilation equipment);*
The TM59 methodology is for primarily naturally ventilated buildings and considers passive measures to reduce the overheating risk but cannot accommodate comfort cooling within the assessment. The Nilan system provides heating and ventilation to the apartments and can reduce the internal air temperature by 8-10 degrees via comfort cooling. This additional cooling is outside of the TM59 modelling.

The TM59 software output is provided in hours over 26 degrees for Criteria B.

'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 failure).'

Temperature data (see appendix 10.5) confirms for the worst failing bedroom (APT22) the hours over 26 °C is double the permitted 32 hours, with a maximum temperature of 32 degrees. On the assumption the Nilan unit reduces the temperature by 8 degrees C (actually 8-10 degrees), then the temperature of the bedroom within the worse-performing bedroom would be 24 degrees, well below the requirements of TM59 for the DSY1 Criteria B for the 2080s weather files.

- *Confirmation who will be responsible to mitigate the overheating risk once the development is occupied.*
No additional mitigation is required.
- *In addition to the Condition the following Actions have also been received from London Borough of Haringey. These are set out below with responses in red.*

Actions:

- *Specify the solar reflectance of the internal blinds and the modelled maximum opening areas of the windows.*
No blinds are proposed within the new specification.
- *Confirm the internal blinds would not interfere with the opening of the windows.*
No blinds are proposed within the new specification.
- *Confirm if occupiers facing Brownlow Road will be able to open their windows without being exposed to adverse level of air pollution and noise levels.*
There are no air quality or noise issues to prevent windows facing Brownlow Road from being opened.
- *Perform future modelling of units with the 2050s and 2080s weather files for central London.*
See above.
- *Model the mitigation measures required to pass future weather files, and clearly set out the measures to be delivered before occupation and measures to be a part of the retrofit plan.*
See above.
- *Confirm that the retrofit measures can be integrated within the design.*
See above.
- *Confirm who will be responsible to mitigate the overheating risk post-occupation.*
See above.

1.0 Introduction

This report had been produced to assess the design stage proposals for **Brownlow Road Apartments** against the overheating criteria outlined by CIBSE TM59:2017. 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.

The new apartment development at 26-28 Brownlow Road, Haringey, London, consists of primarily residential accommodation within a 4-storey apartment block. Additional accommodation areas consist of an entrance lobby, communal corridors, lift/stair core and communal cycle storage.



("Map data ©2020 Google")



Elevation Images courtesy of LSI architects.

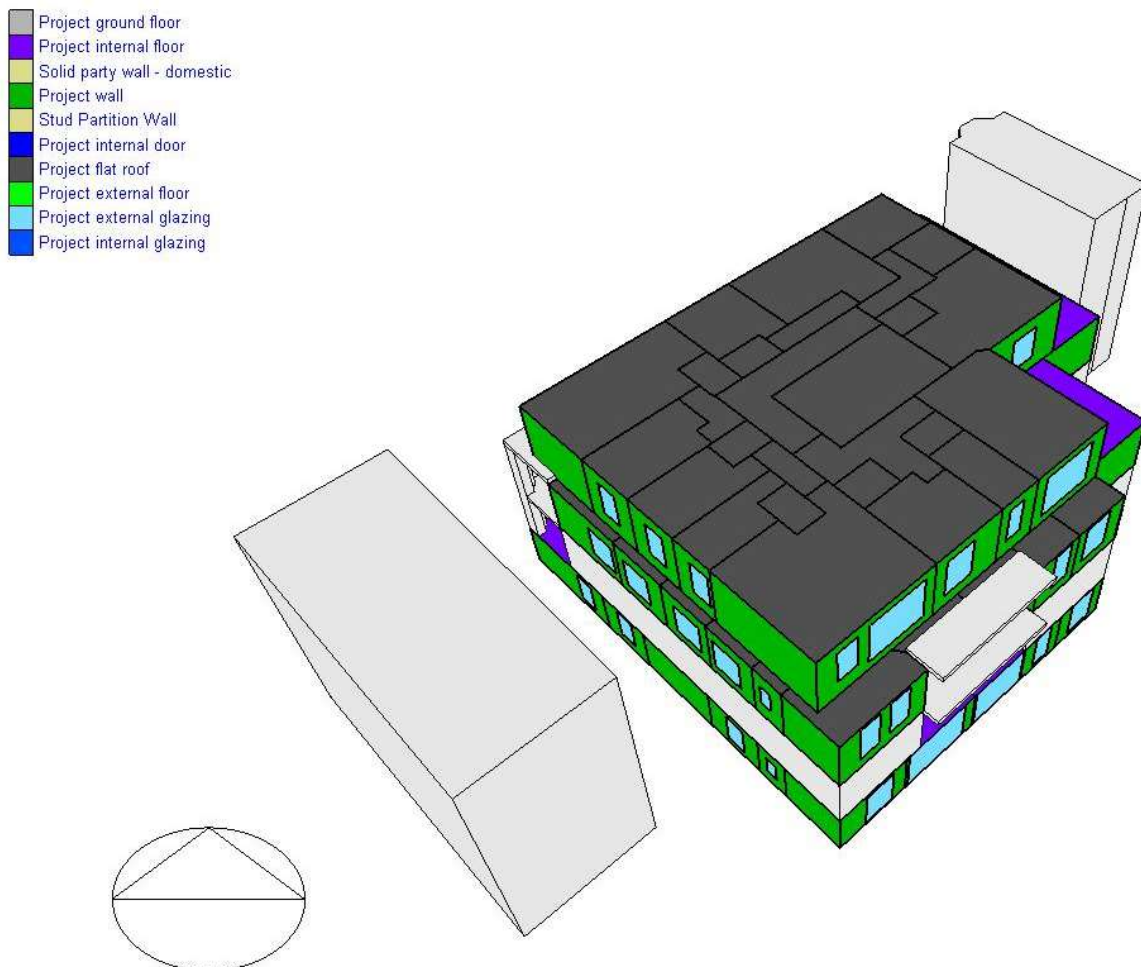
2.0 Overheating Criteria

The most recognised methodology for assessing thermal comfort in domestic spaces is CIBSE TM59:2017. The guidance document is available online and can be consulted 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).



3.0 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 6.1.7.007

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 was 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, 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).

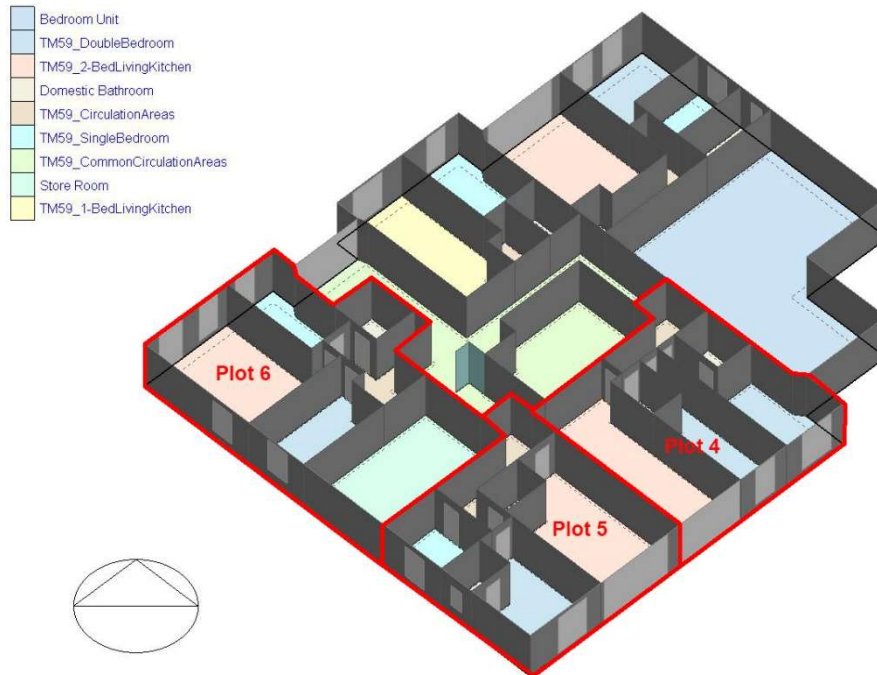
5.2 Sample Units

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

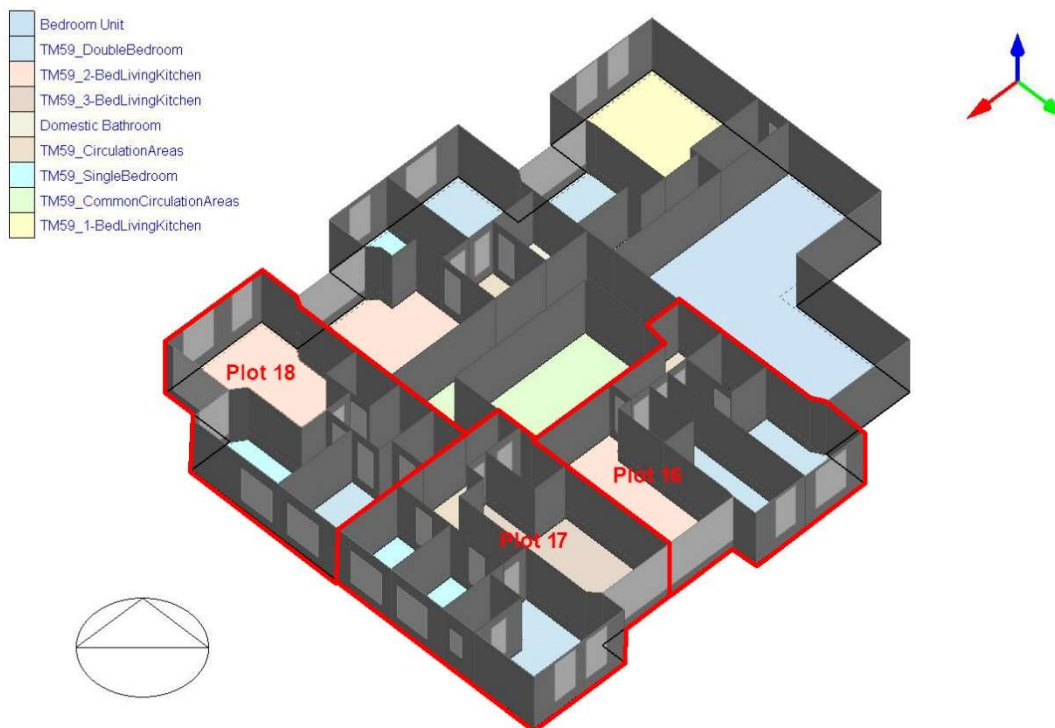
At least 50% rooms on the top floor, 75% of rooms with South or South West aspect.

- Flat 04 – 2 Bedroom, Ground Floor (South East)
- Flat 05 – 2 Bedroom, Ground Floor (South)
- Flat 06 – 2 Bedroom, Ground Floor (South West)
- Flat 16 – 2 Bedroom, Mid Floor (South East)
- Flat 17 – 3 Bedroom, Mid Floor (South)
- Flat 18 – 2 Bedroom, Mid Floor (South West)
- Flat 21 – 2 Bedroom, Mid Floor (South East)
- Flat 22 – 2 Bedroom, Mid Floor (South)
- Flat 23 – 1 Bedroom, Mid Floor (South West)

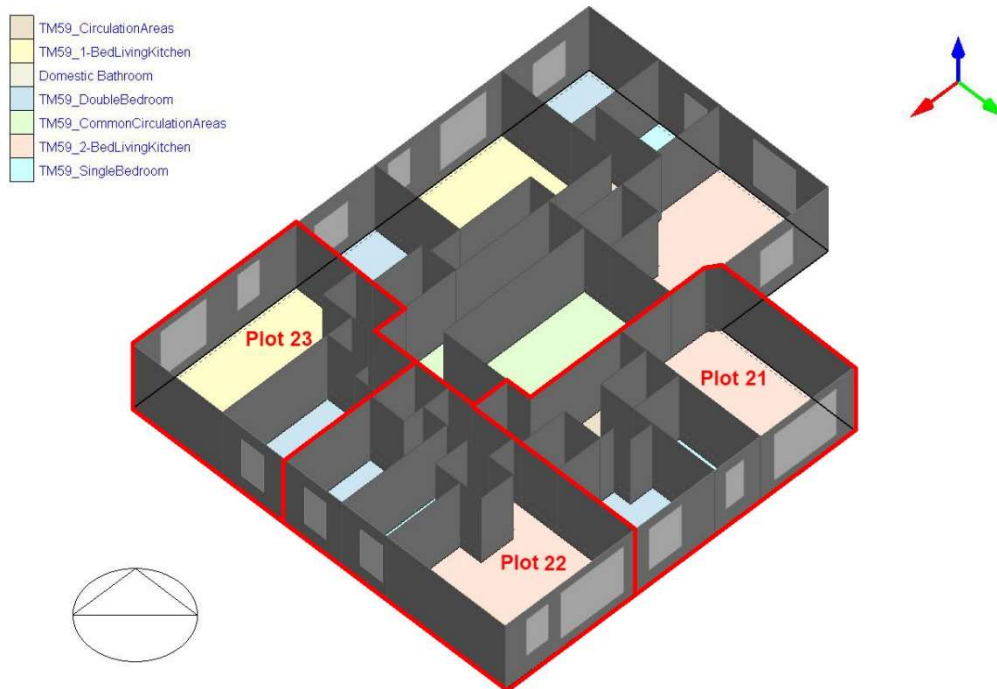
5.3 Sample Units – Ground Floor Apartments 4,5 and 6



5.4 Sample Units – Mid Floor Apartments 16,17 and 18



5.5 Sample Units – Top Floor Apartments 21,22 and 23



6.0 Summary of Model Inputs

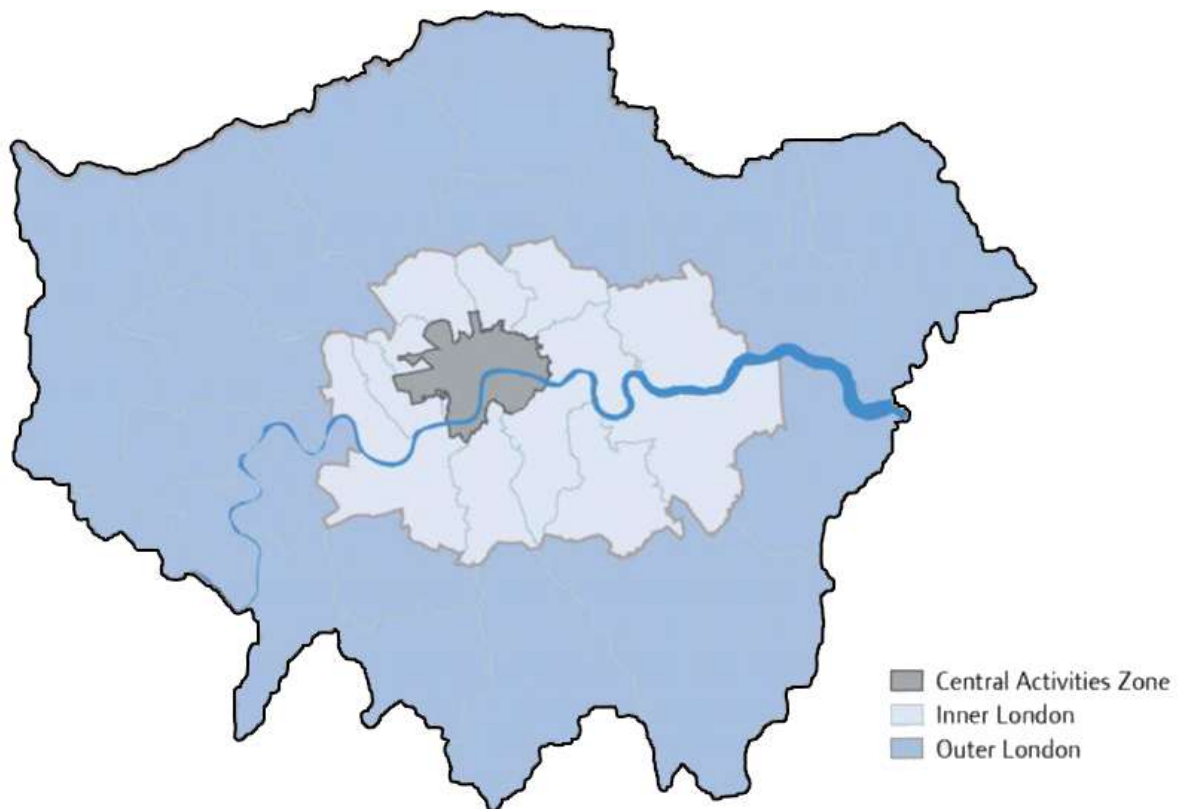
6.1 Location Data

Building type: Residential
Building Location: 26-28 Brownlow Road, Haringey, London
Orientation: Entrance Faces North West
Latitude: 51.36° North
Longitude: 0° West

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-values are based on Construction Specification provided.

Table 2 – Building Fabric		
Ground Floor	65mm cement / sand screed, Vapour separation layer 500 gauge, 130mm Kingspan Kooltherm K103 Floorboard, DPM 1200 gauge, In situ concrete floor.	0.11W/m2K
External Wall	102.5mm brickwork, 10mm clear residual cavity, 75mm cavity, 90mm Kingspan Kooltherm K106 cavity board, 100mm lightweight aggregate blockwork, 8mm parge coat, 8mm Plaster dabs, 12.5mm plasterboard, 3mm skim finish.	0.16 W/m2K
Stud Wall	100mm unspecified – based on timber stud.	0.00 W/m2K
Party Walls	300mm Full Fill Cavity wall.	0.00 W/m2K
Terrace Floor/Roof	110mm Kingspan Kooltherm K110 Soffit Board, Mechanical fixings, In situ concrete slab.	0.17 W/m2K
Flat Roof	Single ply membrane, 175mm Kingspan Thermaroom TR27, Vapour control layer, 18mm structural grade OSB3, Timber joists, 15mm Fireline board, 3mm skim finish.	0.13 W/m2K
Windows	G-Value 0.21 – Bedroom Windows G-Value 0.17 Light transmitted assumed 40%	1.1 /m2K

6.4 Building Services

- **Heating and Ventilation:** Nilan Compact P ducted air heating and ventilation system.
Flow rates for each room are based on the minimum flow rate listed below:
Bathroom flow rate – 10 l/s
Kitchen flow rate – 20 l/s
Bedroom flow rate – 20 l/s
The Communal corridors based on electric panel heaters 100% efficient.
- **hot waters:** Point of used hot water via electric emersion cylinder
- **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.”
 - “For communal corridors, 2 W/m², this may be assumed as zero if passive infrared (PIR) sensors are present.”

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 10.2).

There are no communal corridor pipework heat gains as the client has confirmed no pipework within the corridors.

6.6 Air Infiltration Rate

The air permeability of the building envelope must conform to the standard set by criterion 2 of Part L 2013, namely a maximum air permeability of 10 m³h⁻¹m² at 50 Pa. It is proposed that the air permeability of this development will be significantly less than the maximum value, with a target design air permeability of <10 m³h⁻¹m² @ 50 Pa. The airtightness crack template is set to Good in the simulation model.

Air flow 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

Window opening details have not been provided at this time, although the client has confirmed which windows have fixed panes and which are openable. In order to complete the assessment an opening angle of 30° has been used for top hung windows and 45° has been used for side-hung windows, windows/doors directly onto a balcony are based on 100% openable free aperture data can be found in appendix 10.1. All openable windows are projected to be opened manually by the end user when the internal temperature exceeds 22-24°C. The manual opening is modelled in tandem with the occupancy profiles prescribed by CIBSE TM59. In reality, rooms will be un-occupied at un-expected times, and it is important that the design team consider ventilation for unoccupied periods.

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

7.1 Simulation Results 2020’s DSY 1 – Mitigation Measures Included

Based on the natural ventilation strategy, low g-glazing and Nilan Compact P ducted air heating and ventilation system, a simulation model has been completed for a sample of units, assessed under the methodology of CIBSE TM59:2017. The results below show all worst-case sample plots pass criteria A and B set by CIBSE TM59:2017.

Table 3 – 2020’s Simulation Results for Sample Apartments (CIBSE TM59:2017)			
Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Apartment 4 – Double Bedroom	0	10.5	Pass
Apartment 4 – Double Bedroom	0	9.17	Pass
Apartment 4 – Livingroom / Kitchen	0.28	N/A	Pass
Apartment 5 – Double Bedroom	0.09	12	Pass
Apartment 5 – Single Bedroom	0	6.83	Pass
Apartment 5 – Livingroom / Kitchen	0.46	N/A	Pass
Apartment 6 – Double Bedroom	0	8.33	Pass
Apartment 6 – Single Bedroom	0.01	8	Pass
Apartment 6 – Livingroom / Kitchen	0.31	N/A	Pass
Apartment 16 – Double Bedroom	0	9.83	Pass
Apartment 16 – Single Bedroom	0	9.67	Pass
Apartment 16 – Livingroom / Kitchen	0.25	N/A	Pass
Apartment 17 – Single Bedroom	0.13	11	Pass
Apartment 17 – Single Bedroom	0.11	10.17	Pass
Apartment 17 – Single Bedroom	0.13	9.83	Pass
Apartment 17 – Livingroom / Kitchen	0.48	N/A	Pass
Apartment 18 – Double Bedroom	0.18	5.5	Pass
Apartment 18 – Single Bedroom	0.12	8.33	Pass
Apartment 18 – Livingroom / Kitchen	0.24	N/A	Pass
Apartment 21 – Double Bedroom	0.15	8.17	Pass
Apartment 21 – Single Bedroom	0.21	11.33	Pass
Apartment 21 – Livingroom / Kitchen	0.55	N/A	Pass
Apartment 22 – Double Bedroom	0.16	14.33	Pass
Apartment 22 – Single Bedroom	0.25	15	Pass
Apartment 22 – Livingroom / Kitchen	0.63	N/A	Pass
Apartment 23 – Double Bedroom	0.07	12.83	Pass
Apartment 23 – Livingroom / Kitchen	0.46	N/A	Pass

7.2 Corridors Baseline Results 2020's DSY1

Corridors have been tested under the advisory TM59 overheating criteria. (Internal temperatures advised not to exceed 28°C for more than 3% of annual hours.

Table 4 – 2020's Simulation Results for Corridors (CIBSE TM59:2017)		
Zone	Exceedance 28° (%)	Pass / Fail
Apartment 4 – Circulation	0.04	Pass
Apartment 5 – Circulation	0.11	Pass
Apartment 6 – Circulation	0.05	Pass
Communal – GF Circulation	0	Pass
Apartment 16 – Circulation	0.03	Pass
Apartment 17 – Circulation	0.25	Pass
Apartment 18 – Circulation	0.19	Pass
Communal – MF Circulation	0	Pass
Apartment 21 – Circulation	0.23	Pass
Apartment 22 – Circulation	0.42	Pass
Apartment 23 – Circulation	0.24	Pass
Communal – TF Circulation	0	Pass

8. Extreme and Future weather scenarios

The Greater London Authority (GLA) guidance requires all building to comply with DSY1 (Design Summer Year) for the 2020s, high emissions, 50% percentile. This has been proven in section 7. The GLA guidance also requires additional testing should be undertaken using the more extreme design weather years DSY2 and DSY3 (2020's).

8.1 2020's DSY2 and DSY3 (Extreme Weather)

It is acknowledged by the GLA that meeting the CIBSE compliance Criteria A and B is challenging for 2020's DSY2/DSY3 and it may not be possible via passive measures:

'Where the CIBSE compliance criteria is not met for a particular weather file, the applicant must demonstrate that the risk of overheating has been reduced as far as practical and that all passive measures have been explored, including reduced glazing and increased external shading.' – Greater London Authority guidance.

Calculations have been undertaken based on the proposed building specification that is 2020's DSY 1 compatible. The extreme weather scenarios DSY 2 and DSY 3 and the required mitigation measures are summarised in the table below.

Table 5 – 2020's Extreme DSY2&3 Simulation Results, Sample units (CIBSE TM59:2017)			
Weather file	Criteria A (%)	Criteria B (hr)	Mitigation required to pass
2020's DSY 2	All Pass except the SE facing top floor Living/kitchens	Pass	Increased airflow ventilation to SE top floor Living/kitchens. 60 l/s flow rate
2020's DSY 3	All except the SE facing top floor Living/kitchens	Most Bedrooms Fail	Increased airflow ventilation to all Bedrooms and SE top floor Living/kitchens. 90 l/s flow rate

Providing the above mitigation measures are incorporated, CIBSE compliance with criteria A and B can be achieved.

8.2 2050's and 2080's Weather scenarios

Haringey council have requested additional future weather simulations, above and beyond the GLA guidance. Simulations have been run using projected 2050's and 2080's, high emissions, 50% percentile scenarios.

Future scenarios:

2050, high emissions, 50% percentile

2080, high emissions, 50% percentile

As these weather files are above and beyond the GLA requirement, CIBSE compliance with Criteria A and B will be extremely challenging and potentially unfeasible via passive measures. Calculations have been undertaken based on the proposed building specification that is 2020's DSY 1 compatible, the results of future weather scenarios are summarised in the table below.

Table 6 – 2050's and 2080's DSY1 Simulation Results, Sample units (CIBSE TM59:2017)			
Weather file	Criteria A (%)	Criteria B (hr)	Mitigation required to pass
2050's DSY 1	Pass	The majority of Bedrooms Fail	Increased airflow ventilation to all Bedrooms. 80 l/s flow rate
2080's DSY 1	Some Living/kitchens Fail	All Bedrooms Fail	Further measures will be required.

Providing the above 2050's mitigation measures are incorporated, CIBSE compliance with criteria A and B can be achieved for the 2050's weather file. As expected, the 2080's failure will require further mitigation and are unlikely to be surmountable with passive measures.

8.3 Further Passive Measures

In an attempt to reduce the 2080's overheating risk, further passive mitigation measures have been modelled for potential future retrofit.

Low – G glazing throughout: To reduce the projected solar gains to living rooms and kitchens the developer should consider installing the lower g-value glazing throughout the development.

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 of vertical fins to avoid low-angled sun, 0.5-1.5m in length. Overhead of side window shading should be considered for initial installation or for the potential future retro fit.

Louvres: Louvers provide the maximum shading as they provide all-day shading to the openings, although they will limit visibility for occupants.

Increased Flow rates: The Nilan Compact P ducted air heating and ventilation system works on a duct and fan system. By increasing the ducting and fan size it may be possible to increase the air flow rates in Bedrooms, Livingroom's and Kitchens.

Calculations have been undertaken based on future retrofit of all the proposed passive measures for the 2080's future weather file.

2080 DSY 1 Potential future retro-fit Mitigation:

Glazing Specification: **G-Value 0.17 throughout**

Ventilation Flow rates:

Bedrooms 200 l/s

Kitchen 200 l/s

Bathroom 10l/s

External shading: **4x 1m Louvers, and side fins to all windows.**

Table 7 – All passive measure incorporated 2080's DSY1 Simulation Results, Sample units (CIBSE TM59:2017)			
Weather file	Criteria A (%)	Criteria B (hr)	Mitigation required to pass
2080's DSY 1	Pass	All Bedrooms Fail	No Passive measures remain. Comfort cooling to the bedrooms would be possible via the GLA guidance

The Greater London Authority (GLA) guidance does not allow active cooling when passive measures could be used as a viable alternative. However, for the 2080's weather scenario, all passive measures have been modelled and found to be insufficient to meet CIBSE compliance with criteria B for the bedrooms.

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

9. Conclusions

A detailed dynamic thermal model of the proposed **Brownlow Apartment** building has been produced using Design Builder Energy Plus. The model has been used to simulate a selection of the highest risk apartments within the proposed development.

The purpose 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 sample of the worst-case apartments compliance with the overheating criteria as defined by CIBSE TM59:2017, weather file 2020's DSY1, can be achieved, in line with the Greater London Authority (GLA) guidance requires.

2020 DSY 1 Overheating Mitigation:

Glazing Specification: **1.10 W/m²K – G-Value 0.21 – Bedroom windows G-Value 0.17**

Ventilation System: **Nilan Compact S MVHR – Minimum flow rates:**

Bedrooms 20 l/s

Kitchen 20 l/s

Bathroom 10l/s

Table 8 – 2020's DSY1 Simulation Results, Sample units (CIBSE TM59:2017)			
House Type / Plot	Criteria A (%)	Criteria B (hr)	Pass / Fail
Ground Floor (Unit 04)	Pass	Pass	Pass
Ground Floor (Unit 05)	Pass	Pass	Pass
Ground Floor (Unit 06)	Pass	Pass	Pass
Mid Floor (Unit 16)	Pass	Pass	Pass
Mid Floor (Unit 17)	Pass	Pass	Pass
Mid Floor (Unit 18)	Pass	Pass	Pass
Top Floor (Unit 21)	Pass	Pass	Pass
Top Floor (Unit 22)	Pass	Pass	Pass
Top Floor (Unit 23)	Pass	Pass	Pass

Provided the above recommendations are implemented, the ventilation design combined with natural ventilation effectively removes the heat gains in these spaces and replenishes minimum fresh air to the occupants as such that the building fulfils the TM59:2017 criteria.

9.2 Advisory Recommendations to meet future criteria.

Advisory recommendations have been made to reduce the overheating risk for extreme and future weather scenarios these are outlined in sections 7-8 of this report.

10. Appendix

10.1 Free aperture Calculations

Window	Width	Height	Area Opening	Opening aperture angle 30 / 45%	Free aperture percentage	Hung
Apt 4 kitchen/Living Window E	3.150	2.400	7.560	Patio Door		Top
Apt 4 Bedroom 1 Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 4 Bedroom 2 Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 4 Bedroom2 Double D	0.525	1.975	1.037	Fixed		
Apt 5 kitchen/Living Window A	1.125	1.500	1.688	0.916	54.258	Side
Apt 5 kitchen/Living Window B	1.360	2.400	3.264	Patio Door		Side
Apt 5 kitchen/Living Window C	1.025	1.275	1.307	0.544	41.626	Top
Apt 5 Bedroom Single A	1.125	1.500	1.688	0.916	54.258	Side
Apt 5 Bedroom Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 6 kitchen/Living Window E	3.150	2.400	7.560	Patio Door		Top
Apt 6 Bathroom Window F	0.685	1.225	0.839	0.315	37.539	Top
Apt 6 Bedroom Single A	1.125	1.500	1.688	0.916	54.258	Side
Apt 6 Bedroom Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 6 Bedroom Double D	0.525	1.975	1.037	Fixed		
Apt 16 kitchen/Living Window E	3.150	2.400	7.560	Patio Door		Top
Apt 16 Bedroom 1 Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 16 Bedroom 2 Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 16 Bedroom 2 Double D	0.525	1.975	1.037	Fixed		
Apt 17 kitchen/Living Window E	3.150	2.400	7.560	Patio Door		Top
Apt 17 Bathroom Window F	0.685	1.225	0.839	0.315	37.539	Top
Apt 17 Bedroom Single Window G	0.850	1.450	1.233	0.800	64.909	Side
Apt 17 Bedroom Single Window G Fixed	0.850	1.450	1.233	Fixed		
Apt 17 Bedroom Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 17 Bedroom Double	0.525	1.975	1.037	Fixed		
Apt 18 Bedroom Single Window G	0.850	1.450	1.233	0.800	64.909	Side
Apt 18 Bedroom Single Window G Fixed	0.850	1.450	1.233	Fixed		
Apt 18 Bedroom Double Window G	0.850	1.450	1.233	0.800	64.909	Side
Apt 18 Bedroom Double Window G Fixed	0.850	1.450	1.233	Fixed		
Apt 18 Bedroom Double Patio	1.500	2.400	3.600	Patio Door		Side
Apt 18 kitchen/Living Patio	2.870	2.400	6.888	Patio Door		Side
Apt 21 kitchen/Living A	1.125	1.500	1.688	0.916	54.258	Side
Apt 21 kitchen/Living Patio	2.800	2.400	6.720	Patio Door		Side
Apt 21 Bedroom Single A	1.125	1.500	1.688	0.916	54.258	Side
Apt 21 Bedroom Double Patio	1.650	2.400	3.960	Patio Door		Side
Apt 22 kitchen/Living A	1.125	1.500	1.688	0.916	54.258	Side
Apt 22 kitchen/Living Patio	3.170	2.400	7.608	Patio Door		Side
Apt 22 Bedroom Single A	1.125	1.500	1.688	0.916	54.258	Side
Apt 22 Bedroom Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 23 Bedroom Double A	1.125	1.500	1.688	0.916	54.258	Side
Apt 23 kitchen/Living A	1.125	1.500	1.688	0.916	54.258	Side
Apt 23 kitchen/Living Patio	2.300	2.400	5.520	Patio Door		Side

windows/doors directly onto a balcony are based on 100% openable.

10.2 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 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
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

10.3 Example low-G Glazing specification



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/m²·K)	Unit Maximum Sizes¹		
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

10.4 Developer annotated floor plans.







10.5 Temperature distribution data APT22 Double bedroom.

