



QUEENSBERRY DESIGN Ltd.
ENGINEERING, SUSTAINABILITY & ARCHITECTURAL CONSULTANTS

Apartments
26-28 Brownlow Road, Haringey, London

Overheating Risk, Thermal Model
CIBSE TM59:2017 Report

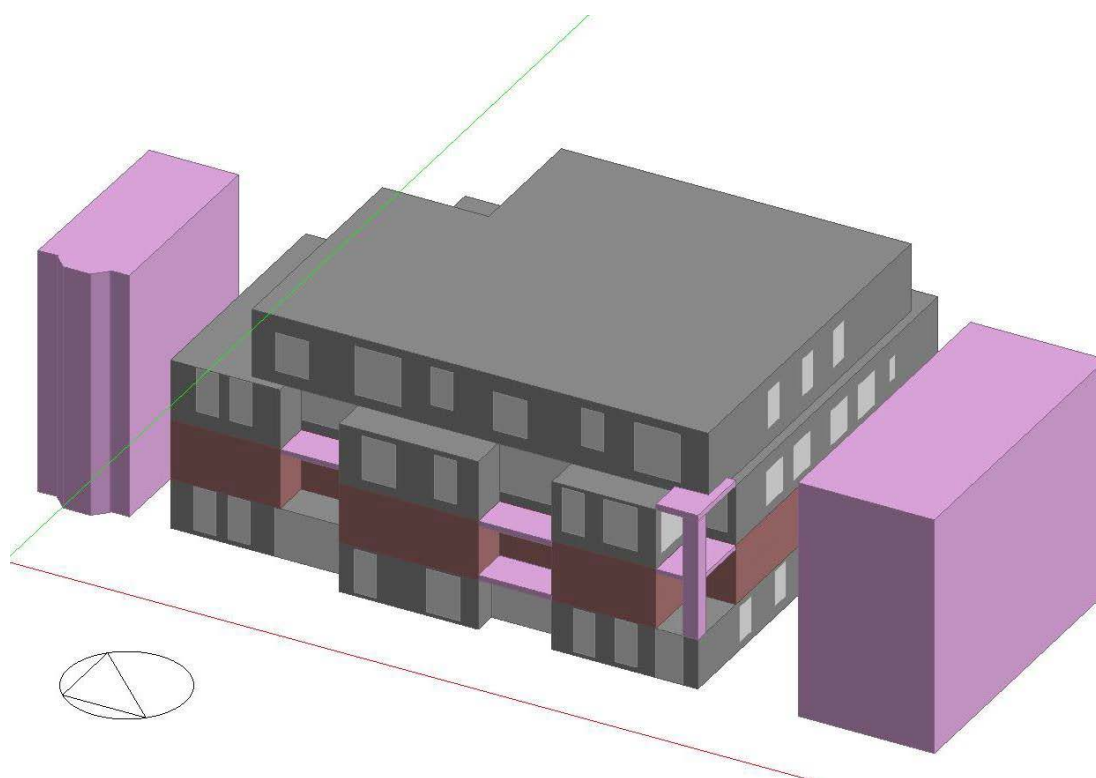
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Disclaimer

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.

1.0 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

Baseline result show significant failures to all apartments based on the overheating criteria as defined by CIBSE TM59:2017. A sample of all corridor spaces pass the CIBSE TM59 criteria, with none exceeding 28°C for more than 3% of annual hours.

1.2 Advisory Recommendations to meet future criteria

Advisory recommendations have been made to reduce the overheating risk within the building. Additional calculations have been completed examining the inclusion of low-g glazing, additional extract ventilation, increased openings, and internal blinds. These are outlined in section 7-8 of this report.

Table 1 - Additional calculations to meet TM59 for 2020's, high emissions, 90%			
Measures	Criteria A (%)	Criteria B (hr)	Pass / Fail
Low g-value glazing specification	Some bedrooms still fail TM59		
Additional extract ventilation to bedrooms	Most bedrooms pass TM59		
Increased window openings apt 14 & 34 Internal blinds to selected bedrooms.	All zones pass TM59		

2.0 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.

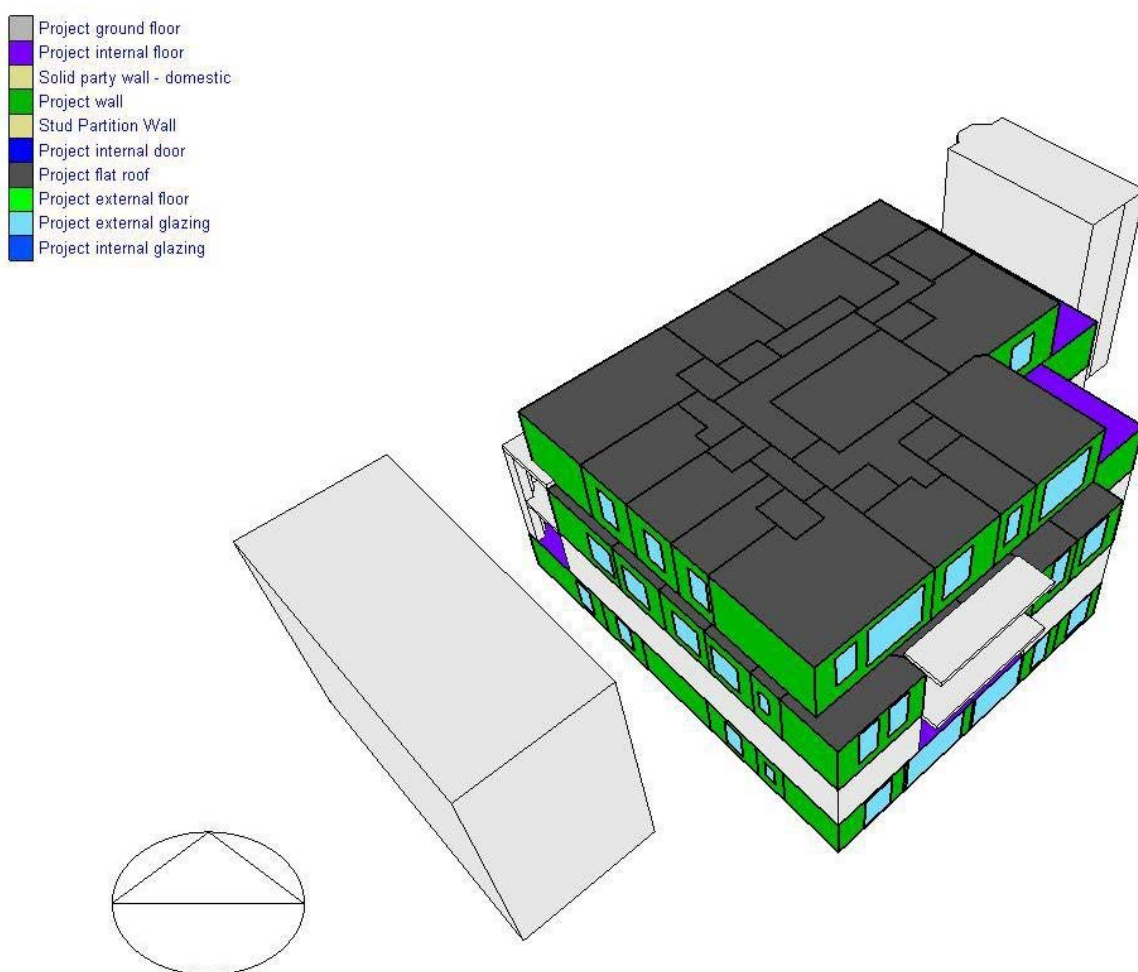
3.0 Overheating Criteria

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



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 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).

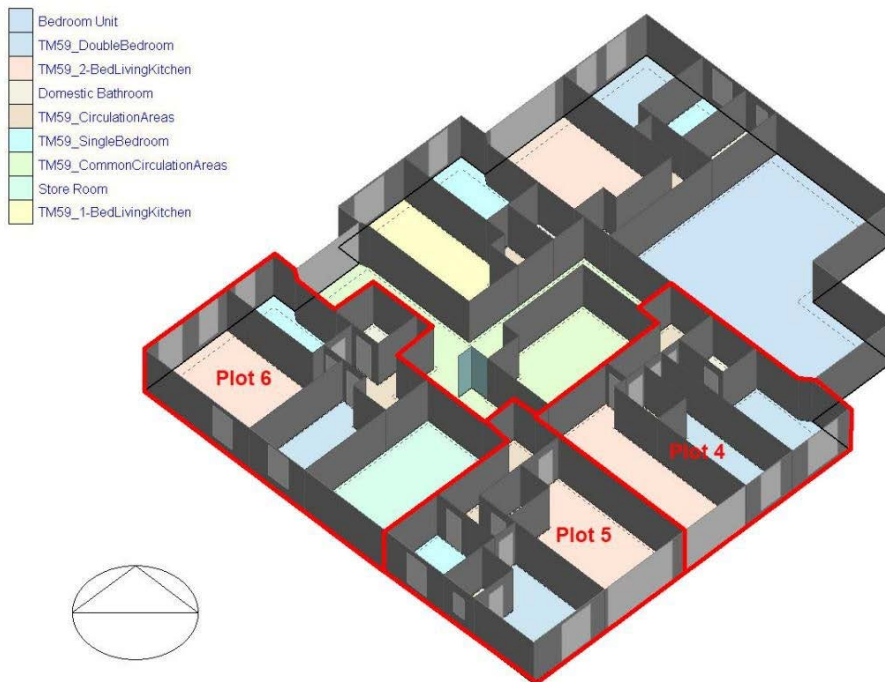
5.2 Sample Units

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

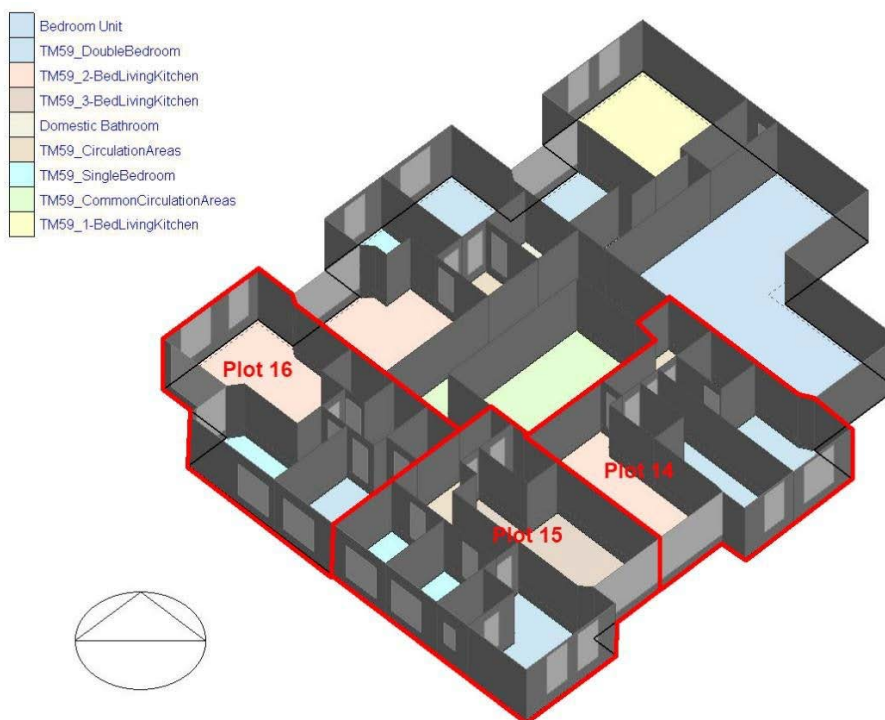
At least 50% rooms on the top floor, 75% of rooms with South or South West aspect.

- Flat 04 – 2 Bedroom, Ground Floor (South East)
- Flat 05 – 2 Bedroom, Ground Floor (South)
- Flat 06 – 2 Bedroom, Ground Floor (South West)
- Flat 10 – 2 Bedroom, Mid Floor (South East)
- Flat 11 – 3 Bedroom, Mid Floor (South)
- Flat 12 – 2 Bedroom, Mid Floor (South West)
- Flat 21 – 2 Bedroom, Top Floor (South East)
- Flat 22 – 2 Bedroom, Top Floor (South)
- Flat 23 – 1 Bedroom, Top Floor (South West)

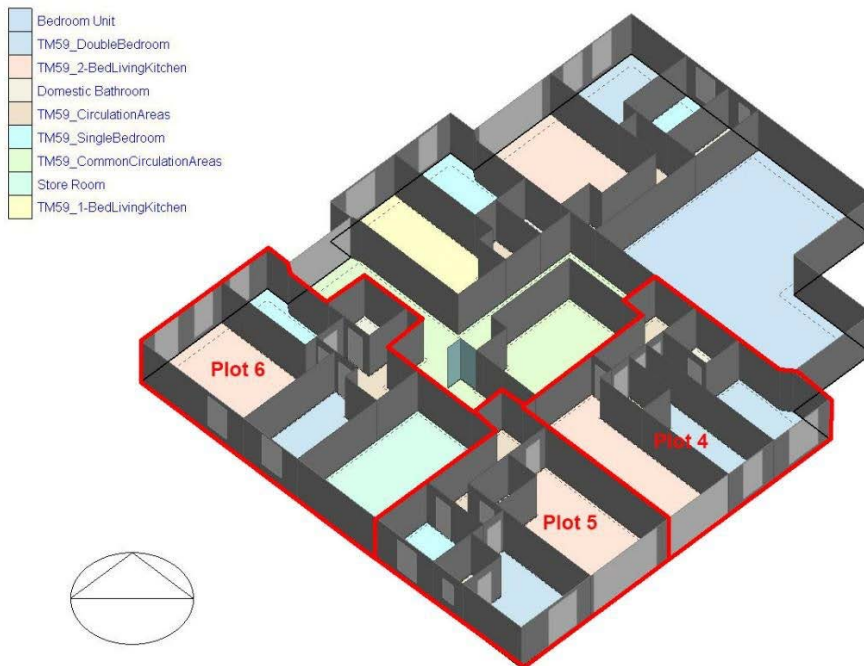
5.3 Sample Units – Ground Floor Apartments 4,5 and 6



5.4 Sample Units – Mid Floor Apartments 10,11 and 12



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



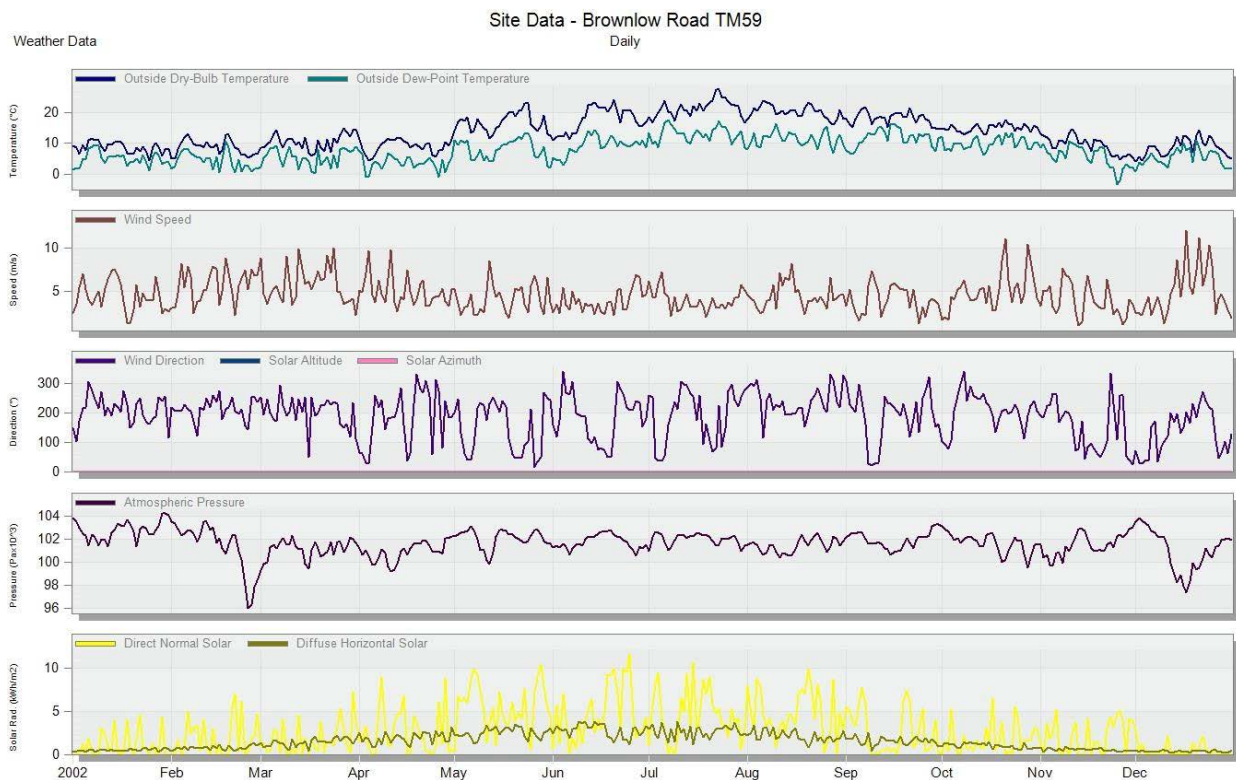
6.0 Summary of Model Inputs

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

The weather data used is London Weather Centre DSY 1 (Design Summer Year) 2020's, high emissions, 50% percentile scenario.



6.3 Building Fabric

Fabric U-values are based on preliminary information provided.

Table 2 – Building Fabric		
Ground Floor	Unspecified – currently based on: 70mm screed, 100mm floor slab, 300mm insulation, to meet U-value.	0.11W/m2K
External Wall	450mm unspecified – currently based on: 100mm brick, 75mm cavity, 100mm rigid insulation, 150mm medium density block, plaster board on dabs, to meet U-value.	0.17 W/m2K
Stud Wall	100mm unspecified – currently based on timber stud	0.00 W/m2K
Party Walls	250mm unspecified – currently based on sold wall	0.00 W/m2K
Flat Roof	400-500mm unspecified – currently based on 300mm insulation to meet U-value.	0.13 W/m2K
Windows	G-Value 0.63 (light transmission based on 0.7)	0.14 W/m2K

6.4.1 Building Services

- **Heating and hot waters:** Radiator heating to apartments via electric boilers and hot water via air sourced heat pump (Dimplex Edel or Vaillant aroSTOR). The Communal corridors based on electric panel heaters 100% efficient.
- **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.”
- **Ventilation:** Domestic ventilation to each apartment is System 1, Mechanical Extract Ventilation. No product extract rates available, so rates are based on Approved Document Part F and/or industry standard guidance (see appendix 10.1 A Vent-Axia Ventilation Design Guidelines).

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. 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 Baseline Results 2020's

Based on the natural ventilation strategy, the simulation model has been completed for a sample of apartments, assessed under the methodology of CIBSE TM59:2017. All inputs used for this scenario can be found in section 6 of this report. The results below show significant failures to all apartments in relation to 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	0.41	113.83	Fail
Apartment 4 – Double Bedroom	0.48	81.83	Fail
Apartment 4 – Livingroom / Kitchen	1.18	N/A	Pass
Apartment 5 – Double Bedroom	0.64	104	Fail
Apartment 5 – Single Bedroom	0.1	30.33	Pass
Apartment 5 – Livingroom / Kitchen	1.7	N/A	Pass
Apartment 6 – Double Bedroom	0	31.33	Pass
Apartment 6 – Single Bedroom	0.12	42	Fail
Apartment 6 – Livingroom / Kitchen	0.98	N/A	Pass
Apartment 10 – Double Bedroom	1.6	162	Fail
Apartment 10 – Double Bedroom	1.02	124.83	Fail
Apartment 10 – Livingroom / Kitchen	1.08	N/A	Pass
Apartment 11 – Single Bedroom	0.78	64.17	Fail
Apartment 11 – Double Bedroom	0.84	79.5	Fail
Apartment 11 – Single Bedroom	0.62	55.33	Fail
Apartment 11 – Livingroom / Kitchen	1.16	N/A	Pass
Apartment 12 – Double Bedroom	0.31	50.83	Fail
Apartment 12 – Single Bedroom	0.57	25.17	Pass
Apartment 12 – Livingroom / Kitchen	1.22	N/A	Pass
Apartment 21 – Double Bedroom	1.29	155.33	Fail
Apartment 21 – Single Bedroom	1	78	Fail
Apartment 21 – Livingroom / Kitchen	1.82	N/A	Pass
Apartment 22 – Double Bedroom	0.56	79.67	Fail
Apartment 22 – Single Bedroom	0.8	86.17	Fail
Apartment 22 – Livingroom / Kitchen	1.57	N/A	Pass
Apartment 23 – Double Bedroom	0.51	56.17	Fail
Apartment 23 – Livingroom / Kitchen	1.2	N/A	Pass

7.2 Corridors Baseline Results 2020's

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.

Zone	Exceedance 28° (%)	Pass / Fail
Apartment 4 – Circulation	0.94	Pass
Apartment 5 – Circulation	0.85	Pass
Apartment 6 – Circulation	0.41	Pass
Communal – GF Circulation	0	Pass
Apartment 10 – Circulation	1.52	Pass
Apartment 11 – Circulation	1.08	Pass
Apartment 12 – Circulation	0.81	Pass
Communal – MF Circulation	0	Pass
Apartment 21 – Circulation	1.54	Pass
Apartment 22 – Circulation	1.15	Pass
Apartment 23 – Circulation	0.96	Pass
Communal – TF Circulation	0.52	Pass

8. Advisory Measures to Reduce Overheating Risk

8.1 Advisory Measures

Baseline results show significant failures to all apartments based on the overheating criteria as defined by CIBSE TM59:2017. To ensure all sample apartments meet the criteria; reduction measures have been considered including; Low G Glazing, additional ventilation, blinds or curtains and additional window openings. The developer should also consider building wide measures such as external shading to futureproof the building.

8.2 Low G Glazing

To reduce the projected solar gains the developer should consider a low g-value glazing such as Pilkington Suncool (see appendix 10.3 for details).

Low G-value Glazing	G-value <0.18
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Table 4 – Low G-value glazing Results for Sample Apartments previously failing (CIBSE TM59:2017)			
Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Apartment 4 – Double Bedroom	0	37	Fail
Apartment 4 – Double Bedroom	0	32.83	Fail
Apartment 5 – Double Bedroom	0.05	36.67	Fail
Apartment 6 – Single Bedroom	0	24.17	Pass
Apartment 10 – Double Bedroom	0	57.5	Fail
Apartment 10 – Double Bedroom	0	51.83	Fail
Apartment 11 – Single Bedroom	0.15	33.17	Fail
Apartment 11 – Double Bedroom	0.17	37.67	Fail
Apartment 11 – Single Bedroom	0.03	30	Pass
Apartment 12 – Double Bedroom	0	29	Pass
Apartment 21 – Double Bedroom	0.1	65.83	Fail
Apartment 21 – Single Bedroom	0.29	42	Fail
Apartment 22 – Double Bedroom	0	43.67	Fail
Apartment 22 – Single Bedroom	0.2	44.5	Fail
Apartment 23 – Double Bedroom	0	33.67	Fail

As shown in the table above low g glazing would ensure most sample apartments meeting the CIBSE TM59:2017 overheating criteria.

8.3 Additional Extract Ventilation:

To reduce overheating further, additional ventilation measures have been modelled for the bedrooms. The additional calculations have been run based on the inclusion of extract or MVHR ventilation to all bedrooms. The ventilation design will need to meet the required mechanical extract rates (Air Changes/hour) listed below. The rates are based on industry standard guidance (see appendix 10.1 A Vent-Axia Ventilation Design Guidelines); the worst-case bedrooms are:

Apartment 10 – Double bedroom

Apartment 21–Single bedroom

Apartment 22 – Double bedroom

Apartment 22–Single bedroom

Apartment 22 – Double bedroom

Bedroom ventilation	4 Air Changes/hour
Worst case bedrooms	10 Air Changes/hour

Table 5 – Additional Simulation mechanical extract rates: Bedrooms: 4 Air Changes/hour Worst Case Bedrooms: 10 Air Changes/hour Results for Sample Apartments previously failing (CIBSE TM59:2017)			
Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Apartment 4 – Double Bedroom	0	29.33	Pass
Apartment 4 – Double Bedroom	0	25	Pass
Apartment 5 – Double Bedroom	0	31	Pass
Apartment 10 – Double Bedroom	0	33.17	Fail
Apartment 10 – Double Bedroom	0	32.67	Fail
Apartment 11 – Single Bedroom	0	27.5	Pass
Apartment 11 – Double Bedroom	0	30.83	Pass
Apartment 11 – Single Bedroom	0	24.83	Pass
Apartment 21 – Double Bedroom	0	41.17	Fail
Apartment 21 – Single Bedroom	0.14	32.5	Fail
Apartment 22 – Double Bedroom	0	28.83	Pass
Apartment 22 – Single Bedroom	0.1	32.33	Fail
Apartment 23 – Double Bedroom	0	28.17	Pass

8.4 Additional Window Openings:

The inclusion of extract ventilation to the bedroom removes most of the overheating, however a small number of the bedrooms with South East windows are still failing. It is advised that the fixed pane portion of the windows for apartment 14 master bedroom and apartment 34 double bedroom be openable. Additional internal blinds are advised for apartment 14 master bedroom and apartment 33 double bedroom.

Blinds

Blinds Specification	- Low reflective fixed angle slats, manually operated (Summertime occupancy schedule)
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Table 6 – Additional openable windows and blinds added to selected bedrooms. Results for Sample Apartments previously failing (CIBSE TM59:2017)			
Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Apartment 4 – Double Bedroom	0	29.5	Pass
Apartment 4 – Double Bedroom	0	24.83	Pass
Apartment 5 – Double Bedroom	0	30.5	Pass
Apartment 10 – Double Bedroom	0	25.67	Pass
Apartment 10 – Double Bedroom	0	30.83	Pass
Apartment 11 – Single Bedroom	0	27	Pass
Apartment 11 – Double Bedroom	0	30.17	Pass
Apartment 21 – Double Bedroom	0	0	Pass
Apartment 21 – Single Bedroom	0	0.17	Pass
Apartment 22 – Double Bedroom	0	28.5	Pass
Apartment 22 – Single Bedroom	0.1	32	Pass
Apartment 23 – Double Bedroom	0	28	Pass

As shown in the table above all bedroom previously failing, now meet the CIBSE TM59:2017 criteria.

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

Baseline result show significant failures to all apartments based on the overheating criteria as defined by CIBSE TM59:2017. A sample of all corridor spaces pass the CIBSE TM59 criteria, with none exceed 28°C at any point.

9.2 Advisory Recommendations to meet future criteria

Advisory recommendations have been made to reduce the overheating risk within the building. Additional calculations have been completed examining the inclusion of low-g glazing, additional extract ventilation, increased openings, and internal blinds. These are outlined in section 7-8 of this report.

The additional calculations confirm that the building can meet the overheating criteria set by CIBSE TM59. A full set of calculation can be found in appendix 10.4.

Additional calculations to meet TM59 for 2020's, high emissions, 90%			
Measures	Criteria A (%)	Criteria B (hr)	Pass / Fail
Low g-value glazing specification	Some bedrooms still fail TM59		
Additional extract ventilation to bedrooms	Most bedrooms pass TM59		
Increased window openings apt 14 & 34 Internal blinds to selected bedrooms.	All Zones pass TM59		

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.

10. Appendix

10.1 VentAxia Ventilation Design Guidelines (recommended Air Changes/hour)

Vent-Axia Ventilation Design Guidelines

Successful Planning

Today, people are becoming increasingly aware of the problems of indoor pollution and the important contribution that well-planned ventilation makes to modern living.

Effective ventilation is now regarded as a necessity because no-one can feel their best or work efficiently in air that contains smells, smoke, moisture or excessive heat. Stale air in pubs, clubs, offices and workshops is bad for business. In the stuffy atmosphere created by lack of ventilation, colds, flu and airborne viruses will quickly spread. VentAxia controlled ventilation can help in all these situations and reduces lost output caused by absenteeism through illness.

Damaging condensation affects 4.5 million homes in the UK alone. This can quickly cause paintwork and wallpaper to deteriorate and encourages mould, stains and a deterioration of the property. So people are faced with the expensive cost of redecorating.

Unfortunately, modern thermally efficient buildings are not designed to encourage natural ventilation. The Building

Regulations are recognising this problem and, nationally, local authorities are specifying higher rates of ventilation. When installing ventilation it is most important to obtain maximum efficiency from the investment so proper planning is essential.

What size of unit & how many ?

The correct size, type and number of VentAxia units required for any area is determined by three factors: the room size, its use and location.

First, work out the volume of the room by multiplying length x width x height. This volume is then multiplied by the required number of air changes per hour (ACH) given in the table to give the total air movement required per hour. Select the number of fans necessary to achieve the desired volume.

The Building Regulations (Document F) require the following intermittent ventilation rates in new dwellings. Alternatively ventilate continuously at 0.3 l/s/m²:

- Kitchen areas: an extract rate of no less than 216m³/h 60 l/sec. For calculation purposes we recommend a minimum air change rate of 15 per hour.
- Utility rooms: an extract rate of no less than 108m³/h 30 l/sec. For calculation purposes we recommend a minimum air change rate of 15 per hour.
- Bathrooms: an extract rate of no less than 54m³/h 15 l/sec. For calculation purposes we recommend a minimum air change rate of 6 per hour.
- WC's: an extract rate of no less than 6 l/sec. For calculation purposes we recommend a minimum air change rate of 6 per hour.

The new requirements are designed to remove steam and smells at source before they are able to migrate causing damage to colder parts of the dwelling.

Air Changes Per Hour (ACH) Table

This table provides suggested air changes per hour (ACH) under normal conditions based on VentAxia's extensive experience.

Assembly rooms	4 - 8	Dye works	20 - 30	Living rooms	3 - 6
Bakeries	20 - 30	Electroplating shops	10 - 12	Mushroom houses	6 - 10
Banks/Building Societies	4 - 8	Engine rooms	15 - 30	Offices	6 - 10
Bathrooms	6 - 10	Entrance halls & corridors	3 - 5	Paint shops (not cellulose)	10 - 20
Bedrooms	2 - 4	Factories and workshops	8 - 10	Photo & X-ray darkrooms	10 - 15
Billiard Rooms *	6 - 8	Foundries	15 - 30	Public house bars	12 minimum
Boiler Rooms	15 - 30	Garages	6 - 8	Recording control rooms	15 - 25
Cafes and coffee bars	10 - 12	Glasshouses	25 - 60	Recording studios	10 - 12
Canteens	8 - 12	Gymnasiums	6 minimum	Restaurants	8 - 12
Cellars	3 - 10	Hairdressing salons	10 - 15	Schoolrooms	5 - 7
Changing Rooms Main area	6 - 10	Hospitals - sterilising	15 - 25	Shops and supermarkets	8 - 15
Changing Rooms Shower area	15 - 20	- wards	6 - 8	Shower baths	15 - 20
Churches	1 - 3	Kitchens - domestic	15 - 20	Stores & warehouses	3 - 6
Cinemas & theatres *	10 - 15	# - commercial	30 minimum	Squash courts	4 minimum
Club rooms	12 minimum	Laboratories	6 - 15	Swimming baths	10 - 15
Compressor rooms	10 - 20	Laundrettes	10 - 15	Toilets	6 - 10
Conference rooms	8 - 12	Laundries	10 - 30	Utility rooms	15 - 20
Dairies	8 - 10	Lavatories	6 - 15	Welding shops	15 - 30
Dance halls	12 minimum	Lecture theatres	5 - 8		
Dental surgeries	12 - 15	Libraries	3 - 5		

* Increase by 50% where heavy smoking occurs or if the room is underground.

Some commercial kitchens may require higher ventilation rates, based on cooking equipment in use.

The total extract airflow rate during normal operation of a continuous mechanical ventilator eg. MultiVent etc, should be 0.3 l/s/m². This is based on the whole dwelling volume, with provision to increase the inlet volume, as required, in moisture generation areas.

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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 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

10.3 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/m²K)	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 Simulation Results including all recommendation

Table 7 – 2020's Simulation Results including all recommendation (CIBSE TM59:2017)			
Zone	Criteria A (%)	Criteria B (hr)	Pass / Fail
Apartment 4 – Double Bedroom	0	29.5	Pass
Apartment 4 – Double Bedroom	0	24.83	Pass
Apartment 4 – Livingroom / Kitchen	0.08	N/A	Pass
Apartment 5 – Double Bedroom	0	30.5	Pass
Apartment 5 – Single Bedroom	0	14.5	Pass
Apartment 5 – Livingroom / Kitchen	0.11	N/A	Pass
Apartment 6 – Double Bedroom	0	13.33	Pass
Apartment 6 – Single Bedroom	0	16.67	Pass
Apartment 6 – Livingroom / Kitchen	0.09	N/A	Pass
Apartment 14 – Double Bedroom	0	25.67	Pass
Apartment 14 – Double Bedroom	0	30.83	Pass
Apartment 14 – Livingroom / Kitchen	0.17	N/A	Pass
Apartment 15 – Single Bedroom	0	27	Pass
Apartment 15 – Double Bedroom	0	30.17	Pass
Apartment 15 – Single Bedroom	0	24.67	Pass
Apartment 15 – Livingroom / Kitchen	0.26	N/A	Pass
Apartment 16 – Double Bedroom	0	22.67	Pass
Apartment 16 – Single Bedroom	0	13.5	Pass
Apartment 16 – Livingroom / Kitchen	0.35	N/A	Pass
Apartment 33 – Double Bedroom	0	32	Pass
Apartment 33 – Single Bedroom	0.1	29.67	Pass
Apartment 33 – Livingroom / Kitchen	0.4	N/A	Pass
Apartment 34 – Double Bedroom	0	28.5	Pass
Apartment 34 – Single Bedroom	0.1	32	Pass
Apartment 34 – Livingroom / Kitchen	0.43	N/A	Pass
Apartment 35 – Double Bedroom	0	28	Pass
Apartment 35 – Livingroom / Kitchen	0.44	N/A	Pass